The TPTP Problem Library

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Abstract

This report provides a detailed description of the TPTP Problem Library for automated theorem proving systems. This library is available via Internet, and is intended to form a common basis for the development of and experimentation with automated theorem provers. To support this goal, this report provides

- the motivations for building the library;
- a discussion of troublesome issues, and how they have been resolved;
- a description of the library structure, including overview information;
- information on each problem contained in the library;
- descriptions of supplementary utility programs;
- guidelines for obtaining and using the library.

Contents

1 Introduction

This technical report describes the TPTP (Thousands of Problems for Theorem Provers) Problem Library. The TPTP is a library of problems for automated theorem proving (ATP) systems, for the clause normal form (CNF) of 1st order logic. The TPTP is comprehensive, and thus provides an overview of, and a simple, unambiguous reference mechanism for, ATP problems. The TPTP problems are presented in a specifically designed, easy to understand format, and automatic conversion to other known ATP formats is provided.

The principal motivation for this project is to move the testing and evaluation of ATP systems from the previously ad hoc situation onto a firm footing. This became necessary, as results being published often do not accurately reflect the capabilities of the ATP system being considered. A common library of problems is necessary for meaningful system evaluations, meaningful system comparisons, repeatability of testing, and the production of statistically significant results. The TPTP is such a library. Since its first release in 1993, many researchers have used the TPTP as an appropriate and convenient basis for ATP system evaluation.

A Quick Installation Guide for the TPTP is given in Section 4.1 on page 34. Please be sure to read the guidelines for using TPTP problems and presenting results, given in Section 4.2.

This technical report serves as a manual explaining the structure and use of the TPTP. It also explains much of the reasoning behind the development of the TPTP, and thus implicitly explains the design decisions made. It contains the motivations for building the TPTP, a full description of the TPTP contents and organization, details of some utilities for manipulating the TPTP, and guidelines for obtaining and using the TPTP.

What's New in TPTP v1.2.1 (since v1.2.0):

- There have been 233 bugfixes done, in the domains BOO GEO GRP HEN NUM PUZ RNG SET SYN.
- If the axiomatization used in a problem has been formed by reducing and augmenting an existing axiomatization, and the result is complete but also non-standard due to redundancy, this is noted with `(Non-standard)` in the `% Version` field.
- The `% Syntax` field has been extended to include counts of range restricted clauses, and the arity ranges of the predicate and function symbols.
- The tptp2X utility has been extended and improved :
  - One new output format: SPASS.
  - Two new transformations: `to_equality` and `add_equality`.
  - The equality removal has been renamed to `rm_equality`, and now fails if the equality axiomatization is incomplete.
  - The shorten transformation no longer shortens `equal` to `eq`.
- In problems where the equality axiomatization was incomplete, the `equal`/2 predicate has been renamed to `equalish`/2.
- The clause type information has been reviewed and 4 corrections were made. Throughout the TPTP the problem type `theorem` has been replaced with `conjecture`.
- The TPTP technical report (this document) has been updated.

1.1 Previous Problem Collections

A large number of interesting problems have accumulated over the years in the ATP community. Besides publishing particularly interesting individual problems, from early on researchers collected problems in order to obtain a basis for experimentation. The first major publication[1] in this regard was [MOW76], which provides an explicit listing of clauses for 63 problems, many of which are still relevant today. In the same year Wilson and Minker [WM76] documented 86 problems which have since commonly been used for ATP testing. The problem clauses are not supplied in [WM76], however. A second major thrust was provided by [Pel86], which lists 75 problems. Other more recent papers are [BLM+86], [Qua92a], [MW92], and [McC93], to name a few. The Journal of Automated Reasoning's Problem Corner also provided interesting challenge problems. However, problems published in hardcopy form are often not suitable for testing ATP systems, because they have to be transcribed to electronic form. This is a cumbersome, error-prone process, and is feasible for only very small numbers of problems. A problem library in electronic form was made publicly available by Argonne National Laboratories (in Otter format, [McC94]) in 1988 [ANL]. This library has been a major source of problems for ATP researchers. Other electronic collections of problems are available, but have not been announced officially (e.g., that distributed with the SPRFN ATP system [SPR]). Although some of these collections provide significant support to researchers, and formed the early core of the TPTP library, none (with the possible exception of the ANL library) was specifically designed to serve as a common basis for ATP research. Rather, these collections typically were built in the course of research into a particular ATP system. As a result there are several factors that limit their usefulness as a common basis for research. In particular, previously existing problem collections

- are often hard to discover and obtain.
  System development and system evaluations typically rely on a small set of test problems, depending on the collections of problems available to the researcher.

- need to be transformed to suit the syntax of the ATP system being considered.
  The problem format used in a collection may not be appropriate for the desired purpose, and a comparatively large effort is required just to make the problems locally usable (which in practice often means that such a collection of problems is simply ignored).

- are often limited in scope and size.
  The problems used are often homogeneous, and thus cannot be used for a broad test of the capabilities of the ATP system under consideration. If there are too few problems, statistically significant testing is not possible.

- may be outdated.
  The problems may insufficiently reflect the current state-of-the-art in ATP research.

- are sometimes designed and tuned (regarding clause selection, clause ordering, and literal ordering) for a particular ATP system.
  Using a collection designed and tuned for a particular ATP system may lead to biases in results.

[1] To our knowledge, the first circulation of problems for testing ATP systems was due to L. Wos in the late sixties.

- provide no indication of the difficulty or significance of the problems.
  The significance and difficulty of a problem, with respect to the current state-of-the-art in ATP systems, is hard to assess by newcomers to the field. Existing test problems are often not adequate anymore (e.g., Schubert's Steamroller [Sti86]), while others may be solvable only with specialized techniques (e.g., LIM+ [Ble90]) and therefore are much too hard to start with.

- are inconsistent in their presentation of equally named problems.
  Many copies and variants of the same "original" problem may exist in different libraries. This means that unambiguous identification of problems, and therefore a clear interpretation of performance figures, for given problems, has become difficult.

- are usually undocumented.
  It is hard to obtain information on problem semantics, the original problem source, and the particular sytle of axiomatization. It also contributes to the problem of unambiguous problem identification.

- are almost always unserviced.
  They do not provide a mechanism for adding new problems or correcting errors in existing problems, and cannot be used to electronically distribute new and corrected problems to the ATP community. This in turn perpetuates the use of old and erroneous problems.

- provide no guidelines for their use.
  Quite often, inadequate system evaluations are performed. As a consequence, results that provide little indication of the system properties are reported.

The problem of meaningfully interpreting results is even worse than indicated. Commonly a few problems are selected and hand-tuned (clauses and literals are arranged in a special order, irrelevant clauses are omitted, lemmas are added in, etc) specifically for the ATP system being tested. The presentation of a problem can significantly affect the nature of the problem, and changing the clauses clearly makes a different problem altogether. Nevertheless the problem may be referenced under the same name as it was presented elsewhere. As a consequence the experimental results reveal little. Some researchers avoid this ambiguity by listing the clause sets explicitly, but obviously this usually cannot be done for a large number of problems or for large individual problems. The only satisfactory solution to these issues is a common and stable library of problems. The TPTP is such a library.

1.2 What is Required?

The goal for building the TPTP has been to overcome previous drawbacks, and to centralize the burden of problem collection and maintenance to one place. The TPTP tries to address all relevant issues. In particular, the TPTP

- is easy to discover and obtain.
  Awareness of the TPTP is assured by extensive formal and informal announcements. The TPTP is available by anonymous ftp, and is thus easily available to the research community.

- is easy to use.
  Problems are presented in a specifically designed, easy to understand format. Automatic conversion to other known formats is also provided, thus eliminating the necessity for transcription.

- spans a diversity of subject matters.
  This reduces biases in the development and testing of ATP systems, which arise from the use of a limited scope of problems. It also provides an overview of the domains that ATP systems are used in.

- is large enough for statistically significant testing.
  In contrast to common practise, an ATP system should be evaluated over a large number of problems, rather than a small set of judiciously selected examples. The large size of the TPTP makes this possible.

- is comprehensive.
  The TPTP contains all problems known to the community. There is no longer a need to look elsewhere.

- is up-to-date.
  As new problems appear in the literature and elsewhere (see the paragraph Sources on page 7), they are added to the TPTP as soon as possible.

- is independent of any particular ATP system.
  The problem clauses are arranged so as to be modular and human-readable, rather than arranged for a particular ATP system.

- contains problems varying in difficulty.
  The difficulty of problems in the TPTP ranges from very simple problems through to open problems. This allows all interested researchers, from newcomers to experts, to rely on the same problem library.

- will provide a rating for the difficulty of each problem.
  This is important for several reasons: (1) It simplifies problem selection according to the user's intention. (2) It allows the quality of an ATP system to be judged. (3) Over the years, changes in the problem ratings will provide an indicator of the advancement in ATP. The problem ratings are currently being worked on, and will be part of a future TPTP release.

- provides statistics for each problem and the library as a whole.
  This provides information about the syntactic nature of the problems.

- has an unambiguous naming scheme.
  This provides unambiguous problem reference, and makes the comparison of results meaningful. See Section 2.4 for details.

- is well structured and documented.
  This allows effective and efficient use of library. Useful background information, such as an overview of ATP application domains, is provided.

- documents each problem.
  This contributes to the unambiguous identification of each problem.

- provides a mechanism for adding new problems.
  The TPTP contains standard axiomatizations that can be used in new problems. This simplifies the construction of new problems (see Section 4.3). A template is provided for submission of new problems. The TPTP is thus a channel for making new problems available to the community, in a simple and effective way.

- provides a mechanism for correcting errors in existing problems.
  TPTP users can report errors, and these are corrected immediately. Patched TPTP releases are made regularly.

- provides guidelines for its use in evaluating ATP systems.
  A standard library of problems together with evaluation guidelines makes reported results meaningful and reproducible by others. This will in turn simplify and improve system comparisons, and allow ATP researchers to accurately gauge their progress.

The development of the TPTP problem library is an ongoing project, with the aim to provide all of the desired properties. Typical issues that have to be considered when building and maintaining a problem library are listed below, together with some clue of how they have been attacked in the TPTP.

- Accuracy
  Problems are thoroughly checked before release, and errors are corrected on notice.

- Consistency
  A modular problem representation is used (see Section 2.2).

- Documentation of the problems and axiomatizations
  Important information is taken from the source of the problem or axiomatization, and presented with the problem or axiomatization. In some cases the original authors have been contacted to obtain more information.

- Comprehensiveness
  All problem sources known to the ATP community are considered. The library is updated whenever new problems are found or proposed (see also the paragraph Sources on page 7).

- Unambiguous identification of problems
  A naming scheme has been developed to provide unambiguous names for problems and axiomatizations (see Section 2.4).

Current Limitations of the TPTP. The current release of the TPTP library is limited to problems expressed in 1st order logic, presented in clause normal form. There are no problems in first order form, for induction, or for non-classical theorem proving. However, see Section 5 for upcoming and planned extensions.

2 Inside the TPTP

Scope. Release v1.2.1 of the TPTP contains 2044 abstract problems, which result in 2752 ATP problems, due to alternative presentations (see Section 2.2). Tables 1, 2, and 3 provide some statistics about release v1.2.1 of the TPTP.

Number of problem domains	25	
Number of abstract problems	2044	
Number of generic problems	85	
Number of problems	2752	
Number of non-Horn problems	1486	(54%)
Number of range restricted problems	105	(4%)
Number of problems with equality	1920	(70%)
Number of pure equality problems	493	(18%)
Number of satisfiable problems	$\geq$ 59	(2%)
Number of propositional problems	42	(2%)
... being non-Horn	30	(1%)
... being satisfiable	6	(0%)
Total number of clauses	323074	
Total number of literals	743104	

Table 1: Statistics on the TPTP.

The problems in the TPTP are syntactically diverse, as is indicated by the ranges of the values in Tables 2 and 3. The problems in the TPTP are also semantically diverse, as is indicated by the range of domains that are covered. The problems are grouped into 25 domains, covering topics in the fields of logic, mathematics, computer science, engineering, and others. The domains are presented and discussed in Section 2.1.

Sources. The problems have been collected from various sources. The two principal sources have been existing electronic problem collections and the ATP literature. Other sources include logic programming, mathematics, puzzles, and correspondence with ATP researchers. Many people and organizations have contributed towards the TPTP. In particular, the foundations of the TPTP were laid with David Plaisted's SPRFN collection; many problems have been taken from Argonne National Laboratory's ATP problem library (special thanks to Bill McCune here); Art Quaife has provided several hundred problems in set theory and algebra; the Journal of Automated Reasoning, CADE Proceedings, and Association for Automated Reasoning Newsletters have provided a wealth of material; smaller numbers of problems have been provided by a number of further contributors (see the Acknowledgements at the end of Section 5).

Releases. The TPTP is managed in the manner of a software product, in the sense that fixed releases are made. Each release of the TPTP is identified by a release number, in the form v<Version>.<Edition>.<Patch level>. The Version number enumerates major new releases of the TPTP, in which important new features have been added. The Edition number is incremented each time new problems are added to the current version. The

Measure	Minimum	Maximum	Average	Median
Number of clauses	2	504	118	54
Percentage of non-Horn clauses	0%	99%	5%	4%
...in non-Horn problems	2%	99%	9%	5%
Percentage of unit clauses	0%	100%	34%	22%
Percentage of range restricted clauses	0%	100%	60%	63%
Number of literals	2	1512	273	129
Percentage of equality literals	0%	100%	43%	46%
...in equality problems	19%	100%	61%	47%
Maximal clause size	1	25	4	5
Number of predicate symbols	1	48	9	3
Percentage of propositions	0%	67%	0%	0%
Minimal predicate arities	0	5	1	1
Maximal predicate arities	1	10	2	3
Number of functors	1	93	23	9
Percentage of constants	0%	100%	50%	50%
Minimal functor arities	0	2	0	0
Maximal functor arities	0	8	2	2
Number of variables	0	1094	269	130
Percentage of singletons	0%	100%	8%	7%
Maximal term depth	1	14	4	4

Table 2: Statistics for non-propositional TPTP problems.

Patch level is incremented each time errors, found in the current edition, are corrected. All non-trivial changes are recorded in a history file, as well as in the file for an affected problem.

2.1 The TPTP Domain Structure

This section provides the structure according to which the problems are grouped into domains. Some information about the domains is also given.

Measure	Minimum	Maximum	Average	Median
Number of clauses	3	82	24	18
Percentage of non-Horn clauses	0%	81%	25%	25%
...in non-Horn problems	8%	81%	35%	33%
Percentage of unit clauses	0%	100%	19%	13%
Number of literals	4	232	64	40
Maximal clause size	1	11	3	3
Number of predicate symbols	2	63	13	11

Table 3: Statistics for propositional TPTP problems.

An attempt has been made to classify the totality of the TPTP problems in a systematic and natural way. The resulting domain scheme reflects the natural hierarchy of scientific domains, as presented in standard subject classification literature. The current classification is based mainly on the Dewey Decimal Classification (DDC) [Dew89] and the Mathematics Subject Classification (MSC) [MSC92] used for the Mathematical Reviews by the American Mathematical Society. Five main fields are defined: logic, mathematics, computer science, engineering, and other. Each field contains further subdivisions, called *domains*. Each domain is identified by a three-letter mnemonic. These mnemonics are also part of the problem naming scheme (see Section 2.4). The TPTP domains constitute the basic units of our classification. The full classification scheme is shown in Figure 1.

TPTP				# of Problems abstract/versions/generic
Logic	Combinatory logic		COL	81 / 141 / 0
	Logic calculi		LCL	256 / 278 / 0
	Henkin models		HEN	12 / 64 / 0
Mathematics	Set Theory		SET	562 / 695 / 0
	Graph Theory		GRA	1 / 1 / 0
	Algebra	Boolean Algebra	BOO	19 / 52 / 0
		Robbins Algebra	ROB	27 / 36 / 0
		Left distributive	LDA	14 / 23 / 0
		Lattices	LAT	5 / 10 / 0
		Groups	GRP	193 / 313 / 50
		Rings	RNG	40 / 100 / 0
		General Algebra	ALG	2 / 4 / 0
	Number Theory		NUM	285 / 309 / 2
	Topology		TOP	19 / 24 / 0
	Analysis		ANA	5 / 19 / 0
	Geometry		GEO	78 / 165 / 0
	Category theory		CAT	19 / 58 / 0
Computer science	Computing Theory		COM	4 / 6 / 0
	Planning		PLA	23 / 30 / 0
	Program Verification		PRV	9 / 9 / 0
Engineering	Circuit Design		CID	3 / 4 / 0
	Circuit Verification		CIV	4 / 4 / 0
Other	Syntactic		SYN	340 / 350 / 27
	Puzzles		PUZ	34 / 45 / 3
	Miscellaneous		MSC	9 / 12 / 3

Figure 1: The domain structure of the TPTP.

A brief description of the domains, with a non-ATP reference for a general introduction and a generic ATP reference, is given below. For each domain, appropriate DDC and MSC numbers are also given:

COL *Combinatory Logic.*
Combinatory logic is about applying one function to another. It can be viewed as an alternative foundation of mathematics (or, due to its Turing-completeness, as a programming language). More formally, it is a system satisfying two combinators and satisfying reflexivity, symmetry, transitivity, and two equality substitution axioms for the function that exists implicitly for applying one combinator to another.
Indices : MSC 03B40
References : General [CF58, CHS72, Bar81], ATP [WM88b].

LCL *Logic Calculi.*
A logic calculus defines axioms and rules of inference that can be used to prove theorems. This domain currently contains the following logical calculi:

- Implication/Negation 2 valued modal
- Implication/Negation 2 valued sentential (CN-calculus)
- Implicational propositional (IC-calculus, negation-free part of sentential calc.)
- Implication/Falsehood 2 valued sentential (C0-calculus)
- Disjunction/Negation 2 valued sentential (AN-calculus)
- Many valued sentential (MV-calculus)
- Equivalential (EC-calculus, theorems represent group identity in Boolean groups)
- R (under some constraint, theorems represent identity in Abelian groups)
- Left group (LG-calculus, under some constraint theorems represent formulas equal to identity in groups)
- Right group (RG-calculus, theorems are related to identity in groups)
- Wajsberg Algebra.

The following relations hold between theorems of the above calculi: LG theorems $\subset$ L theorems $\subset$ EC theorems, RG theorems $\subset$ R theorems $\subset$ EC theorems.
Indices : DDC 511.3, MSC 03XX
References : General [Luk63], ATP [MW92]

HEN *Henkin Models.*
Henkin models provide a generalized semantics for higher order logics. This leads to a larger class of models and, as a consequence, fewer true sentences. However, in contrast to standard semantics, complete and correct calculi can be found.
Indices : MSC 03CXX
References : General [Hen50, Leb83].

SET *Set Theory.*
Classically, a set is a totality of certain definite, distinguishable objects of our intuition or thought - called the elements of the set. Due to paradoxes that arise from such a naive definition, mathematicians now regard the notion of a set as an undefined, primitive concept [How72]. In this domain, Naive and Neumann-Bernays-Gödel axiom sets are used.
Indices : DDC 511.322, MSC 03EXX, 04XX
References : General [Neu25, Qui69], ATP [Qua92b].

GRA *Graph Theory.*
A graph consists of a finite non-empty set of points together with a prescribed set of pairs of points.
Indices : MSC 05CXX, 68R10
References : General [Har69, BB70], ATP –.

BOO *Boolean Algebra.*

A Boolean algebra is a set of elements with two binary operations which are idempotent, commutative, and associative. These operations are mutually distributive, there exist universal bounds 0, 1, and there is a unary operation of complementation.

Indices : DDC 511.324, MSC 06EXX

References : General [Whi61, BM65, BB70], ATP –.

ROB *Robbins Algebra.*

Problems which demand conditions that make a near-Boolean algebra Boolean (the Robbins problem).

References : General [HMT71], ATP [Win90].

LDA *Left Distributive Algebra.*

LD-algebras are related to large cardinals. Under a very strong large cardinal assumption, the free-monogenic LD-algebra can be represented by an algebra of elementary embeddings. Theorems about this algebra can be proved from a small number of properties, suggesting the definition of an embedding algebra.

References : General –, ATP [Jec93a].

LAT *Lattice Theory.*

A lattice is a set of elements, with two binary operations which are idempotent, commutative, and associative, and which satisfy the absorption law.

Indices : MSC 06BXX

References : General [BM65], ATP [McC88].

GRP *Group Theory.*

A group is a system of elements which is closed under a single-valued binary operation which is associative, and relative to which there exists an element satisfying the identity law, and with each element another element (called its inverse) satisfying the inverse law.

Indices : DDC 512.2, MSC 20

References : General [Bou89, BM65], ATP [MOW76].

RNG *Ring Theory.*

A ring is a system of elements which is an Abelian group under an operation of addition, and which is closed under a binary operation of multiplication, the latter being associative, and distributive with respect to addition.

Indices : DDC 512.4, MSC 13XX, 16XX

References : General [Bou89, BB70], ATP [MOW76].

ALG *Algebra.*

An algebra is a set with a system of operations defined on it.

Indices : DDC 512

References : General [Bou89, BM65, BB70], ATP –.

NUM *Number Theory.*

Number theory is the study of integers and their properties.

Indices : MSC 11YXX

References : General [HW92], ATP [Qua92b].

TOP *Topology.*

Topology is the study of properties of geometric configurations (e.g., point sets) which are unaltered by elastic deformations (homeomorphisms, i.e., functions that are 1-1 mappings between sets such that both the function and its inverse are continuous).

Indices : DDC 514, MSC 46AXX
References : General [Kel55, Mun75], ATP [WM89].

ANA *Analysis.*
Analysis is a branch of mathematics concerned with functions and limits. The main parts of analysis are differential calculus, integral calculus, and the theory of functions.
Indices : DDC 515, MSC 26XX
References : General [Ros90], ATP [Ble90].

GEO *Geometry.*
Geometry is a branch of mathematics that deals with the measurement, properties, and relationships of points, lines, angles, surfaces, and solids. Here: plane geometry, based on Tarski's axiom system for Euclidean geometry.
Indices : DDC 516, MSC 51
References : General [Tar51, Tar59], ATP [Qua92b].

CAT *Category Theory.*
A category is a mathematical structure together with the morphisms that preserve this structure.
Indices : MSC 18XX
References : General [Mac71], ATP [MOW76].

COM *Computing Theory.*
Computing theory is a subfield of computer science dealing with theoretical issues such as decidability (whether or not a given problem admits an algorithmic solution), completeness (does an algorithm always find a solution if one exists?), correctness (are only solutions produced?), and computational complexity (the resource requirements of algorithms).
Indices : DDC 004-006, MSC 68

PLA *Planning.*
Planning is the process of determining the sequence of actions to be performed by an agent, to reach a desired state. The initial state and the desired state are provided.
Indices : MSC 68T99
References : General [AKPT91], ATP [Pla81, Pla82].

PRV *Program Verification.*
Program verification formally establishes that a computer program does the task it is designed for. This typically requires extracting and examining the semantics of the program being verified.
Indices : DDC 005.14, MSC 68Q60
References : General –, ATP [WOLB92, MOW76].

CID *Circuit Design.*
Circuits are formed by inter-connecting logic gates. Circuit design is used to form a circuit that will transform given input patterns to required output patterns.
Indices : DDC 621.395, MSC 94CXX
References : General [Hay93], ATP [WW83].

CIV *Circuit Verification.*
Circuit verification is used to ensure that a previously designed circuit performs the desired transformation of input patterns to required output patterns. One approach is to check the performance of the circuit for every possible combination of given inputs. Other techniques are also used.

Indices : DDC 621.395, MSC 94CXX
References : General [Hay93], ATP [Woj83].

SYN *Syntactic.*
Syntactic problems have no obvious semantic interpretation.

PUZ *Puzzles.*
Puzzles are designed to test the ingenuity of humans.
References : General [Car86, Smu78b, Smu78a].

MSC *Miscellaneous.*
A collection of problems which do not fit well into any other domain.

2.2 Problem Versions and Standard Axiomatizations.

There are often many ways to formulate a problem for presentation to an ATP system. Thus, in the TPTP, there are often alternative presentations of a problem. The alternative presentations are called *versions* of the underlying *abstract problem.* As the problem versions are the objects that ATP systems must deal with, they are referred to simply as problems, and the abstract problems are referred to explicitly. Each problem is stored in a separate physical file. The primary reason for different versions of an abstract problem, is the use of different axiomatizations. This issue is discussed below. A secondary reason is different formulations of the theorem to be proved.

Different Axiomatizations

Commonly, many different axiomatizations of a theory exist. In the TPTP an axiomatization is *standard* if it is complete (in the sense that it captures some closed theory) and it has not had any lemmas added. (Note: A standard axiomatization may be redundant, because some axioms are dependent on others. In general, it is not known whether or not an axiomatization is minimal, and thus the possibility of redundancy in standard axiomatizations must be tolerated.) In the TPTP, standard axiomatizations are kept in separate axiom files, and are included in problems as appropriate. If an axiomatization uses equality, the required axioms of substitution are kept separate from the theory specific axioms. The equality axioms of reflexivity, symmetry, and transitivity, which are also required when equality is present, are also kept separately. By using different standard axiomatizations of a particular theory, different versions of a problem can be formed. A side effect of separating out the axioms into axiom files is that the clause order in the TPTP presentation of problems is typically different from that of any original presentation. This reordering is acceptable because the performance of a decent ATP system should not be very dependent on a particular clause ordering in the TPTP.

Within the ATP community, some problems have been created with *non-standard* axiomatizations. A non-standard axiomatization is formed by modifying a standard axiomatization. The standard axiomatization may be *reduced* (i.e., axioms are removed) and the result is an *incomplete* axiomatization, or it may be *augmented* (i.e., lemmas are added) and the result is a *redundant* axiomatization. Non-standard axiomatizations are typically used to find a proof of a theorem (based on the axiomatization) using a particular ATP system. In any 'real' application of an ATP system, a standard axiomatization of the application domain would typically have to be used, at least initially. Thus the use of standard axiomatizations is desirable, because it reflects such 'real' usage. In the TPTP, for each collected problem that uses a non-standard axiomatization, a new version of the problem is created with a standard axiomatization.

There are some TPTP problems in which the axioms cannot be obtained by reducing or augmenting a standard axiomatization. These axiomatizations are called `special` axiomatizations. Typically, such axiomatizations are each used in only one problem.

Equality Axiomatization

In the TPTP equality is represented using the `equal`/2 predicate, written in prefix notation like all other predicates. The `equal`/2 predicate is used only if the equality axiomatization in the problem is complete, i.e., including the axioms of reflexivity, symmetry, transitivity, function substitution for all functors, and predicate substitution for all predicate symbols. If the equality axiomatization is not complete, but the 'intention' is to represent equality, the `equalish`/2 predicate is used. The TPTP problems containing the `equal`/2 predicate do contain a complete equality axiomatization.

Many ATP systems have built in mechanisms, e.g., paramodulation, that make some or all of the equality and substitution axioms unnecessary. If any of these axioms are removed when the problems are submitted to an ATP system, then the removal must be explicitly noted in reported results (see Section 4.2). The tptp2X utility (see Section 3.1) can be used to remove equality axioms.

2.3 Problem Generators

Some abstract problems have a generic nature, and particular instances of the abstract problem are formed according to some size parameter(s). An example of a generic problem is the $N-$queens problem: place N queens on a $N \times N$ chess board such that no queen attacks another. The clauses for any size of this problem can be generated automatically, for any size of $N \geq 2$ (note that for this problem satisfiability depends on the problem size).

Up to TPTP v1.1.3, the TPTP simply contained problem files for particular sizes of generic problems. This, however, was undesirable. Firstly, only a finite number of different problem sizes could be included, and therefore a desired size may be missing. Secondly, even a small number of different problem sizes for each generic problem could consume a considerable amount of disk space. To overcome these problems the TPTP now contains *generator* files. Generator files are used to generate instances of generic problems, according to user supplied size parameters. The generators are used in conjunction with the tptp2X utility, and a full description of their use is given in Section 3.1.

For convenience, the TPTP still contains a particular instance of each generic problem. The size chosen for each such instance is a compromise between being large enough to be non-trivial for the SETHEO ATP system [LSBB92] and small enough to avoid using too much disk space. As result data for other systems are obtained, these sizes might change in the next TPTP release, in order to remove the current bias towards the SETHEO system. An unsatisfiable size is chosen where ever one exists. The statistics in Tables 1, 2, and 3 take into account these instances of generic problems.

2.4 Problem, Generator, and Axiomatization Naming

Providing unambiguous names for all problems is necessary in a problem library. A naming scheme has been developed for the TPTP, to provide unique, stable names for abstract problems, problems, generators, and axiomatizations. Files are assigned names according to the schemes depicted in Figures 2 and 3. The `DDDNNN` combination provides an unambiguous name for an abstract problem or axiomatization. The `DDDNNN-V[.SSS]` combination provides an unambiguous name for a problem or generator, and the `DDDNNN-E` combination provides an unambiguous name for a group of axioms. The complete file names are unique within the TPTP.

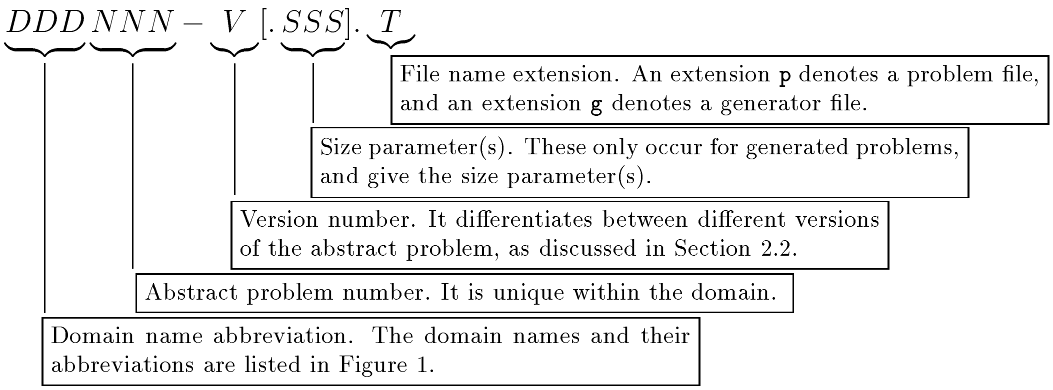

Figure 2: Problem file naming scheme.

The abstract problem numbers within each domain are not always successive. This is because some numbers have already been allocated to non-CNF problems, which will be part of a future TPTP release (see Section 5.1).

The version numbers used for each abstract problem do not always start at 1, and are not necessarily contiguous. This arises out of assigning (where ever possible) the same version number to all problems that come from the same source, within each domain.

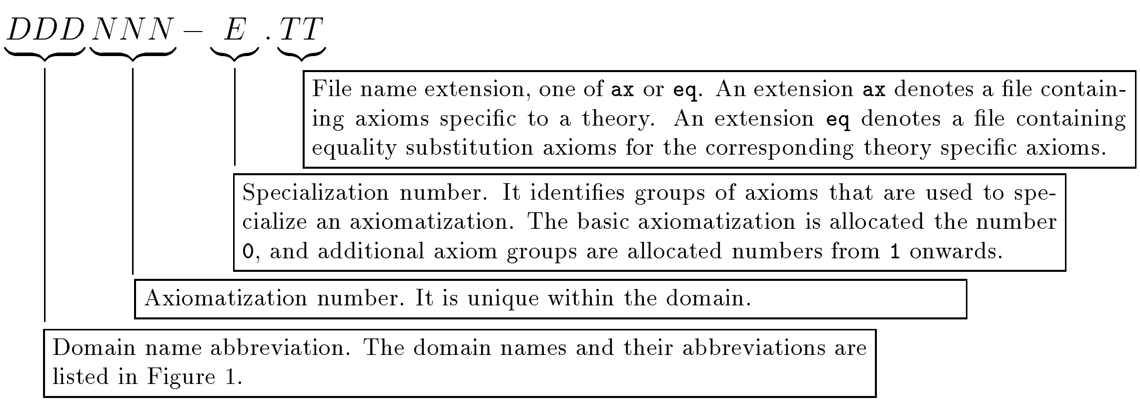

Figure 3: Axiom file naming scheme.

If a file is ever removed from or renamed in the TPTP, then the extension is changed to

`.rm`. The file is not physically removed, and a comment is added to the file to explain what has happened. This mechanism maintains the unique identification of problems and axiomatizations.

Semantic Names. Abstract problems and axiomatizations have also been allocated semantic names. The semantic names can be used to augment file names, so as to provide an indication of the file contents. While these names are provided for users who like to work with mnemonic names, only the standard syntactic names are guaranteed to provide unambiguous reference. The semantic names are formed from a set of abbreviations, which are listed in Appendix 9.1. The semantic names can be added to the syntactic file names using the `tptp_naming` script, as described in Section 3.2. Syntactic names of the form `DDDNNN-K.Ext` and `DDDNNN-K.SSS.Ext` are transformed to `DDDNNN-K=SemanticName.Ext` and `DDDNNN-K.SSS=SemanticName.Ext`, respectively. The TPTP is distributed without the semantic names in use.

2.5 Problem Presentation

The physical presentation of the TPTP problem library is such that ATP researchers can easily use the problems. The TPTP file format, for problem files and axiom files, has three main sections. The first section is a header section that contains information for the user. This information is not for use by ATP systems (see Section 4.2). The second section contains `include` instructions for axiom files. The last section contains the clauses that are specific to the problem or axiomatization. TPTP generator files have three sections, different from the problem and axiom files. The header section of generator files is similar to that of problem and axiom files, but with place-holders for information that is filled in based on the size of problem and the clauses generated. Following that comes Prolog source code to generate the clauses, and finally data describing the permissible sizes and the chosen TPTP size for the problem. More details are given in Section 3.1.7.

The syntax of all files is that of Prolog. This conformance makes it trivial to manipulate the files using Prolog. All information in the files that is not for use by ATP systems is formatted as Prolog comments, with a leading `%`. All the information for ATP systems is formatted as Prolog facts. A utility is provided for converting TPTP files to other known ATP system formats (see Section 3.1). A description of the information contained in TPTP files is given below.

2.5.1 The Header Section

This section contains information about the problem, for the user. It is divided into four parts. The first part identifies and describes the problem. The second part provides information about occurrences of the problem. The third part gives the problem's ATP status and a table of syntactic measurements made on the problem. The last part contains general information about the problem. An example of a TPTP header, extracted from the problem file `GRP039-7.p`, is shown in Figure 4.

The `% File` field. This field contains three items of information. The first item is the problem's name. This is displayed in the format
<Abstract problem name>`=`<Semantic name>`-`<Problem version>`[.`<Size>`]`.

```
%--------------------------------------------------------------------------
% File     : GRP039=SubGI2Norm-7 : TPTP v1.2.1. Bugfixed v1.0.1.
% Domain   : Group Theory (Subgroups)
% Problem  : Subgroups of index 2 are normal
% Version  : [McCharen, et al., 1976] (equality) axioms : Augmented.
% English  : If O is a subgroup of G and there are exactly 2 cosets
%            in G/O, then O is normal [that is, for all x in G and
%            y in O, x*y*inverse(x) is back in O].

% Refs     : McCharen J.D., Overbeek R.A., Wos L.A. (1976), Problems and
%            Experiments for and with Automated Theorem Proving Programs
%            IEEE Transactions on Computers C-25(8), 773-782.
% Source   : [McCharen, et al., 1976]
% Names    : GP2 [McCharen, et al., 1976]

% Status   : unsatisfiable
% Syntax   : Number of clauses    :   25 (   2 non-Horn;  13 unit;  12 RR)
%            Number of literals   :   43 (  28 equality)
%            Maximal clause size  :    4
%            Number of predicates :    2 (   0 propositional; 1-2 arity)
%            Number of functors   :    8 (   5 constant; 0-2 arity)
%            Number of variables  :   38 (   0 singleton)
%            Maximal term depth   :    3

% Comments : Used to define a subgroup of index two is a theorem which
%            says that {for all x, for all y, there exists a z such that
%            ... (some lines removed here for brevity)
% Bugfixes : v1.0.1 - Duplicate axioms multiply_inverse_left and
%            multiply_inverse_right removed.
%--------------------------------------------------------------------------
```

Figure 4: Example of a problem file header (`GRP039-7.p`).

The current TPTP release number is given next, followed by the TPTP release in which the problem was released or last bugfixed (i.e., the clauses were changed). The abstract problem name in Figure 4 is `GRP039`, the semantic name is `SubGI2Norm`, and the problem version is 7. The TPTP release is `v1.2.1`, and the problem clauses were last bugfixed in release `v1.0.1`.

The `% Domain` field. The domain field identifies the domain, and possibly a subdomain, from which the problem is drawn (see Section 2.1). The domain corresponds to the first three letters of the problem name. The domain of the problem of Figure 4 is `Group Theory`, and the subdomain is `Subgroups`.

The `% Problem` field. This field provides a one-line, high-level description of the abstract problem. In axiom files, this field is called `% Axioms`, and provides a one-line, high-level description of the axiomatization. Thus, the problem of Figure 4 proves that `Subgroups of index 2 are normal`.

The `% Version` field. This field gives information that differentiates this version of the problem from other versions of the problem. The first possible differentiation is the axiomatization that is used. If a specific axiomatization is used, a citation is provided. In the problem of Figure 4, the axiomatization used is that of `[McCharen, et al., 1976]`. If the axiomatization is a pure equality axiomatization (uses only the `equal/2` predicate) then this is noted too, as is the case in Figure 4. The second possible differentiation is the status of the axiomatization, as discussed in Section 2.2. The axiomatization used may be an original axiomatization, or it may have been derived from an existing axiomatization. If it is an original axiomatization and is standard, then no further information is given in this part of the `% Version` field. If it is an `Incomplete` original axiomatization, then this is noted alone. If the axiomatization used has been derived from an `Incomplete` existing axiomatization, then this is noted followed by a `>` separator. The derivation information is given next. The derivation information tells whether the previously existing axiomatization has been `Reduced`, `Augmented`, or both. In all cases where an axiomatization has been `Reduced`, and in cases where an `Incomplete` axiomatization has been `Augmented`, the resultant status of the axiomatization is noted next, after a `>`. The resultant status is one of `Complete` or `Incomplete`. Altogether, there are 12 possibilities:

- <empty>. Indicates that the axiomatization is original and standard, i.e., it is complete and has had no lemmas added (it may be redundant).
- `Incomplete`. Indicates that the axiomatization is original and incomplete.
- `Reduced > Complete`. Indicates that a standard existing axiomatization has had axioms removed, and the result is complete. The existing axiomatization is necessarily redundant.
- `Reduced > Incomplete`. Indicates that a standard existing axiomatization has had axioms removed, and the result is non-standard due to incompleteness.
- `Augmented`. Indicates that a standard existing axiomatization has had lemmas added, and the result is non-standard due to redundancy.
- `Reduced & Augmented > Complete`. Indicates that a standard existing axiomatization has had axioms removed and lemmas added, and the result is complete. If the axiomatization is non-standard due to redundancy, this is noted with `(Non-standard)` after `Complete`.
- `Reduced & Augmented > Incomplete`. Indicates that a standard existing axiomatization has had axioms removed and lemmas added, and the result is non-standard due to incompleteness.
- `Incomplete > Reduced > Incomplete`. Indicates that an incomplete existing axiomatization has had axioms removed, and the result is non-standard due to incompleteness.
- `Incomplete > Augmented > Complete`. Indicates that an incomplete existing axiomatization has had axioms added, and the result is complete.
- `Incomplete > Augmented > Incomplete`. Indicates that an incomplete existing axiomatization has had lemmas added, and the result is non-standard due to incompleteness.
- `Incomplete > Reduced & Augmented > Complete`. Indicates that an incomplete existing axiomatization has had axioms removed and lemmas added, and the result is complete. If the axiomatization is non-standard due to redundancy, this is noted with `(Non-standard)` after `Complete`.
- `Incomplete > Reduced & Augmented > Incomplete`. Indicates that an incomplete existing axiomatization has had axioms removed and lemmas added, and the result is

non-standard due to incompleteness.

In the problem of Figure 4, a standard axiomatization has been `Augmented`, and has become non-standard due to redundancy.

The third possible differentiation between problem versions is in the theorem formulation. Variations in the theorem formulation are noted in a `Theorem formulation` entry, e.g.,

```
% Version  : [McCharen, et al., 1976] (equality) axioms.
%             Theorem formulation :  Explicit formulation of the commutator.
```

The `% English` field. This field provides a full description of the problem, if the one-line description in the `% Problem` field is too terse.

The `% Refs` field. This field provides a list of references to items in which the problem has been presented. Other references that are cited in the header section are also listed.

The `% Source` field. The problems in the TPTP have been (physically) obtained from a variety of sources, both hardcopy and electronic. In this field the source of the problem is acknowledged, usually as a citation. If the problem was sourced from an existing problem collection then the collection name is given in [ ] brackets. The problem collections used thus far are:

- ANL - the Argonne National Laboratory library [ANL],
- OTTER - the collection distributed with the Otter ATP system [McC90, McC94]
- Quaife - Art Quaife's collection of set theory (based) problems [Qua92d]
- ROO - the problems used for testing the ROO ATP system [LM92]
- SPRFN - the collection distributed with the SPRFN ATP system [SPR],
- TPTP - the problem first ever appeared in the TPTP [SS96],
- SETHEO - the collection used for testing the SETHEO ATP system [LSBB92].

The problem of Figure 4 was taken from `[McCharen, et al., 1976]`.

The `% Names` field. Problems which have appeared in other problem collections or the literature, often have names which are known in the ATP community. This field lists all such names known to us for the problem, along with the source of the name. If the source is an existing problem collection then the collection name is cited, as in the `% Source` field. If the source of a name is the literature then a citation is given. If a problem is not given a name in a paper, a citation is given and "-" is used as the known name. Problems which first appeared in the TPTP have source TPTP, and no other name. In generator files all known names for instances of the abstract problem are listed, with the instance size given before the source. A reverse index, from known names to TPTP names, is in Appendix 9.2, and is also distributed with the TPTP (see Section 2.6). The problem of Figure 4 is called `GP2` in `[McCharen, et al., 1976]`.

The `% Status` field. This field gives the ATP status of the problem, one of `satisfiable`, `unsatisfiable`, `open`, or `unknown`. In Figure 4, the status is `unsatisfiable`.

The % Syntax field. This field lists various syntactic measures of the problem's clauses. The measures are: the number of clauses, the number of non-Horn clauses, the number of unit clauses, the number of range restricted clauses, the number if literals, the number of equality literals, the maximal clause size (measured by number of literals), the number of distinct predicate symbols, the number of distinct propositional variables, the minimal and maximal predicate symbol arites, the number of distinct function symbols, the number of distinct constants, the minimal and maximal functor arites, the number of distinct variables, the number of singleton variables (variables that appear only once in a clause), and the maximal term depth (with constants and variables having depth 1). See Tables 2 and 3 for a summary of this information over the entire TPTP.

The % Comments field. This field contains free format comments about the problem, e.g., the significance of the problem, or the reason for creating the problem.

The % Bugfixes field. This field describes any bugfixes that have been done to the clauses of the problem. Each entry gives the release number in which the bugfix was done, and attempts to pinpoint the bugfix accurately. In the problem of Figure 4, a bugfix was made in release `v1.0.1`, by removing the duplicate `multiply_inverse_left` and `multiply_inverse_right` clauses.

2.5.2 The Include Section

The include section contains `include` instructions for TPTP axiom files. An example of an include section, extracted from the problem file `GRP039-7.p`, is shown in Figure 5.

```
%--------------------------------------------------------------------------
%----Include the axioms of equality
include('Axioms/EQU001-0.ax').
%----Include the axioms for group theory in equality form
include('Axioms/GRP004-0.ax').
%----Include the subgroup axioms in equality formulation
include('Axioms/GRP004-1.ax').
%--------------------------------------------------------------------------
```

Figure 5: Example of a problem file include section (`GRP039-7.p`).

Each of the `include` instructions indicates that the clauses in the named axiom file should be included at that point. Axiom files are presented in the same format as problem files, and `include` instructions may also appear in axiom files. If required, full versions of TPTP problems (without `include` instructions) can be created by using the tptp2X utility (see Section 3.1).

2.5.3 The Clauses Section

TPTP problems are presented in clause normal form. The literals that make up a clause are presented as a Prolog list of terms (i.e., in `[]`). Each literal is a term whose functor is either `++` or `--`, indicating a positive or negative literal, respectively. The atom of the literal is the single argument of the sign, in the form of a Prolog term. Thus predicate symbols and functors start with lower case alphanumeric, and variables start with upper case alphabetic (variables may not start with an _). The signs `++` and `--` are assumed to be defined as prefix operators in Prolog.

Each clause has a name, in the form of a Prolog atom. Each clause also has a type, one of `axiom`, `hypothesis`, or `conjecture`. The `hypothesis` and `conjecture` clauses are those that are derived from the negation of the conjecture to be proved. These clauses are only of type `hypothesis` if they can clearly be determined as such; otherwise they are of type `conjecture`[2].

The name, type, and literal list of each clause are bundled as the three arguments of a Prolog fact, whose predicate symbol is `input_clause`. These facts are in the clause section of the problem file.

An example of a clause section, extracted from the problem file `GRP039-7.p`, is shown in Figure 6.

```
%--------------------------------------------------------------------------
%----Redundant two axioms
input_clause(right_identity,axiom,
    [++equal(multiply(X,identity),X)]).

input_clause(right_inverse,axiom,
    [++equal(multiply(X,inverse(X)),identity)]).

    <some clauses omitted>

%----Denial of theorem
input_clause(b_in_O2,hypothesis,
    [++subgroup_member(b)]).

input_clause(b_times_a_inverse_is_c,hypothesis,
    [++equal(multiply(b,inverse(a)),c)]).

input_clause(a_times_c_is_d,hypothesis,
    [++equal(multiply(a,c),d)]).

input_clause(prove_d_in_O2,conjecture,
    [--subgroup_member(d)]).
%--------------------------------------------------------------------------
```

Figure 6: Example of a problem file clause section (`GRP039-7.p`).

[2]The input formats of some existing ATP systems cannot capture the information regarding clause type. If such systems require clause selections, e.g., when choosing which clause(s) to focus on initially, that selection is made without the benefit of this information. Furthermore, for some systems clause selections have to be specified in their input files. This is usually done by the user (which may render the system incomplete, as is the case for some Model Elimination based ATP systems that we know of). For such systems, the tptp2X utility (see Section 3.1) provides a default selection.

2.6 Physical Organization

The TPTP is physically organized into six subdirectories, as follows:

- `Axioms` - The axiom files directory.
- `Problems` - The problem files directory with subdirectories for each domain. The domain name abbreviations, as described in Section 2.1, are used as subdirectory names. The subdirectories contain the problem files.
- `Generators` - The generator files directory.
- `Documents` - A directory containing documents that relate to the TPTP :
  - `Abbreviations` - A list of the abbreviations used in the semantic names of abstract problems and axiomatizations, as given in Appendix 9.1.
  - `History` - A history of the changes made to the TPTP up to the current release.
  - `AxiomList` - A list of the axiomatizations in the TPTP, giving their syntactic names, semantic names, number of specializations, and one-line descriptions. This summarizes the axioms table given in Section 6.
  - `GeneratorList` - A list of the generic problems in the TPTP, giving their syntactic names, semantic names, permissible sizes, TPTP size, and one-line descriptions. This summarizes the generators table given in Section 7.
  - `ProblemList` - A list of all the abstract problems in the TPTP, giving their syntactic names, semantic names, number of versions, and one-line descriptions. With the `ProblemStatistics`, this summarizes the problems table given in Section 8.
  - `ProblemStatistics` - A list of all the problems in the TPTP, giving the `% Status` value and the `% Syntax` field values. With the `ProblemList`, this summarizes the problems table given in Section 8.
  - `ProblemStatistics.rm_eq` - A list of all the problems in the TPTP, giving the `% Status` value and the `% Syntax` field values after removing all equality axioms from the problem (done using tptp2X, see Section 3.1).
  - `ReadMe` - General information about the TPTP.
  - `ReverseIndex` - An index from existing known names for problems to their TPTP file names, as given in Appendix 9.2.
  - `Synopsis` - Statistics on the TPTP, as given in Tables 1, 2, and 3, and a chart showing the structure of the TPTP problem domains, as given in Figure 1.
  - `Template` - A template for submitting new TPTP problems.
  - `Users` - A list of registered TPTP users. Registered users receive notification of TPTP patches, and other information relevant to the TPTP. If you would like to have you name added to or removed from this list, please let us know. Our addresses are given in Section 4.3.

  The files in the `Documents` directory contain comprehensive online information about the TPTP. They summarize much of the information contained in this report, in specific files. This format provides quick access to the data, using standard system tools (e.g., `grep`, `awk`).

- `Scripts` - A directory containing C shell scripts that may be used with the TPTP. Currently there is only one script (see Section 3.2).
- `TPTP2X` - The directory containing the tptp2X utility, described in Section 3.1.

2.7 The TPTP Listings

In Sections 6, 7, and 8, listings of all the axiomatizations, generators, and problems in the TPTP are given. All listings are structured according to the domain hierarchy described in Section 2.1, with each domain listed separately.

For all listings, there is a delimited section for each abstract problem. The first line in each section gives information about the abstract problem, and each of the following lines gives information about a particular problem version. See Figure 7 for an extract of the actual problem listing. The legend describes the information given. The axiom listing follows a similar convention. The generators listing cannot show syntactic entity counts, since these are problem size dependent. Instead, the generators listing shows the permissible size values and the size contained in the TPTP.

Syntactic name		Semantic name	Description					
	V#	Other names	References	V	Cl	Av	nH	Eq
...	...	...	...	...	...	...	...	...
Domain ANA (5 abstract problems, 17 problems)								
ANA001		MinVal	`Attaining minimum (or maximum) value`					
	–1	AM8	[WB87]	`C`	18	2.0	16%	–
ANA002		IntmedVal	`Intermediate value theorem`					
	–1		[WB87]	`C`	18	2.0	27%	–
	–2		[WB87]	`C`	18	2.0	27%	–
	–3	IMV	[WB87]	`C`	17	3.0	29%	–
	–4	ivt.lop	[WB87]	`C`	17	3.0	29%	–
ANA003		SumContFuncLem1	`Lem. 1 for the sum of 2 continuous functions is continuous`					
	–1	prob1.ver2.in	[MOW76]	`C`	38	2.0	–	47%
	–2	BL1, prob1.ver1.in	[MOW76]	`I`	17	2.0	–	5%
	–3		[Ble90, Ble92]	`C`	50	2.0	10%	40%
	–4	Problem 1, Bledsoe-P1, p1.lop	[Ble90, LM92, Ble92]	`I`	12	2.0	33%	–
...	...	...	...	...	...	...	...	...

<u>Legend</u>

Syntactic name: The abstract problem's syntactic name (In the axiom listing this is extended with either `ax` to indicate theory specific axioms or `eq` to indicate equality substitution axioms).
Semantic name: The abstract problem's semantic name.
Description : The one-line description of the abstract problem.
V# : The version number for each problem (For axiom files, this is the specialization number).
Other names : Other known names for the problem version, as listed in the `% Names` field of the problem header.
References : A list of citations to items in which the problem has been presented, as listed in the `% Refs` field of the problem header.
V : A condensed summary of what makes the version different from others, as contained in the `% Version` field in the problem header: I = Incomplete, S = Complete and Standard, N = Complete and Non-standard, or "-" = Special for those problems which cannot be obtained from a standard axiomatization.
Cl : The number of clauses in the problem.
Av : The average number of literals per clause in the problem.
nH : The percentage of non-Horn clauses in the problem, or "-" for Horn problems.
Eq : The percentage of equality literals in the problem, or "-" for problems without equality.
: An additional "P" at the end of a line denotes a propositional problem.

Figure 7: Example for problem listing.

3 Utility Programs and Scripts

3.1 The tptp2X Utility

The tptp2X utility is a multi-functional utility for reformatting, transforming, and generating TPTP problem files. In particular, it

- Converts from the TPTP format to formats used by existing ATP systems.
- Applies various transformations to the clauses of TPTP problems.
- Controls the generation of TPTP problem files from TPTP generator files.

The tptp2X utility is written in Prolog, and should run on most Prolog systems[3]. There is some code that is specific to the BinProlog, SICStus 2.1, Quintus, and Eclipse Prolog dialects. Before using tptp2X, it is necessary to install the code for the dialect of Prolog that is to be used. This and other installation issues are described next.

3.1.1 Installation

The tptp2X utility consists of the following files:

- `tptp2X` - A `tcsh` script for running the tptp2X utility.
- `tptp2X_install` - A `csh` script for installing the tptp2X utility.
- `tptp2X.config` - Configuration file with site specific information.
- `tptp2X.main` - The main source code file of the tptp2X utility.
- `tptp2X.read` - Procedures for reading TPTP problem files.
- `tptp2X.generate` - Procedures for using TPTP generator files.
- `tptp2X.syntax` - Procedures for extracting syntactic measures from files.
- `transform.`<TRAN> - Procedures for doing <TRAN> transformations on TPTP problems, where <TRAN> is one of `arrange`, `equality`, `magic`, `shorten`.
- `format.`<ATP> - Procedures for outputing clauses in <ATP> format, where <ATP> is one of `kif`, `leantap`, `tap` (for 3TAP format), `meteor`, `mgtp`, `otter`, `pttp`, `setheo`, `spass`, `sprfn`, `tptp`.

Installation of the tptp2X utility requires simple changes in the `tptp2X` script and the files `tptp2X.config` and `tptp2X.main`. These changes can be made by running `tptp2X_install`, which will prompt for required information. Otherwise, to install tptp2X by hand, the following must be attended to:

- In the `tptp2X` script file:
  - `TPTPDirectory` must be set to the absolute path name of the TPTP directory.
  - `PrologInterpreter` must be set to the absolute path name of the Prolog interpreter.
  - `PrologArguments` must be set to any command line arguments for the Prolog interpreter.
  - The `Gawk` variable must be set to the absolute path name of gawk or awk.

[3] In particular, the tptp2X code will run on BinProlog 5.00. BinProlog is written by Paul Tarau of the University of Moncton (Canada), and is freely available by anonymous ftp, from `clement.info.umoncton.ca:BinProlog`.

- In the `tptp2X.config` file:
  - The appropriate facts for the desired Prolog dialect must be uncommented.
  - The absolute path name of the TPTP directory must be set in the `tptp_directory/1` fact.
- In the `tptp2X.main` file:
  - If your Prolog interpreter does not support `compile/1` for loading source code, the `compile/1` directives must be changed to something appropriate, e.g., `[]`.

3.1.2 Using tptp2X

The most convenient way of using the tptp2X utility is through the `tptp2X` script. The use of this script is:

```
tptp2X [-h][-q<Level>][-i][-s<Size>][-t<Transform>][-f<Format>][-d<Directory>] <TPTPFiles>
```

The `-h` flag specifies that usage information should be output. The `-q<Level>` flag specifies the level of quietness at which the script should operate. There are three quietness levels; 0 is verbose mode, 1 suppresses informational output from the Prolog interpreter, and 2 suppresses all informational output except lines showing what files are produced. The default quietness level is 1. The `-i` flag specifies that the script should enter interactive mode after processing all other command line parameters. Interactive mode is described below. The other command line parameter values are:

- -s<Size> : This specifies the required sizes when generating problems. <Size> is either an integer, a <Low>..<High> integer size range, or a : separated list of <Sizes>.
  - An integer directly specifies the required problem size.
  - Each integer in a size range is used to generate a separate set of clauses.
  - A : separated string of <Sizes> is used for generators that require multiple parameters, one <Size> for each size parameter required. For example, `-s3..5:2` means the three sizes `3:2`, `4:2`, and `5:2`.

  -s<Size> is ignored for problem (`.p`) files.
- -t<Transform> : Specifies transformations to be applied to the clauses. <Transform> is either a single transformation, a `+` separated string of transformations, or a comma separated list of <Transform>s.
  - A single transformation is applied directly to the clauses.
  - Each transformation in a `+` separated string is applied to the clauses serially.
  - Each <Transform> in a list of <Transform>s is used to create a separate set of transformed clauses.

  The transformations are:
  - `lr`, to reverse the literal ordering in the clauses.
  - `cr`, to reverse the clause ordering in the problem.

- clr, to do both reversals.
- random, to randomly reorder the clauses and literals in the problem.

  The rearrangement of clauses and/or literals in a problem facilitates testing the sensitivity of an ATP system to the order in which the clauses and literals are presented.
- rm_equality:<Remove>, to remove equality axioms.
  <Remove> is a string that indicates which equality axioms to remove. The characters that can be in the string are:
  * r, to remove reflexivity,
  * s, to remove symmetry,
  * t, to remove transitivity,
  * f, to remove function substitution,
  * p, to remove predicate substitution.

  For example, -t rm_equality:stfp would indicate to remove symmetry, transitivity, function substitution, and predicate substitution. This transformation works only if the equality axiomatization is complete (i.e., including the axioms of reflexivity, symmetry, transitivity, function substitution for all functors, and predicate substitution for all predicate symbols), using equal/2 as the equality predicate. (All TPTP problems containing the equal/2 predicate do contain a complete equality axiomatization; see Section 2.2.)
- add_equality, to add missing equality axioms to a problem. If the problem contains the equal/2 predicate, then a check is made to see if the equality axiomatization is complete. If not, the missing equality axioms are added to the problem.
- to_equality, to convert the problem to a pure equality representation. Every non-equality literal is converted to an equality literal (using the equal/2 predicate) with the same sign. The arguments of the new equality literal are the atom of the non-equality literal and the constant true.
- magic, to do Mark Stickel's magic set transformation [Sti94].
- shorten, to replace all the symbols in the problem by short, meaningless symbols. This is useful if you are only interested in the syntax of the problem, and do not want to read through the long, meaningful symbols that are often used in TPTP problems. Note that equal/2 is not shortened.
- none, to do nothing (same as omitting it, but required for advanced use; see Section 3.1.5).

The default <Transform> is none.

- -f<Format> : Specifies the format in which the output is to be written. The available output formats are:
  - kif, to convert to the KIF format [GF92].
  - leantap, to convert to the leanTAP format [BP95];
  - tap, to convert to the 3TAP format [HBG94].
  - meteor, to convert to the METEOR format [Ast92];

- `mgtp`, to convert to the MGTP format [FHKF92];
- `otter:`<SoS>`:'`<Otter options>`'`,
  to convert to the Otter `.in` format [McC94].
  <SoS> specifies the Set-of-Support to use. It can be one of:
  - `conjecture`, to use the clauses whose type is `conjecture`,
  - `hypothesis`, to use the clauses whose type is `hypothesis` or `conjecture`,
  - `positive`, to use the positive clauses,
  - `negative`, to use the negative clauses,
  - `unit`, to use the unit clauses,
  - `all`, to use all clauses,
  - `none`, to use no clauses.

  <Otter options> is a quoted (to avoid UNIX shell errors), comma separated list of Otter options, which will be output before the clause lists. See the Otter Reference Manual and Guide [McC94] for details of the available options. For example, `-f otter:none:'set(auto),assign(max_seconds,5)'` would configure Otter to use its `auto` mode with a time limit of 5 seconds. As the `auto` mode is commonly used with Otter, the tptp2X script allows the abbreviation `-f otter` to specify `-f otter:none:'set(auto)'`. If no <Transform> is specified then `-f otter` also sets `-t equality:stfp`.
- `pttp`, to convert to the PTTP format [Sti84];
- `setheo:`<Style>, to convert to the SETHEO `.lop` format [STvdK90].
  <Style> specifies the style of SETHEO clauses to write. It can be one of:
  - `sign`, to write the atoms of the negative and positive literals of each clause in the antecendent and consequent of an implication, respectively;
  - `type` In the `type` style, if there are no negative `axiom` or `hypothesis` clauses, then the `sign` style is used. Otherwise in all negative `axiom` and `hypothesis` clauses the first literal is negated to form the consequent of an implication, with the remaining literals' atoms being written as the antecedent. Further, in all `conjecture` clauses all positive literals are negated so that all literals' are written in the antecedent of an implication.

  The default style is `sign`, i.e., the abbreviation `-fsetheo` means `-fsetheo:sign`.
- `spass`, to convert to the SPASS format [WGR96, Wei96];
- `sprfn`, to convert to the SPRFN format [Pla88];
- `tptp`, to convert to the TPTP format, substituting `include` instructions with the actual clauses.

The default <Format> is `tptp`.

- -d<Directory> : Specifies the top level directory below which the output files are to be placed. If the <Directory> value is `-`, then all output files are written to standard output. Otherwise the output files associated with an input file are placed in a subdirectory below the <Directory>, named according to the domain (the first 3 characters) of the input file.

  The default <Directory> is a subdirectory below the TPTP `Problems` directory, named according to the <Format>.

- <TPTPFiles> : Lists the input files which are to be processed. As a shortcut, the three letter domain names can be given, which processes all problems in those domains. If specific files names are not absolute, then tptp2X looks in the current working directory, the `Generators` directory, the `Problems` directory, and the domain directories, for the file. If the file name `-` is specified then input is taken from standard input and all output is written to standard output (overriding any <Directory> specification).

  The default <TPTPFiles> are all TPTP problem files.

A common first use of tptp2X is to convert TPTP problems to another format. To convert all TPTP problems to another format, the use is `tptp2X -f<Format>`, e.g., `tptp2X -fotter`. To limit the conversion to one or more domains, the domain names are specified after the <Format>, e.g., `tptp2X -fleantap ALG GRP LDA`. If you are a new TPTP user, these are probably the uses that you want to start with.

3.1.3 The tptp2X Output Files

The output files produced by tptp2X are named according to the TPTP file name and the options used. The name of the TPTP problem (the input file name without the `.p` or `.g`) forms the basis of the output file names. For generated files the size parameters are appended to the base name, separated from the base name by a `.`. Then, for each transformation applied a suffix is appended. The suffixes for the transformations are:

Transformation	Suffix
none	
lr	+lr
cr	+cr
clr	+clr
random	+ran
shorten	+short
magic	+nhms
rm_equality:<Remove>	+rm_eq_<Remove>
add_equality	+eq
to_equality	+2eq

Finally an extension to indicate the output format is appended to the file name. The suffixes for the output formats are:

Format	Extension
kif	.kif
leanTAP	.leantap
tap	.3tap
meteor	.me
mgtp	.mgtp
otter	.in
pttp	.pttp
setheo	.lop
spass	.spass
sprfn	.sprfn
tptp	.tptp

To further record how a tptp2X output file has been formed, the tptp2X parameters are listed as an entry in the `% Comments` field of the output file.

Example

```
~/TPTP/TPTP2X> tptp2X -tlr,cr,clr -fpttp ../Problems/ALG/ALG001-1.p
----------------------------------------------------------------------
TPTP2X directory      = /home/geoff/TPTP/TPTP2X
TPTP directory        = /home/geoff/TPTP
Prolog interpreter    = /usr/local/bin/sicstus
Files to convert      = ../Problems/ALG/ALG001-1.p
Size                  =
Transformation        = lr,cr,clr
Format to convert to  = pttp
Output directory      = /home/geoff/TPTP/Problems/pttp
----------------------------------------------------------------------
Made the directory /home/geoff/TPTP/Problems/pttp/ALG
ALG001-1 -> /home/geoff/TPTP/Problems/pttp/ALG/ALG001-1+lr.pttp
ALG001-1 -> /home/geoff/TPTP/Problems/pttp/ALG/ALG001-1+cr.pttp
ALG001-1 -> /home/geoff/TPTP/Problems/pttp/ALG/ALG001-1+clr.pttp
~/TPTP/TPTP2X>
```

This run applies three separate transformations to the problem `ALG001-1`. The transformations are literal order reversal, clause order reversal, and reversal of both literal and clause order. The transformed problems are output in `pttp` format, in the directory `pttp/ALG` below the TPTP `Problems` directory. The file names are `ALG001-1+lr.pttp`, `ALG001-1+cr.pttp`, and `ALG001-1+clr.pttp`.

Example

```
~/TPTP/TPTP2X> tptp2X -q2 -s3..5 -fotter -d~geoff/tmp ../Generators/SYN001-1.g
SYN001-1 -> /home/geoff/tmp/SYN/SYN001-1.003+eq_stfp.in
SYN001-1 -> /home/geoff/tmp/SYN/SYN001-1.004+eq_stfp.in
SYN001-1 -> /home/geoff/tmp/SYN/SYN001-1.005+eq_stfp.in
~/TPTP/TPTP2X>
```

This run generates three sizes of the generic problem `SYN001-1`. The sizes are 3, 4, and 5. The output files are formatted for Otter, to use its `auto` mode. The files are placed in `~geoff/tmp/SYN`, and are named `SYN001-1.003.lop`, `SYN001-1.004.lop`, and `SYN001-1.005.lop`. The quietness level is set to 2, thus suppressing all informational output except the lines showing what files are produced.

Example

```
~/TPTP/TPTP2X> tptp2X -q2 -tmagic+shorten - < ~geoff/TPTP/Problems/GRP/GRP001-1.p
%--------------------------------------------------------------------------
% File     : GRP001=SqrComm-1 : TPTP v1.1.3. Released v1.0.0.
% Domain   : Group Theory
% Problem  : X^2 = identity => commutativity
         <Lots of output>
input_clause(clause_41,theorem,
    [--p2(c8,c7,c9)]).
%--------------------------------------------------------------------------
~/TPTP/TPTP2X>
```

This run uses the tptp2X script as a filter, to apply the non-Horn magic set transformation and then the symbol shortening transformation to `GRP001-1.p`. Output is written to standard output. The quietness level is set to 2, and as the output is to standard output, all informational output is suppressed.

3.1.4 The tptp2X Interactive Mode

If the `-i` flag is set, the tptp2X script enters interactive mode after processing all other command line parameters. In interactive mode the user can change the value of any of the command line parameters. The user is prompted for the <TPTPFiles>, the <Size>, the <Transform>, the <Format>, and the <Directory>. In each prompt the current value is given. The user may respond by specifying a new value or by entering <cr> to accept the current value. The prompt-respond loop continues for each parameter until the user accepts the current value for the parameter.

Example

```
~/TPTP/TPTP2X> tptp2X -q0 -d~geoff/tmp -i
---- Interactive mode --------------------------------------------
Files to convert      [Problems/*/*.p] : ../Problems/GRP/GRP001-1.p
Files to convert      [../Problems/GRP/GRP001-1.p] :
Size                  [] :
Transformation        [none] : lr+equality:stfp
Transformation        [lr+equality:stfp] :
Format to convert to  [tptp] : setheo
Format to convert to  [setheo] :
Output directory      [/home/geoff/tmp] :
---- End of Interactive mode -------------------------------------
------------------------------------------------------------------
TPTP2X directory      = /home/geoff/TPTP/TPTP2X
TPTP directory        = /home/geoff/TPTP
Prolog interpreter    = /usr/local/bin/sicstus
Files to convert      = ../Problems/GRP/GRP001-1.p
Size                  =
Transformation        = lr+equality:stfp
Format to convert to  = setheo:sign
Output directory      = /home/geoff/tmp
------------------------------------------------------------------
Made the directory /home/geoff/tmp/GRP
SICStus 2.1 #9: Thu Apr 21 09:39:25 +1000 1994
{compiling /home/2/geoff/TPTP/TPTP2X/tptp2X.main...}
         <Lots of informational output>
{/home/2/geoff/TPTP/TPTP2X/tptp2X.main compiled, 19906 msec 248400 bytes}

yes

yes
GRP001-1 -> /home/geoff/tmp/GRP/GRP001-1+lr+eq_stfp.lop

yes
~/TPTP/TPTP2X>
```

This run converts the problem `GRP001-1` to a SETHEO format file. The literals are reversed and all equality clauses except reflexivity are removed. The top level output directory is specified as `~geoff/tmp`, below which the subdirectory `GRP` is made. The output file is named `GRP001-1+lr+eq_stfp.lop`. Verbose mode is used, so all informational output is given.

The following sections are only of interest to real Prolog users. If you do not want to use Prolog directly, skip to Section 3.2 on page 34.

3.1.5 Running tptp2X from within Prolog

The tptp2X utility may also be run from within the Prolog interpreter. The `tptp2X.main` file has to be loaded, and the entry point is then `tptp2X/5`, in the form:

`?-tptp2X(`<TPTPFile>,<Size>,<Transform>,<Format>,<Directory>`).`

The parameters are similar to the tptp2X script command line parameters. A summary, including differences (!), is given here. See Section 3.1.2 for parameter options.

- <TPTPFile> is the name of a single TPTP file. If the file name is not absolute, then it is considered to be relative to the directory specified in the `tptp_directory/1` fact in the `tptp2X.config` file (!). If the file name is `user` (!), then input is taken from standard input.

- <Size> is either an integer, a `:` separated string of <Size>s, a <Low>..<High> integer size range, or a Prolog list of <Size>s (!). Each <Size> in a Prolog list of <Size>s is used in all possible ways to generate separate sets of clauses.

- <Transform> is either a single transformation specifier, a `+` separated string of <Transform>s (!), or a Prolog list (!) of <Transform>s.

- <Format> is an output format or a Prolog list (!) of output formats. An output file is written for each output format specified. For the `otter` format, the syntax is `otter:`<SoS>`:[`<Otter options>`]` (!), i.e., the Otter options form a Prolog list.

- <Directory> specifies the directory in which the output files are to be placed. If the <Directory> is `user` (!) then output is sent to standard output.

Example

```
~/TPTP/TPTP2X> sicstus
SICStus 2.1 #9: Thu Apr 21 09:39:25 +1000 1994
| ?- ['tptp2X.main'].
{consulting /home/2/geoff/TPTP/TPTP2X/tptp2X.main...}
          <Lots of informational output>
{/home/geoff/TPTP/TPTP2X/tptp2X.main consulted, 19158 msec 256800 bytes}

yes
| ?- tptp2X('Generators/SYN010-1.g',3:[2,4],[lr,cr]+magic,kif,'.').
{compiling /home/geoff/TPTP/Generators/SYN010-1.g...}
{/home/geoff/TPTP/Generators/SYN010-1.g compiled, 246 msec 2240 bytes}
SYN010-1 -> ./SYN010-1.003:002+lr+nhms.kif
SYN010-1 -> ./SYN010-1.003:002+cr+nhms.kif
SYN010-1 -> ./SYN010-1.003:004+lr+nhms.kif
SYN010-1 -> ./SYN010-1.003:004+cr+nhms.kif

yes
| ?- ^D
~/TPTP/TPTP2X>
```

This run generates two sizes of the generic problem `SYN010-1`, and does two transformation sequences on each of the two sets of clauses, to produce four output files. The sizes are 3:2 and 3:4. The first transformation sequence is literal order reversal followed by the non-Horn magic set transformation, and the second transformation sequence is clause order reversal followed by the non-Horn magic set transformation. The files are output in KIF format in the current directory. The file names are
`SYN010-1.003:002+lr+nhms.kif`, `SYN010-1.003:002+cr+nhms.kif`,
`SYN010-1.003:004+lr+nhms.kif`, and `SYN010-1.003:004+cr+nhms.kif`.
Note that the TPTP file name is quoted in the query, to form a Prolog atom.

3.1.6 Writing your own Transformations and Output Formats

The transformations and output formating are implemented in Prolog, in the files transform.<TRAN> and format.<ATP>, respectively. It is simple to add new transformations and output formats to the tptp2X utility, by creating new transformation and format files. New files should follow the structure of the existing files. Typically, a new file can be created by modifying a copy of one of the existing files.

The entry point in a transformation file is <Transform>/6, where <Transform> is the principle symbol of the transformation specification (currently one of none, lr, cr, clr, random, shorten, magic, rm_equality, add_equality, to_equality). The first three arguments are inputs: a list of the problem's clauses, the variable dictionary (a bit complicated), and the transformation specification. The next three arguments are outputs: the transformed clauses, the transformed variable dictionary (typically the same as the input dictionary), and the transformation suffix. As well as the <Transform>/6 entry point, a <Transform>_file_information/2 fact must be provided. The two arguments of the <Transform>_file_information/2 fact are the atom transform and a description of the possible transformation specifications (as used in the third argument of <Transform>/6). See the existing transform.<TRAN> files for examples.

The entry point in a format file is <Format>/2, where <Format> is the principle symbol of the output format specification (currently one of kif, leantap, tap, meteor, mgtp, otter, pttp, setheo, spass, sprfn, tptp). The two arguments are inputs: a list of the problem's clauses, and the format specification. As well as the <Format>/2 entry point, a <Format>_format_information/2 fact and a <Format>_file_information/2 fact must be provided. The two arguments of the <Format>_format_information/2 fact are a character that can be used to start a comment in the output file and the format extension, both as Prolog atoms. The two arguments of the <Format>_file_information/2 fact are the atom format and a description of the possible format specifications (as used in the second argument of <Format>/2). See the existing format.<ATP> files for examples.

New transformation and format files must be compiled in with the other tptp2X files. This is done by adding a compile query in the tptp2X.main file, alongside the queries that compile in the existing files.

If you are in doubt, please contact Geoff Sutcliffe for help.

3.1.7 Writing your own Problem Generators

The TPTP generators are implemented in Prolog. It is simple to write new generators. New files should follow the structure of the existing files.

The entry point in a generator file is <Problem name>/3, where <Problem name> is the file name without the .g suffix. The first argument is an input: the size parameter for generation. The second and third arguments are outputs: the clauses generated and the status of the clauses. The clauses must be a Prolog list of clauses in TPTP input_clause/3 format. The status value must be one of unsatisfiable, satisfiable, open, or unknown. A <Problem name>_file_information/3 fact must also be provided. The three arguments of the fact are the atom generator, a description of the possible size parameters (as used in the first argument of <Problem name>/3), and the TPTP size for this problem (this is hard to determine!). See the existing generator files for examples.

If you are in doubt, please contact Geoff Sutcliffe for help.

3.2 The tptp_naming Script

This script renames TPTP files with either their syntactic or syntactic=semantic names, using the names given in the `% File` field of the header (see Section 2.4).

Usage: `tptp_naming syntactic|semantic` <List of problem files>

Example

```
~/TPTP/Scripts> tptp_naming semantic Problems/GRP/GRP001*
Problems/GRP/GRP001-1.p renames to Problems/GRP/GRP001=SqrComm-1.p
Problems/GRP/GRP001-2.p renames to Problems/GRP/GRP001=SqrComm-2.p
Problems/GRP/GRP001-3.p renames to Problems/GRP/GRP001=SqrComm-3.p
Problems/GRP/GRP001-4.p renames to Problems/GRP/GRP001=SqrComm-4.p
Problems/GRP/GRP001-5.p renames to Problems/GRP/GRP001=SqrComm-5.p
~/TPTP/Scripts>
```

This use of `tptp_naming` adds the semantic name to all versions of the abstract problem GRP001.

4 You and the TPTP

4.1 Quick Installation Guide

This section explains how to obtain and install the TPTP, and how to syntax-convert the TPTP problems.

4.1.1 Obtaining the TPTP via FTP

The distribution consists of three files:

- ReadMe-v1.2.1 (8.9 kByte) contains an overview of the TPTP.
- TR-v1.2.1.ps.gz (0.42 MByte, 1.9 MByte unpacked) contains this version of the TPTP technical report.
- TPTP-v1.2.1.tar.gz (0.73 MByte, 11.4 MByte unpacked) contains the library (including a copy of the ReadMe-v1.2.1 file).

There also might be a file called BuggedProblems-v1.2.1, containing a list of files that have been found to contain errors, in the current release (bugs that have been discovered after the release has been distributed).

Ftp instructions for obtaining the TPTP from Australia or Germany:

```
prompt> cd <the directory where you want the TPTP to reside>
prompt> ftp -i ftp.cs.jcu.edu.au             # or: ftp -i 137.219.17.4
        # or use alternatively
        ftp -i flop.informatik.tu-muenchen.de  # or: ftp -i 131.159.8.35
Name (ftp.cs.jcu.edu.au:<your login-name>): ftp
331 Guest login ok, send your complete e-mail address as password.
Password:<your full email address>
ftp> cd pub/research/tptp-library   # on ftp.cs.jcu.edu.au
     cd pub/tptp-library            # on flop.informatik.tu-muenchen.de
ftp> binary
ftp> mget *
ftp> quit
```

Or use the World Wide Web (WWW) with either of the following URLs :
`http://www.cs.jcu.edu.au/ftp/users/GSutcliffe/TPTP.html`
`http://wwwjessen.informatik.tu-muenchen.de/~suttner/TPTP.html`.

4.1.2 Installing the TPTP

```
prompt> gunzip -c TPTP-v1.2.1.tar.gz | tar xvf -
prompt> TPTP-v1.2.1/TPTP2X/tptp2X_install
        <... the script will then ask for required information>
```

If you don't have any Prolog installed, you need to get one first. BinProlog is freely available via anonymous ftp from `clement.info.umoncton.ca:BinProlog`.

4.1.3 Converting Problems to Other Syntax

```
prompt> TPTP-v1.2.1/TPTP2X/tptp2X <desired_syntax>
```

As <desired_syntax>, choose any one of `kif`, `leantap`, `tap`, `meteor`, `mgtp`, `otter`, `pttp`, `setheo`, `spass`, `sprfn`, or `tptp`. The `tptp` option simply expands `include` directives (see Section 2.5) in problems, producing files in the TPTP Prolog-style syntax. `tptp2X` offers MUCH more than this. See Section 3.1 for a detailed description of the utility, including information on how to produce output in your own syntax.

4.2 Important: Using the TPTP

By providing this library of ATP problems, and a specification of how these problems should be presented to ATP systems, it is our intention to place the testing, evaluation, and comparison of ATP systems onto a firm footing. For this reason, you should abide by the following conditions when using TPTP problems and presenting your results:

- The TPTP release number must be stated, and each problem must be referenced by its unambiguous syntactic name.

- No clauses/literals may be changed, added, or removed without explicit notice (this holds also for removing equality axioms when built-in equality is provided by the prover).
- The clauses/literals may not be rearranged without explicit notice. If clause or literal reordering is done using the tptp2X utility, (see Section 3.1), the reordering must be explicitly noted.
- The header information in each problem may not be used by the ATP system without explicit notice. Any information that is given to the ATP system, other than that in the `input_clauses`, must be explicitly noted (including any system switches or default settings).

Abiding by these rules will allow unambigous identification of the problem, the arrangement of clauses, and further input to the ATP system. If you follow these rules, please make this clear in any presentation of your results, by an explicit statement. We propose that you state "These results were obtained in compliance with the guidelines for use of TPTP v1.2.1". By making this clear statement, ATP researchers are assured of your awareness of our guidelines. Conversely, it will become clear when the guidelines may have been ignored.

4.3 Please contact us if ...

Please contact one of us if:

- You find any mistakes in the TPTP.
- You are able to provide further information for a TPTP problem.
- You want to contribute a problem to the TPTP. Please use the problem template that comes with the distribution (in the Documents directory - see Section 2.6) and fill in header information as far as possible. Any unambiguous representation will do for the clauses.
- You have further suggestions for improving the TPTP library.

Our contact addresses are:
Geoff Sutcliffe - geoff@cs.jcu.edu.au (FAX: +61-77-814029)
Christian Suttner - suttner@informatik.tu-muenchen.de (FAX: +49-89-526502)

5 The Future

5.1 Current Activities

Currently a new version of the TPTP is being built. It will contain two important new features.

Firstly, in addition to the current CNF syntax, problems in FOF (First Order Format, i.e., including quantifiers) syntax will be integrated into the TPTP. This will extend the TPTP user community to researchers working on non-normal form systems. Also, ATP systems with automatic conversion to clause normal form will be able to derive additional information regarding a given problem, such as which functors are Skolem functors. For systems unable to deal with FOF, we also will provide a clause normal form transformation in the tptp2X utility. Over a hundred FOF problems have already been collected. Everybody is invited to submit problems in FOF syntax for inclusion. Please contact us for details if you would like to contribute.

Secondly, each problem will obtain an individual difficulty rating. The problem ratings are currently being worked on. As part of this, we are collecting performance data for state-of-the-art theorem provers. The data collection will become part of future releases of the TPTP. TPTP users are invited to submit performance data for their ATP systems. Please contact us for details if you would like to contribute. Note that, as advances in automated theorem proving are made, problem ratings should decrease. Therefore the long term development of the individual problem ratings will provide an objective measure of progress in the field.

The next major release will also contain a summary of work that references the TPTP. This will allow users to compare published results obtained for different systems, and also will give an overview on the usage of the TPTP. Finally, it will include a BibTeX file containing the references found in this report.

5.2 Further Plans

We have several short and long term plans for further development of the TPTP. The main ideas are listed here.

- ATP system evaluation guidelines.
  General guidelines outlining the requirements for ATP system evaluation will be produced.
- The BSTP Benchmark Suite.
  A benchmark suite (the BSTP) will be selected from the TPTP. The BSTP will be a small collection of problems, and will provide a minimal set of problems on which an ATP system evaluation can be based. The BSTP will be accompanied by specific guidelines for computing a performance index for an ATP system.
- Various translators.
  Translators between various logical forms will be provided.
  - from non-Horn to Horn form
  - from 1st order to propositional form
- Other logics.
  The TPTP may be extended to include problems expressed in non-classical and higher order logics.

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Location abbreviations:

ANL	= Argonne National Laboratory	SUNY	= State University of New York
LMU	= Ludwig-Maximilian-Universität München	TUM	= Technische Universität München
MPIS	= Max-Planck-Institut Saarbrücken	UCB	= University of California at Berkeley
NJIT	= New Jersey Institute of Technology	UNC	= University of North-Carolina at Chapel Hill
PSU	= Pennsylvania State University	UNM	= University of New Mexico, Albuquerque
SRI	= Stanford Research International		

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6 The TPTP v1.2.1 Axiom Sets Listing

Syntactic name	V#	Semantic name / References	Description	V	Cl	Av	nH	Eq
ALG001	ax	GodelAlg1	Abstract algebra axioms, based on Godel set theory					
	–0	[BLM+86, McC92b]		c	24	2.8	29%	18%
ALG001	eq	GodelAlg1Subs	Substitution axioms for abstract algebra axioms					
	–0	[BLM+86]		c	34	2.4	–	67%
ANA001	ax	Limits1	Analysis (limits) axioms for continuous functions					
	–0	[MOW76]		c	14	1.9	–	18%
ANA001	eq	Limits1Subs	Substitution axioms for analysis (limits) axioms					
	–0	[MOW76]		c	8	2.3	–	77%
ANA002	ax	Limits2	Analysis (limits) axioms for continuous functions					
	–0	[Ble90, Ble92]		c	26	1.7	7%	13%
ANA002	eq	Limits2Subs	Substitution axioms for analysis (limits) axioms					
	–0	[Ble90]		c	14	2.1	–	86%
BOO001	ax	B3Alg	Ternary Boolean algebra (equality) axioms					
	–0	[Wos88, Win82]		c	9	1.4	–	100%
BOO002	ax	BoolAlg1	Boolean algebra axioms					
	–0	[Whi61, MOW76]		c	22	2.7	–	3%
BOO002	eq	BoolAlg1Subs	Substitution axioms for Boolean algebra axioms					
	–0	[Whi61, MOW76]		c	11	2.5	–	57%
BOO003	ax	EqBoolAlg1	Boolean algebra (equality) axioms					
	–0	[Whi61, MOW76]		c	19	1.3	–	100%
BOO004	ax	EqBoolAlg2	Boolean algebra (equality) axioms					
	–0	[Ver94]		c	13	1.4	–	100%
CAT001	ax	Catgry1	Category theory axioms					
	–0	[Mit67]		c	18	2.5	–	2%
CAT001	eq	Catgry1Subs	Substitution axioms for category theory axioms					
	–0	[Mit67]		c	10	2.6	–	53%
CAT002	ax	EqCatgry1	Category theory (equality) axioms					
	–0	[Qua89a]		c	11	1.7	–	100%
CAT003	ax	Catgry2	Category theory axioms					
	–0	[Sco79]		c	17	2.2	11%	40%
CAT003	eq	Catgry2Subs	Substitution axioms for category theory axioms					
	–0	[Sco79]		c	9	2.3	–	71%
CAT004	ax	Catgry3	Category theory axioms					
	–0	[Sco79]		c	11	1.9	–	33%
CAT004	eq	Catgry3Subs	Substitution axioms for category theory axioms					
	–0	[Sco79]		c	7	2.4	–	64%
CID001	ax	Logic	Definitions of AND, OR and NOT					
	–0	[WOLB92]		c	10	1.0	–	100%
CID001	eq	LogicSubs	Substitution axioms for AND, OR and NOT					
	–0	[WOLB92]		-	5	2.0	–	100%
CID002	ax	Logic	Definitions of AND, OR and NOT					
	–0	[WOLB92]		c	6	1.0	–	100%
COL001	ax	TRC	Type-respecting combinators					
	–0	[Jec93b]		c	17	1.5	5%	100%
EQU001	ax	Equality	Reflexivity, symmetry and transitivity, of equality					
	–0	[Jec93b]		-	3	2.0	–	100%
FIE001	ax	Semantic	Ordered field axioms.					
	–0	[Drä93]		x	26	2.8	11%	31%
FIE002	ax	Semantic	Ordered field axioms.					
	–0	[Drä93]		l	44	2.1	6%	26%
FIE003	ax	Semantic	Ordered field axioms.					
	–0	[Drä93]		e	25	3.0	12%	–
FIE004	ax	Semantic	Ordered field axioms.					
	–0	[Drä93]		l	34	2.9	8%	12%
FIE005	ax	Semantic	Ordered field axioms.					
	–0	[Drä93]		l	33	2.4	9%	57%
FIE006	ax	Semantic	Ordered field axioms.					
	–0	[Drä93]		b	49	2.3	8%	68%
GEO001	ax	Tarski1	Tarski geometry axioms					
	–0	[Tar59, MOW76, Wos88]		c	20	3.2	30%	12%
	–1	[Tar59, MOW76]		c	4	2.5	25%	–
GEO001	eq	Tarski1Subs	Substitution axioms for geometry axioms					
	–0	[Tar59, MOW76, Wos88]		c	32	2.2	–	80%
	–1	[Tar59, MOW76]		c	3	3.0	–	33%
GEO002	ax	Tarski2	Tarski geometry axioms					
	–0	[Tar59, MOW76, Qua89b]		c	18	3.1	27%	12%
	–1	[Tar59, MOW76, Qua89b]		c	4	2.5	25%	–
	–2	[Tar59, MOW76, Qua89b]		c	1	1.0	–	100%
	–3	[Tar59, MOW76, Qua89b]		c	1	1.0	–	100%
GEO002	eq	Tarski2Subs	Substitution axioms for geometry axioms					
	–0	[Tar59, MOW76, Qua89b]		c	32	2.2	–	80%
	–1	[Tar59, MOW76, Qua89b]		c	3	3.0	–	33%
	–2	[Tar59, MOW76, Qua89b]		c	2	2.0	–	100%
	–3	[Tar59, MOW76, Qua89b]		c	4	2.0	–	100%
GEO003	ax	Hilbert1	Hilbert geometry axioms					
	–0	[Ben92]		c	31	5.6	58%	24%
GEO003	eq	Hilbert1Subs	Substitution axioms for geometry axioms					
	–0	[Ben92]		c	24	2.3	–	71%
GRP001	ax	Monoids1	Monoid axioms					
	–0	[MOW76]		c	6	2.3	–	7%
GRP002	ax	SemiGr1	Semigroup axioms					
	–0	[MOW76]		c	4	3.0	–	8%

Syntactic name	V#	Semantic name / References	Description	V	Cl	Av	nH	Eq
GRP002	eq	SemiGr1Subs	Substitution axioms for semigroup axioms					
	–0	[MOW76]		C	5	2.6	–	53%
GRP003	ax	Group1	Group theory axioms					
	–0	[MOW76, Wos88]		C	8	2.0	–	6%
	–1	[MOW76, Wos88]		C	2	3.0	–	–
	–2	[Wosb]		C	1	4.0	–	–
GRP003	eq	Group1Subs	Substitution axioms for group theory axioms					
	–0	[MOW76, Wos88]		C	6	2.5	–	60%
	–1	[MOW76, Wos88]		C	1	3.0	–	33%
	–2	[Wosb]		C	1	3.0	–	33%
GRP004	ax	EqGroup1	Group theory (equality) axioms					
	–0	[MOW76, Wos88]		-	6	1.5	–	100%
	–1	[MOW76]		C	3	3.0	–	22%
	–2	[Fuc94, Sch95]		C	16	1.3	–	100%
GRP005	ax	Group2	Group theory axioms					
	–0	[MOW76, Wos88, Ver92]		C	7	2.4	–	–
GRP006	ax	NamedGr1	Group theory (Named groups) axioms					
	–0	[MOW76]		C	11	2.2	–	4%
GRP006	eq	NamedGr1Subs	Substitution axioms for group theory axioms					
	–0	[MOW76]		C	12	2.5	–	60%
HEN001	ax	Henkin1	Henkin model axioms					
	–0	[MOW76]		C	9	2.3	–	9%
HEN001	eq	Henkin1Subs	Substitution axioms for Henkin model axioms					
	–0	[MOW76]		C	7	2.7	–	47%
HEN002	ax	Henkin2	Henkin model axioms					
	–0	[MOW76]		C	7	1.6	–	27%
HEN002	eq	Henkin2Subs	Substitution axioms for Henkin model axioms					
	–0	[MOW76]		C	4	2.5	–	60%
HEN003	ax	EqHenkin	Henkin model (equality) axioms					
	–0	[MOW76]		C	7	1.6	–	100%
LAT001	ax	EqLatt1	Lattice theory (equality) axioms					
	–0	[Bum65, McC88, Wos88]		C	17	1.3	–	100%
	–1	[Bum65, McC88]		C	5	2.6	–	46%
	–2	[Bum65, McC88]		C	8	2.6	12%	38%
LAT002	ax	Latt1	Lattice theory axioms					
	–0	[MOW76, Wos88]		C	20	2.4	–	4%
LAT002	eq	Latt1	Substitution axioms for the lattice theory axioms					
	–0	[MOW76, Wos88]		C	10	2.6	–	53%
LCL001	ax	WjAlg1	Wajsberg algebra axioms					
	–0	[FRT84, Bon91, MW92]		C	7	1.4	–	100%
	–1	[FRT84, Bon91]		C	10	2.0	–	70%
	–2	[FRT84, AB90, Bon91]		C	10	1.4	–	100%
LCL002	ax	WjAlg2	Alternative Wajsberg algebra axioms					
	–0	[FRT84, AB90, Bon91]		C	11	1.3	–	100%
	–1	[FRT84, AB90, Bon91]		C	10	1.4	–	100%
LCL003	ax	PropLog	Propositional logic deduction axioms					
	–0	[WR27, O'R89, SE94]		C	8	1.6	–	–
LDA001	ax	EmbdgAlg	Embedding algebra axioms					
	–0	[Jec93a]		I	13	2.1	15%	44%
NUM001	ax	RecFunc1	Number theory axioms					
	–0	[LS74]		I	6	1.3	–	–
	–1	[LS74]		C	3	2.3	–	–
	–2	[LS74]		C	3	2.3	33%	–
NUM002	ax	AddAlg	Number theory (equality) axioms					
	–0	[LS74]		C	12	1.8	–	–
NUM003	ax	GodelNum1	Number theory axioms, based on Godel set theory					
	–0	[BLM+86, McC92b]		C	54	4.0	59%	7%
NUM003	eq	GodelNum1Subs	Number theory axioms, based on Godel set theory					
	–0	[BLM+86, McC92b]		C	27	2.0	–	96%
NUM004	ax	Ordinals	Number theory (ordinals) axioms, based on NBG set theory					
	–0	[Qua92c]		C	46	2.3	8%	21%
NUM004	eq	OrdinalsSubs	Substitution axioms for number theory axioms					
	–0	[Qua92c]		C	31	2.4	–	65%
PLA001	ax	Blocks1	Blocks world axioms					
	–0	[G.J73, SE94]		C	10	3.1	–	–
	–1	[G.J73, SE94]		C	20	1.1	–	–
PRV001	ax	ProgVer1	Program verification axioms					
	–0	[MOW76]		C	12	1.9	8%	39%
PRV001	eq	ProgVer1Subs	Substitution axioms for program verification axioms					
	–0	[MOW76]		C	3	2.0	–	100%
PRV002	ax	ProgVer2	Program verification axioms					
	–0	[MOW76]		C	22	2.4	9%	5%
PRV002	eq	ProgVer2Subs	Substitution axioms for program verification axioms					
	–0	[MOW76]		C	4	2.5	–	40%
PUZ001	ax	MarsVns	Mars and Venus axioms					
	–0	[Rap95]		-	16	2.4	25%	2%
PUZ001	eq	MarsVnsSubs	Substitution axioms for Mars and Venus axioms					
	–0	[Rap95]		-	10	2.9	–	37%
PUZ002	ax	TTLiars1	Truthtellers and Liars axioms for two types of people					
	–0	[Smu78b, LO85a]		C	6	2.7	33%	–
PUZ003	ax	TTLiars2	Truthtellers and Liars axioms for three types of people					
	–0	[Smu78b]		C	8	2.9	37%	–
RNG001	ax	Rings1	Ring theory axioms					
	–0	[MOW76, Wos88]		C	17	2.9	–	4%

Syntactic name	V#	Semantic name / References	Description	V	Cl	Av	nH	Eq
RNG001	eq	Rings1Subs	Substitution axioms for ring theory axioms					
	–0	[MOW76, Wos88]		C	11	2.5	–	57%
RNG002	ax	EqRings1	Ring theory (equality) axioms					
	–0	[PS81]		C	19	1.3	–	100%
RNG003	ax	AltRing1	Alternative ring theory (equality) axioms					
	–0	[Ste87]		C	25	1.4	–	100%
RNG004	ax	AltRing2	Alternative ring theory (equality) axioms					
	–0	[AH90]		C	22	1.3	–	100%
RNG005	ax	EqRings2	Ring theory (equality) axioms					
	–0	[Wos88, LW91]		C	14	1.4	–	100%
ROB001	ax	Robbins1	Robbins algebra axioms					
	–0	[HMT71, Win90]		C	6	1.5	–	100%
	–1	[HMT71, Win90]		C	8	1.9	–	60%
SET001	ax	Naive1	Set theory membership and subsets axioms					
	–0	[LS74]		C	6	2.3	16%	–
	–1	[LS74]		C	6	3.3	33%	–
	–2	[LS74]		C	6	3.3	33%	–
	–3	[LS74]		C	6	3.3	66%	–
SET002	ax	Naive2	Set theory axioms					
	–0	[MOW76]		C	21	2.1	14%	–
SET002	eq	Naive2Subs	Substitution axioms for set theory axioms					
	–0	[MOW76]		C	11	2.4	–	–
SET003	ax	GodelSet1	Set theory axioms based on Godel set theory					
	–0	[BLM+86, Wos88, McC92b]		C	141	2.5	14%	13%
SET003	eq	GodelSet1Subs	Substitution axioms for set theory axioms					
	–0	[BLM+86, Wos88]		C	122	2.2	–	82%
SET004	ax	NBG1	Set theory axioms based on NBG set theory					
	–0	[Qua92a]		C	91	2.0	8%	21%
	–1	[Qua92a, Qua92c]		C	21	1.8	–	27%
SET004	eq	NBG1Subs	Substitution axioms for set theory axioms					
	–0	[Qua92a]		C	65	2.2	–	79%
	–1	[Qua92a, Qua92c]		C	7	2.4	–	64%
SYN001	ax	RPT63	Synthetic domain theory for EBL					
	–0	[SE94]		C	368	2.9	–	–
TOP001	ax	Topology	Point-set topology axioms					
	–0	[WM89]		I	109	3.1	21%	–

7 The TPTP v1.2.1 Generators Listing

Syntactic name V#	Semantic name References	Description	V	Valid Sizes	TPTP Size
GRP123	321COILS	(3,2,1) conjugate orthogonality			
−1	[FSB93, Sla93, Zha94a, SFS95]		C	$X \geq 1$	3
−2	[FSB93, Sla93, Zha94a, SFS95]		A	$X \geq 1$	3
−3	[FSB93, Sla93, Zha94a, SFS95]		A	$X \geq 1$	3
−4	[FSB93, Sla93, Zha94a, SFS95]		A	$X \geq 1$	3
−6	[FSB93, Sla93, SFS95]		C	$X \geq 1$	3
−7	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−8	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−9	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
GRP124	312COILS	(3,1,2) conjugate orthogonality			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 1$	3
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−3	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−4	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−6	[FSB93, Sla93, SFS95]		C	$X \geq 1$	3
−7	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−8	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−9	[FSB93, Sla93, SFS95]		A	$X \geq 1$	4
GRP125	Schroeder	(a.b).(b.a) = a			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 1$	3
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−3	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−4	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
GRP126	SteinLaw3	(a.b).(b.a) = b			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 3$	3
−2	[FSB93, Sla93, SFS95]		A	$X \geq 3$	3
−3	[FSB93, Sla93, SFS95]		A	$X \geq 3$	3
−4	[FSB93, Sla93, SFS95]		A	$X \geq 3$	3
GRP127	QG5	((b.a).b).b) = a			
−1	[Ben85, FSB93, Sla93, SFS95]		C	$X \geq 1$	3
−2	[Ben85, FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−3	[Ben85, FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−4	[Ben85, FSB93, Sla93, SFS95]		A	$X \geq 1$	3
GRP128	SchroederLaw1	(a.b).b = a.(a.b)			
−1	[BZ92, FSB93, Sla93, SFS95]		C	$X \geq 1$	3
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−3	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
−4	[FSB93, Sla93, SFS95]		A	$X \geq 1$	3
GRP129	QG7	a.(b.a) = (b.a).b			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 1$	2
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
−3	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
−4	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
GRP130	QG8	(a.(a.b)).b = a			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 1$	2
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
−3	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
−4	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
GRP131	321COILSNoIdem	(3,2,1) conjugate orthogonality, no idempotence			
−1	[FSB93, Sla93, Zha94a, SFS95]		C	$X \geq 1$	2
−2	[FSB93, Sla93, Zha94a, SFS95]		A	$X \geq 1$	2
GRP132	312COILSNoIdem	(3,1,2) conjugate orthogonality, no idempotence			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 1$	2
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
GRP133	SchroederNoIdem	(a.b).(b.a) = a, no idempotence			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 1$	2
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
GRP134	SteinLaw3NoIdem	(a.b).(b.a) = b, no idempotence			
−1	[FSB93, Sla93, SFS95]		C	$X \geq 1$	2
−2	[FSB93, Sla93, SFS95]		A	$X \geq 1$	2
GRP135	QG5NoIdem	((b.a).b).b) = a, no idempotence			
−1	[Ben85, FSB93, Sla93, SFS95]		C	$X \geq 1$	2
−2	[Ben85, FSB93, Sla93, SFS95]		A	$X \geq 1$	2
MSC007	Pigeon	Cook pigeon-hole problem			
−1	[CR79, Pel86]		C	$X \geq 2$	5
−2	[CR79, Pel86, Pel88]		C	$X \geq 2$	2
MSC008	LatSq	The (in)constructability of Graeco-Latin Squares			
−1	[Rob63]		C	$X \geq 2, X \bmod 4 = 2$	2
NUM283	Factorial	Calculation of factorial			
−1			C	$X \geq 1$	5
NUM284	Fibonacci	Calculation of fibonacci numbers			
−1			C	$X \geq 1$	10
PUZ015	Checkers1	Checkerboard and Dominoes : Opposing corners removed			
−2	[Sti93]		C	$X \geq 2$	3
PUZ016	Checkers2	Checkerboard and Dominoes : Row 1, columns 2 and 3 removed			
−2	[Sti93]		C	$X \geq 3$	3
PUZ034	NQueens	N queens problem			
−1			C	$X \geq 2$	3
SYN001	Allways	All signed combinations of some propositions.			
−1	[NS72, LS74, WM76, Pel86]		-	$X \geq 1$	5
SYN002	OddEven	Odd and Even Problem			
−1	[SA92]		-	$X \geq 1, Y > X$ $(X+Y) \bmod 2 = 1$	7:8

Syntactic name V#	Semantic name References	Description	V	Valid Sizes	TPTP Size
SYN003 −1	Implies1 [Pla82]	Implications that form a contradiction	-	$X \geq 2$	6
SYN004 −1	Implies2 [Pla82]	Implications that form a contradiction	-	$X \geq 2$	7
SYN005 −1	Or1 [Pla82]	Disjunctions that form a contradiction	-	$X \geq 1$	10
SYN010 −1	Letz [LMG94]	Example for Proposition 5.2 in [Letz, et al., 1994]	-	$X \geq 1, Y \geq 1$	5:5
SYN085 −1	DAPs1 [Pla94]	Plaisted problem s(1,SIZE)	-	$X \geq 0$	10
SYN086 −1	DAPs2 [Pla94]	Plaisted problem s(2,SIZE)	-	$X \geq 1$	3
SYN087 −1	DAPs3 [Pla94]	Plaisted problem s(3,SIZE)	-	$X \geq 1$	3
SYN088 −1	DAPs4 [Pla94]	Plaisted problem s(4,SIZE)	-	$X \geq 1$	10
SYN089 −1	DAPt2 [Pla94]	Plaisted problem t(2,SIZE)	-	$X \geq 1$	2
SYN090 −1	DAPt3 [Pla94]	Plaisted problem t(3,SIZE)	-	$X \geq 1$	8
SYN091 −1	DAPsyms2 [Pla94]	Plaisted problem sym(s(2,SIZE))	-	$X \geq 1$	3
SYN092 −1	DAPsyms3 [Pla94]	Plaisted problem sym(s(3,SIZE))	-	$X \geq 1$	3
SYN093 −1	DAPut2 [Pla94]	Plaisted problem u(t(2,SIZE))	-	$X \geq 1$	2
SYN094 −1	DAPut3 [Pla94]	Plaisted problem u(t(3,SIZE))	-	$X \geq 1$	5
SYN095 −1	DAPmt2 [Pla94]	Plaisted problem m(t(2,SIZE))	-	$X \geq 1$	2
SYN096 −1	DAPmt3 [Pla94]	Plaisted problem m(t(3,SIZE))	-	$X \geq 1$	8
SYN097 −1	DAPsymut2 [Pla94]	Plaisted problem sym(u(t(2,SIZE)))	-	$X \geq 1$	2
SYN098 −1	DAPsymut3 [Pla94]	Plaisted problem sym(u(t(3,SIZE)))	-	$X \geq 1$	2
SYN099 −1	DAPsymmt2 [Pla94]	Plaisted problem sym(m(t(2,SIZE)))	-	$X \geq 1$	3
SYN100 −1	DAPsymmt3 [Pla94]	Plaisted problem sym(m(t(3,SIZE)))	-	$X \geq 1$	5
SYN101 −1	DAPnt2 [Pla94]	Plaisted problem n(t(2,SIZE1),SIZE2)	-	$X \geq 1, Y \geq 1$	2:2
SYN102 −1	DAPnt3 [Pla94]	Plaisted problem n(t(3,SIZE1),SIZE2)	-	$X \geq 1, Y \geq 1$	7:7
SYN302 −1	DAPa [Pla94]	Plaisted problem a(SIZE)	-	$X \geq 1$	3
SYN313 −1	Decide11 [Fer94]	Problem for testing satisfiability	-	$X \geq 1, Y \geq 1$	1:2
SYN314 −1	Decide12 [Fer94]	Problem for testing satisfiability	-	$X \geq 0, Y \geq 0$	2:1

8 The TPTP v1.2.1 Problems Listing

Syntactic name	V#	Semantic name / Other names	Description	References	V	Cl	Av	nH	Eq
Domain ALG (2 abstract problems, 4 problems)									
ALG001		CmpsnHomoms	The composition of homomorphisms is a homomorphism						
	–1	Problem 221-223		[BLM$^+$86]	-	296	2.4	6%	40%
	–2	Problem 221-223, Test Problem 15		[BLM$^+$86, Wos88]	-	269	2.3	7%	43%
	–3	HO1, HO1		[Qua92a, Qua92b]	-	190	2.0	4%	46%
ALG002		OrdField	In an ordered field, if X > 0 then X^ -1 > 0						
	–1	Example 5, EX5-T?, ex5.lop, FEX5		[FLSY74, WM76]	-	14	2.0	14%	–
Domain ANA (5 abstract problems, 19 problems)									
ANA001		MinVal	Attaining minimum (or maximum) value						
	–1	AM8		[WB87]	-	18	2.3	16%	–
ANA002		IntmedVal	Intermediate value theorem						
	–1			[WB87]	-	18	2.3	27%	–
	–2			[WB87]	-	18	2.3	27%	–
	–3	IMV		[WB87]	-	17	2.6	29%	–
	–4	ivt.lop		[WB87]	-	17	2.6	29%	–
ANA003		SumContFuncLem1	Lemma 1 for the sum of two continuous functions is continuous						
	–1	prob1.ver2.in		[MOW76]	-	38	2.1	–	47%
	–2	BL1, prob1.ver1.in		[MOW76]	-	17	2.2	–	–
	–3			[Ble90, Ble92]	-	50	1.9	10%	39%
	–4	Problem 1, Bledsoe-P1, p1.lop		[Ble90, LM92, Ble92]	-	12	2.3	33%	–
ANA004		SumContFuncLem2	Lemma 2 for the sum of two continuous functions is continuous						
	–1			[MOW76]	-	38	2.1	–	47%
	–2	BL2		[MOW76]	-	16	2.2	–	–
	–3			[Ble90, Ble92]	-	50	1.9	10%	39%
	–4	Problem 2, p2.lop		[Ble90, Ble92]	-	13	2.2	30%	–
	–5	Problem 3, p3.lop		[Ble90, Ble92]	-	16	2.0	25%	–
ANA005		SumContFunc	The sum of two continuous functions is continuous						
	–1	BL3		[MOW76]	-	38	2.1	–	47%
	–2	prob2.ver1.in		[MOW76]	-	16	2.2	–	–
	–3			[Ble90, Ble92]	-	50	1.9	10%	39%
	–4	Problem 4, p4.lop		[Ble90, Ble92]	-	24	2.0	16%	–
	–5	Problem 5, LIM+, p5.lop		[Ble90, Ble92]	-	24	2.0	16%	–
Domain BOO (19 abstract problems, 52 problems)									
BOO001		B3InvIvln	In B3 algebra, inverse is an involution						
	–1	tba_gg.in			-	13	1.5	–	100%
BOO002		B3LId	In B3 algebra, X * X^ -1 * Y = Y						
	–1	Problem 5, CADE-11 Comp. Eq-3, THEOREM EQ-3, PROBLEM 3		[LO85b, Ove90, Ove93, LM93, Zha93]	-	12	1.6	–	100%
	–2	Test Problem 13, Lemma for Axiom Independence		[Wos88]	-	13	1.5	–	100%
BOO003		MultIdem	Multiplication is idempotent (X * X = X)						
	–1	B2 part 1, prob2_part1.ver1.in		[Whi61, MOW76, OMW76]	-	37	2.6	–	25%
	–2	prob2_part1.ver2.in			-	23	1.3	–	100%
	–4	TA		[Ver94]	-	17	1.5	–	100%
BOO004		AddIdem	Addition is idempotent (X + X = X)						
	–1	B2 part 2, prob2_part2.ver1		[Whi61, MOW76, OMW76]	-	37	2.6	–	25%
	–2	prob2_part2.ver2.in			-	23	1.3	–	100%
	–4	TA		[Ver94]	-	17	1.5	–	100%
BOO005		AddBnd	Addition is bounded (X + 1 = 1)						
	–1	B3 part 1, B5, prob3_part1.ver1.in		[Whi61, MOW76, OMW76]	-	37	2.6	–	25%
	–2	prob3_part1.ver2.in			-	23	1.3	–	100%
	–4	TB		[Ver94]	-	17	1.5	–	100%
BOO006		MultBnd	Multiplication is bounded (X * 0 = 0)						
	–1	B3 part 2, B6, prob3_part2.ver1		[Whi61, MOW76, OMW76]	-	37	2.6	–	25%
	–2	prob3_part2.ver2.in			-	23	1.3	–	100%
	–4	TB		[Ver94]	-	17	1.5	–	100%
BOO007		ProdAssc	Product is associative ((X * Y) * Z = X * (Y * Z))						
	–1	Established lemma		[Whi61, MOW76, Ver92]	-	41	2.4	–	25%
	–2	associativity		[Ver92]	-	23	1.3	–	100%
	–4	TD		[Ver94]	-	17	1.5	–	100%
BOO008		SumAssc	Sum is associative ((X + Y) + Z = X + (Y + Z))						
	–1	B1, Theorem 4, prob1.ver1.in		[Whi61, MOW76, OMW76]	-	41	2.4	–	25%
	–2	prob1.ver2.in			-	23	1.3	–	100%
	–3	bool_ass.in, bool.in			-	35	2.1	–	31%
	–4	TD		[Ver94]	-	17	1.5	–	100%
BOO009		MultAbsb	Multiplication absorption (X * (X + Y) = X)						
	–1	B4 part 1, prob4_part1.ver1		[Whi61, MOW76, OMW76]	-	37	2.6	–	25%
	–2	prob4_part1.ver2.in			-	23	1.3	–	100%
	–4	TC		[Ver94]	-	17	1.5	–	100%
BOO010		AddAbsb	Addition absorbtion (X + (X * Y) = X)						
	–1	B4 part 2, prob4_part2.ver1		[Whi61, MOW76, OMW76]	-	37	2.6	–	25%
	–2	prob4_part2.ver2.in			-	23	1.3	–	100%
	–4	TC		[Ver94]	-	17	1.5	–	100%
BOO011		InvAId	Inverse of additive identity = Multiplicative identity						
	–1	B7, prob7.ver1		[Whi61, MOW76]	-	37	2.6	–	26%
	–2	prob7.ver2.in			-	23	1.3	–	100%
	–4	TG		[Ver94]	-	17	1.5	–	100%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
BOO012	InvIvln	Inverse is an involution					
–1	B8	[Whi61, MOW76]	-	37	2.6	–	26%
–2	prob8.ver2.in		-	23	1.3	–	100%
–3	B8, prob8.ver1	[Whi61, MOW76]	-	49	2.5	–	20%
–4	TF	[Ver94]	-	17	1.5	–	100%
BOO013	InvUnq	The inverse of X is unique					
–1	B9	[Whi61, MOW76]	-	41	2.4	–	25%
–2	prob9.ver2.in		-	27	1.3	–	100%
–3	B9, prob9.ver1	[Whi61, MOW76]	-	42	2.4	–	26%
–4	TE	[Ver94]	-	19	1.4	–	100%
BOO014	DeMorgan1	DeMorgan for inverse and product (X+Y)^ -1 = (X^ -1) * (Y^ -1)					
–1		[Whi61, MOW76]	-	39	2.5	–	25%
–2	prob10.ver2.in		-	25	1.3	–	100%
–3	B10, prob.10.ver1	[Whi61, MOW76]	-	41	2.5	–	26%
–4	TH	[Ver94]	-	17	1.5	–	100%
BOO015	DeMorgan2	DeMorgan for inverse and sum (X^ -1 + Y^ -1) = (X * Y)^ -1					
–1	DeMorgan's Laws	[MOW76, Ver92]	-	39	2.5	–	25%
–2	prob10.ver2.in		-	25	1.3	–	100%
–4	TH	[Ver94]	-	17	1.5	–	100%
BOO016	ProdSum	Relating product and sum (X * Y = Z -> X + Z = X)					
–1	Established lemma	[Whi61, MOW76]	-	38	2.5	–	25%
–2			-	24	1.3	–	100%
BOO017	SumProd	Relating sum and product (X + Y = Z -> X * Z = X)					
–1	Established lemma	[Whi61, MOW76]	-	38	2.5	–	25%
–2			-	24	1.3	–	100%
BOO018	InvMId	Inverse of multiplicative identity = Additive identity					
–4	TG	[Ver94]	-	17	1.5	–	100%
BOO019	IndpAx	Prove the independance of Ternary Boolean algebra axiom					
–1	A1, Example 4	[Win82, BCP94]	-	12	1.6	–	100%

Domain CAT (19 abstract problems, 58 problems)

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
CAT001	Monom1	XY monomorphism => Y monomorphism					
–1	C1, p1.ver1.in	[Mit67, MOW76]	-	36	2.3	–	27%
–2	p1.ver2.in	[Qua89a]	-	20	1.8	–	100%
–3	p1.ver3.in	[Sco79]	-	34	2.1	5%	57%
–4		[Sco79]	-	26	2.0	–	56%
CAT002	Monom2	X and Y monomorphisms, XY well-defined => XY monomorphism					
–1	C2, p2.ver1.in	[Mit67, MOW76]	-	37	2.4	–	27%
–2	p2.ver2.in	[Qua89a]	-	21	1.9	–	100%
–3	p2.ver3.in	[Sco79]	-	35	2.1	5%	59%
–4		[Sco79]	-	27	2.0	–	59%
CAT003	Epim1	XY epimorphism => X epimorphism					
–1	C3, p3.ver1.in	[Mit67, MOW76]	-	36	2.3	–	27%
–2	p3.ver2.in	[Qua89a]	-	20	1.8	–	100%
–3	p3.ver3.in	[Sco79]	-	34	2.1	5%	57%
–4		[Sco79]	-	26	2.0	–	56%
CAT004	Epim2	X and Y epimorphisms, XY well-defined => XY epimorphism					
–1	C4, p4.ver1.in	[MOW76]	-	37	2.4	–	27%
–2	p4.ver2.in	[Qua89a]	-	21	1.9	–	100%
–3	p4.ver3.in	[Sco79]	-	35	2.1	5%	59%
–4		[Sco79]	-	27	2.0	–	59%
CAT005	DomUnqRId	Domain is the unique right identity					
–1	C5, p5.ver1.in	[Mit67, MOW76]	-	34	2.4	–	27%
–3	p5.ver3.in	[Sco79]	-	33	2.1	6%	55%
–4		[Sco79]	-	25	2.0	–	54%
CAT006	CodUnqLId	Codomain is the unique left identity					
–1	C6, p6.ver1.in	[Mit67, MOW76]	-	34	2.4	–	27%
–3	p6.ver3.in	[Sco79]	-	33	2.1	6%	55%
–4		[Sco79]	-	25	2.0	–	54%
CAT007	DomEqCod	If domain(x) = codomain(y) then xy is defined					
–1	C7, p7.ver1.in	[Mit67, MOW76]	-	33	2.4	–	27%
–3	p7.ver3.in	[MOW76, Sco79]	-	12	1.9	16%	–
CAT008	DomXCodY	If xy is defined then domain(x) = codomain(y)					
–1	C8, p8.ver1.in	[Mit67, MOW76]	-	33	2.4	–	27%
CAT009	DomXYDomY	If xy is defined, then domain(xy) = domain(y)					
–1	p9.ver1.in	[Mit67]	-	33	2.4	–	27%
–3	p9.ver3.in	[Sco79]	-	31	2.1	6%	56%
–4		[Sco79]	-	23	2.0	–	54%
CAT010	CodXYCodX	If xy is defined, then codomain(xy) = codomain(x)					
–1	p10.ver1.in	[Mit67]	-	33	2.4	–	27%
–4		[Sco79]	-	23	2.0	–	54%
CAT011	DomIdem	domain(domain(x)) = domain(x)					
–1	p11.ver1.in	[Mit67]	-	32	2.4	–	28%
–2	p11.ver2.in	[Qua89a]	-	15	1.7	–	100%
–3	p11.ver3.in	[Sco79]	-	31	2.1	6%	56%
–4		[Sco79]	-	23	2.0	–	54%
CAT012	CodOfDom	codomain(domain(x)) = domain(x)					
–1	p12.ver1.in	[Mit67]	-	32	2.4	–	28%
–3	p12.ver3.in	[Sco79]	-	31	2.1	6%	56%
–4		[Sco79]	-	23	2.0	–	54%
CAT013	DomOfCod	domain(codomain(x)) = codomain(x)					
–1	p13.ver1.in	[Mit67]	-	32	2.4	–	28%
–3	p13.ver3.in	[Sco79]	-	31	2.1	6%	56%
–4		[Sco79]	-	23	2.0	–	54%

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
CAT014		CodIdem	`codomain(codomain(x)) = codomain(x)`					
	–1	p14.ver1.in	[Mit67]	-	32	2.4	–	28%
	–2	p14.ver2.in	[Qua89a]	-	15	1.7	–	100%
	–3	p14.ver3.in	[Sco79]	-	31	2.1	6%	56%
	–4		[Sco79]	-	23	2.0	–	54%
CAT015		Exist	`Prove something exists`					
	–3	p15.related.in	[Sco79]	-	31	2.2	9%	54%
	–4		[Sco79]	-	23	2.1	4%	52%
CAT016		DomEx	`If x exists, then domain(x) exists`					
	–3	p16.ver3.in	[Sco79]	-	31	2.1	6%	54%
	–4		[Sco79]	-	23	2.0	–	52%
CAT017		CodEx	`If x exists, then codomain(x) exists`					
	–3	p17.ver3.in	[Sco79]	-	31	2.1	6%	54%
	–4		[Sco79]	-	23	2.0	–	52%
CAT018		FactEx	`If xy and yz exist, then so does x(yz)`					
	–1	p18.ver1.in	[Mit67]	-	34	2.4	–	26%
	–3	p18.ver3.in	[Sco79]	-	32	2.1	6%	53%
	–4		[Sco79]	-	24	2.0	–	51%
CAT019		Indisc	`Axiom of Indiscernibles`					
	–1	p15.ver1.in	[Mit67]	-	34	2.4	–	31%
	–2	p15.ver2.in	[Qua89a]	-	17	1.8	–	100%
	–3	p15.ver3.no2.in, p15.ver3.no4.in	[Sco79]	-	32	2.2	6%	57%
	–4		[Sco79]	-	24	2.1	–	56%
	–5	p15.ver3.no1.in	[Sco79]	-	25	2.1	–	55%

Domain CID (3 abstract problems, 4 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
CID001		OrNand	`Design an OR gate using NAND gates`					
	–1	design_or.ver1.clauses	[WOLB92]	-	21	1.9	–	64%
CID002		Intchg	`Interchange inputs to outputs`					
	–1	interchange.ver1.clauses	[WOLB92]	-	58	1.7	–	59%
CID003		TwoInv	`Invert 3 inputs with 2 not gates`					
	–1	two.inverter.ver1.in	[WOLB92]	-	69	2.0	–	61%
	–2	two.inverter.ver2.in	[WOLB92]	-	79	2.2	–	56%

Domain CIV (4 abstract problems, 4 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
CIV001		Intchg	`Interchange inputs to outputs`					
	–1	intchg_val.ver1.clauses	[WOLB92]	-	61	1.3	–	92%
CIV002		TwoInv	`Invert 3 inputs with 2 not gates`					
	–1	two.inverter.val.ver1.in	[WOLB92]	-	62	1.2	–	89%
CIV003		Adder1	`One bit Full Adder`					
	–1		[WOLB92]	-	65	1.3	–	92%
CIV004		Adder2	`Two bit Full Adder`					
	–1		[WOLB92]	-	60	1.4	–	90%

Domain COL (81 abstract problems, 141 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
COL001		WkFxdPtSK	`Weak fixed point for S and K`					
	–1	C1	[Smu78a, WM88a]	-	8	1.6	–	100%
	–2		[WM88a]	-	11	1.5	–	100%
COL002		WkFxdPtSBCI	`Weak fixed point for S, B, C, and I`					
	–1	C1.1	[WM88a]	-	10	1.5	–	100%
	–2		[WM88a]	-	11	1.5	–	88%
	–3		[WM88a]	-	11	1.5	–	88%
COL003		StrongFxdPtBW	`Strong fixed point for B and W`					
	–1	C2, Test Problem 17, CADE-11 Comp. Eq-8, CL2, EQ-8, Question 3, Quest. 5, PROBL. 8	[Smu78a, MW87, WM88a, Wos88, Ove90] [LW92, Wos93, Ove93, LM93, Zha93]	-	9	1.7	–	100%
	–2		[Smu78a, MW87, WM88a, Wos93]	-	9	1.7	–	86%
	–3		[Smu78a, MW87, WM88a, Wos93]	-	9	1.7	–	86%
	–4		[Smu78a, MW87, WM88a, Wos93]	-	9	1.7	–	86%
	–5		[Smu78a, MW87, WM88a, Wos93]	-	9	1.7	–	86%
	–6		[Smu78a, MW87, WM88a, Wos93]	-	9	1.7	–	86%
	–7		[WM88a, Wos93]	-	9	1.7	–	86%
	–8		[WM88a, Wos93]	-	9	1.7	–	86%
	–9		[WM88a, Wos93]	-	9	1.7	–	86%
	–10		[WM88a, Wos93]	-	9	1.7	–	86%
COL004		SK_U	`Find combinator equivalent to U from S and K`					
	–1	C4	[WM88a]	-	10	1.7	–	100%
	–2		[WM88a]	-	8	1.6	–	100%
	–3		[WM88a]	-	8	1.6	–	100%
COL005		SWModel	`Find a model for S and W but not a weak fixed point`					
	–1	C5, Question 15	[WM88a, Zha92, Wos93]	-	8	1.6	–	100%
COL006		StrongFxdPtSK	`Strong fixed point for S and K`					
	–1	C6	[WM88a]	-	9	1.7	–	100%
	–2		[WM88a]	-	9	1.7	–	86%
	–3		[WM88a]	-	9	1.7	–	86%
	–4		[WM88a]	-	9	1.7	–	86%
COL007		WkFxdPtL	`Weak fixed point for L`					
	–1		[Smu78a, MW87, WM88a, MW88]	-	7	1.7	–	100%
COL008		WkFxdPtMB	`Weak fixed point for M and B`					
	–1	Question 13	[Smu78a, MW87, WM88a, MW88, Wos93]	-	8	1.6	–	100%
COL009		WkFxdPtBL2	`Weak fixed point for B and L2`					
	–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
COL010	WkFxdPtBS2	Weak fixed point for B and S2					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL011	WkFxdPtOQ1	Weak fixed point for O and Q1					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL012	WkFxdPtU	Weak fixed point for U					
–1		[Smu78a, MW87, WM88a, MW88]	-	7	1.7	–	100%
COL013	WkFxdPtSL	Weak fixed point for S and L					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL014	WkFxdPtLO	Weak fixed point for L and O					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL015	WkFxdPtQM	Weak fixed point for Q and M					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL016	WkFxdPtBML	Weak fixed point for B, M and L					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL017	WkFxdPtBMT	Weak fixed point for B, M, and T					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL018	WkFxdPtWQL	Weak fixed point for W, Q, and L					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL019	WkFxdPtBST	Weak fixed point for B, S, and T					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL020	WkFxdPtBSC	Weak fixed point for B, S, and C					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL021	WkFxdPtBMV	Weak fixed point for B, M, and V					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL022	WkFxdPtBOM	Weak fixed point for B, O, and M					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL023	WkFxdPtBN	Weak fixed point for B and N					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL024	WkFxdPtBMC	Weak fixed point for B, M, and C					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL025	WkFxdPtBW	Weak fixed point for B and W					
–1	stage1.in & stage2.in	[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL026	WkFxdPtBW1	Weak fixed point for B and W1					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL027	WkFxdPtBH	Weak fixed point for B and H					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL028	WkFxdPtBN	Weak fixed point for B and N					
–1		[Smu78a, MW87, WM88a, MW88]	-	8	1.6	–	100%
COL029	StrongFxdPtU	Strong fixed point for U					
–1	Question 1	[Smu78a, MW87, WM88a, MW88, Wos93]	-	8	1.8	–	100%
COL030	StrongFxdPtSL	Strong fixed point for S and L					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.7	–	100%
COL031	StrongFxdPtLO	Strong fixed point for L and O					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.7	–	100%
COL032	StrongFxdPtQM	Strong fixed point for Q and M					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.7	–	100%
COL033	StrongFxdPtBML	Strong fixed point for B, M and L					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL034	StrongFxdPtBMT	Strong fixed point for B, M, and T					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL035	StrongFxdPtWQL	Strong fixed point for W, Q, and L					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL036	StrongFxdPtBST	Strong fixed point for B, S, and T					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL037	StrongFxdPtBSC	Strong fixed point for B, S, and C					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL038	StrongFxdPtBMV	Strong fixed point for B, M, and V					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL039	StrongFxdPtBOM	Strong fixed point for B, O, and M					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL040	StrongFxdPtBN	Strong fixed point for B and N					
–1	Question 5	[Smu78a, MW87, WM88a, MW88, Wos93]	-	9	1.7	–	100%
COL041	StrongFxdPtBMC	Strong fixed point for B, M, and C					
–1		[Smu78a, MW87, WM88a, MW88]	-	10	1.6	–	100%
COL042	StrongFxdPtBW1	Strong fixed point for B and W1					
–1	Question 5	[Smu78a, MW87, WM88a, MW88, Wos93]	-	9	1.7	–	100%
–2		[WM88a, Wos93]	-	9	1.7	–	86%
–3		[WM88a, Wos93]	-	9	1.7	–	86%
–4		[WM88a, Wos93]	-	9	1.7	–	86%
–5		[WM88a, Wos93]	-	9	1.7	–	86%
COL043	StrongFxdPtBH	Strong fixed point for B and H					
–1	CL4, Question 5	[Smu78a, MW87, WM88a, MW88, LW92, Wos93]	-	9	1.7	–	100%
–2		[WM88a, Wos93]	-	10	1.7	–	88%
COL044	StrongFxdPtBN	Strong fixed point for B and N					
–1	CL3, Question 5	[Smu78a, MW87, WM88a, MW88, LW92, Wos93]	-	9	1.7	–	100%
–2		[WM88a, Wos93]	-	10	1.7	–	88%
–3		[WM88a, Wos93]	-	10	1.7	–	88%
–4		[WM88a, Wos93]	-	10	1.7	–	88%
–5		[WM88a, Wos93]	-	10	1.7	–	88%
COL045	WkFxdPtBMS	Weak fixed point for B, M and S					
–1		[Smu78a, MW87, WM88a, Wos89]	-	9	1.6	–	100%
COL046	StrongFxdPtBMS	Strong fixed point for B, M and S					
–1		[Smu78a, MW87, WM88a, Wos89]	-	10	1.6	–	100%
COL047	LQModel	Find a model for L and Q but not a strong fixed point					
–1	Question 7, Question 17	[Zha92, Wos93]	-	9	1.7	–	100%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
COL048	WkFxdPtBWM	Weak fixed point for B, W, and M					
–1		[Smu78a, MW87, WM88a, MW88]	-	9	1.6	–	100%
COL049	StrongFxdPtBWM	Strong fixed point for B, W, and M					
–1	Problem 2, CADE-11 Comp. Eq-6, CL1, THEOREM EQ-6, Question 2, PROBLEM 6	[Smu78a, MW87, WM88a, Ove90, LW92] [Wos93, Ove93, LM93, Zha93]	-	10	1.6	–	100%
COL050	MBird01	The Significance of the Mockingbird					
–1	bird1.ver1.in	[Smu78a]	-	10	1.7	–	100%
COL051	MBird02	Egocentric mocking bird?					
–1	bird2.ver1.in	[Smu78a]	-	10	1.7	–	100%
COL052	MBird03	A Question on Agreeable Birds					
–1	bird4.ver1.in	[Smu78a]	-	12	1.7	–	100%
–2	bird4.ver2.in	[Smu78a]	-	16	1.8	–	79%
COL053	MBird04	An Exercise in Composition					
–1	bird5.ver1.in	[Smu78a]	-	10	1.8	–	100%
COL054	MBird05	Compatible Birds					
–1	bird6.ver1.in	[Smu78a]	-	10	1.8	–	100%
COL055	MBird06	Happy Birds					
–1	bird7.ver1.in	[Smu78a]	-	7	1.9	–	100%
COL056	MBird07	Normal Birds					
–1	bird8.ver1.in	[Smu78a]	-	11	1.6	–	100%
COL057	StrongFxdPtSBCI	Strong fixed point for S, B, C, and I					
–1	CL5	[LW92]	-	11	1.5	–	100%
COL058	Lark1	If there's a lark, then there's an egocentric bird.					
–1		[Smu78a, GO86]	-	7	1.7	–	100%
–2		[Smu78a, GO86]	-	7	1.7	–	100%
–3		[Smu78a, GO86]	-	7	1.7	–	100%
COL059	Lark2	L3 ((lark lark) lark) is not egocentric.					
–1		[Smu78a, GO86]	-	13	1.4	–	100%
COL060	BT_Q	Find combinator equivalent to Q from B and T					
–1	CL-1	[WM88a, WWM+90]	-	11	1.7	–	100%
–2		[WM88a, WWM+90]	-	8	1.6	–	100%
–3		[WM88a, WWM+90]	-	8	1.6	–	100%
COL061	BT_Q1	Find combinator equivalent to Q1 from B and T					
–1	CL-2	[WM88a, WWM+90]	-	11	1.7	–	100%
–2		[WM88a, WWM+90]	-	8	1.6	–	100%
–3		[WM88a, WWM+90]	-	8	1.6	–	100%
COL062	BT_C	Find combinator equivalent to C from B and T					
–1	CL-3	[WM88a, WWM+90]	-	11	1.7	–	100%
–2		[WM88a, WWM+90]	-	8	1.6	–	100%
–3		[WM88a, WWM+90]	-	8	1.6	–	100%
COL063	BT_F	Find combinator equivalent to F from B and T					
–1	CL-4	[WM88a, WWM+90]	-	11	1.7	–	100%
–2		[WM88a, WWM+90]	-	8	1.6	–	100%
–3		[WM88a, WWM+90]	-	8	1.6	–	100%
–4		[WM88a, WWM+90]	-	8	1.6	–	100%
–5		[WM88a, WWM+90]	-	8	1.6	–	100%
–6		[WM88a, WWM+90]	-	8	1.6	–	100%
COL064	BT_V	Find combinator equivalent to V from B and T					
–1	CL-5	[WM88a, WWM+90]	-	11	1.7	–	100%
–2		[WM88a, WWM+90]	-	8	1.6	–	100%
–3		[WM88a, WWM+90]	-	8	1.6	–	100%
–4		[WM88a, WWM+90]	-	8	1.6	–	100%
–5		[WM88a, WWM+90]	-	8	1.6	–	100%
–6		[WM88a, WWM+90]	-	8	1.6	–	100%
–7		[WM88a, WWM+90]	-	8	1.6	–	100%
–8		[WM88a, WWM+90]	-	8	1.6	–	100%
–9		[WM88a, WWM+90]	-	8	1.6	–	100%
–10		[WM88a, WWM+90]	-	8	1.6	–	100%
–11		[WM88a, WWM+90]	-	8	1.6	–	100%
COL065	BT_G	Find combinator equivalent to G from B and T					
–1	CL-6	[WM88a, WWM+90]	-	12	1.8	–	100%
COL066	BQW_P	Find combinator equivalent to P from B, Q and W					
–1	CL-7	[WM88a, WWM+90]	-	12	1.7	–	100%
–2		[WM88a, WWM+90]	-	9	1.6	–	100%
–3		[WM88a, WWM+90]	-	9	1.6	–	100%
COL067	StrongFxdPtBS	Strong fixed point for B and S					
–1	Question 4, Question 5	[WM88a, Wos93]	-	9	1.7	–	100%
COL068	WeakFxdPtBS	Weak fixed point for B and S					
–1	Question 11	[WM88a, Wos93]	-	8	1.6	–	100%
COL069	StrongFxdPtBL	Strong fixed point for B and L					
–1	Question 6	[WM88a, Wos93]	-	9	1.7	–	100%
COL070	WeakFxdPtBN1	Weak fixed point for B and N1					
–1	Question 12	[WM88a, Wos93, Zha94b]	-	8	1.6	–	100%
COL071	StrongFxdPtNQ	Strong fixed point for N and Q					
–1	Question 14	[WM88a, Wos93, Zha95]	-	9	1.7	–	100%
COL072	StrongFxdPtBL	Strong fixed point for B and L					
–1	Question 16	[WM88a, Wos93]	-	9	1.7	–	100%
COL073	StrongFxdPtBN1	Strong fixed point for B and N1					
–1	Question 18	[WM88a, Wos93, Zha94b]	-	9	1.7	–	100%
COL074	UnSatTRC	Unsatisfiable variant of TRC					
–1		[Jec93b]	-	19	1.6	5%	100%
–2		[Jec93b]	-	20	1.6	5%	100%
–3		[Jec93b]	-	22	1.5	4%	100%

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
COL075		UnSatTRCLem1	`Lemma 1 for showing the unsatisfiable variant of TRC`					
	−1		[Jec93b]	-	22	1.6	4%	100%
	−2		[Jec93b]	-	10	1.7	–	100%
COL076		UnSatTRCLem2	`Lemma 2 for showing the unsatisfiable variant of TRC`					
	−1		[Jec93b]	-	21	1.5	4%	100%
	−2		[Jec93b]	-	18	1.6	–	100%
COL077		TRC1a	`Abst Abst Abst Abst Abst Abst = Id`					
	−1	Proposition 1a	[Jec93b]	-	22	1.5	4%	100%
COL078		TRC1b	`Abst Abst Abst Abst = k(k(id))`					
	−1	Proposition 1b	[Jec93b]	-	22	1.5	4%	100%
	−2		[Jec93b]	-	13	1.7	–	100%
COL079		TRC2a	`Abst(Abst(Abst X)) = Abst X`					
	−1	Proposition 2a	[Jec93b]	-	21	1.6	4%	100%
	−2		[Jec93b]	-	12	1.8	–	100%
COL080		TRC2b	`Abst(Abst k(X)) = k(X)`					
	−1	Proposition 2b	[Jec93b]	-	22	1.5	4%	100%
	−2		[Jec93b]	-	13	1.7	–	100%
COL081		TRC2c	`Abst k(k(X)) = k(k(X))`					
	−1	Proposition 2c	[Jec93b]	-	22	1.5	4%	100%
	−2		[Jec93b]	-	13	1.7	–	100%

Domain COM (4 abstract problems, 6 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
COM001		4StSp	`A program correctness theorem`					
	−1	SHORTBURST	[RRY+72, WM76]	-	11	1.5	–	–
COM002		8StSp	`A program correctness theorem`					
	−1	BURSTALL	[RRY+72, WM76]	-	19	1.3	–	–
	−2		[RRY+72]	-	19	1.3	5%	–
COM003		Halting	`The halting problem is undecidable`					
	−1		[Bur87b, Bur87a]	-	50	5.5	64%	–
	−2		[Bur87a, Bru91]	-	43	2.5	4%	–
COM004		Resolution	`Part of completeness of resolution`					
	−1			-	25	2.0	–	54%

Domain GEO (78 abstract problems, 165 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
GEO001		BtwnSymm	`Betweenness is symmetric in its outer arguments`					
	−1	T1, Theorem 5, t1.ver1.in	[MOW76, OMW76, SST83]	-	57	2.5	10%	49%
	−2		[MOW76, SST83, Qua89b]	-	55	2.5	9%	51%
	−3	T1	[MOW76, SST83, Qua89b]	-	84	2.3	10%	47%
	−4		[MOW76, Wos88]	-	9	1.9	–	–
GEO002		XBtwnXY	`For all points x and y, x is between x and y`					
	−1	T2, t2.ver1.in	[MOW76, SST83]	-	56	2.5	10%	50%
	−2		[MOW76, SST83, Qua89b]	-	54	2.5	9%	52%
	−3	T2	[MOW76, SST83, Qua89b]	-	84	2.3	10%	47%
	−4		[MOW76, Wos88]	-	8	2.1	–	–
GEO003		YBtwnXY	`For all points x and y, y is between x and y`					
	−1	T3, t3.ver1.in	[MOW76, SST83]	-	56	2.5	10%	50%
	−2		[MOW76, SST83, Qua89b]	-	54	2.5	9%	52%
	−3	T3	[MOW76, SST83, Qua89b]	-	81	2.3	11%	48%
GEO004		MidPtEx	`Every line segment has a midpoint`					
	−1	T4, t4.ver1.in	[MOW76, SST83]	-	57	2.5	10%	50%
	−2	T4	[MOW76, SST83, Qua89b]	-	56	2.5	8%	53%
GEO005		IsosTriEx	`Isosceles triangle based on line segment`					
	−1	T5, t5.ver1.in	[MOW76, SST83]	-	57	2.5	10%	50%
	−2	T5	[MOW76, SST83, Qua89b]	-	56	2.5	8%	53%
GEO006		Btwn3Pts	`Betweenness for 3 points on a line`					
	−1	T6, t6.ver1.in	[MOW76, SST83]	-	60	2.5	11%	50%
	−2		[MOW76, SST83, Qua89b]	-	58	2.4	10%	52%
	−3	T6	[MOW76, SST83, Qua89b]	-	91	2.3	10%	47%
GEO007		Btwn4Pts	`Betweenness for 4 points on a line`					
	−1	T7, t7.ver1.in	[MOW76, SST83]	-	60	2.4	10%	49%
	−2		[MOW76, SST83, Qua89b]	-	58	2.4	8%	51%
	−3	T7	[MOW76, SST83, Qua89b]	-	124	2.5	13%	39%
GEO008		Btwn5Pts	`Betweenness for 5 points on a line (Five point theorem)`					
	−1	T8, Test Problem 10, Five Point Theorem, t8.ver1.in	[MOW76, SST83, Wos88]	-	59	2.5	10%	49%
	−2		[MOW76, SST83, Qua89b]	-	57	2.4	8%	51%
	−3	T8	[MOW76, SST83, Qua89b]	-	126	2.5	15%	37%
GEO009		1stInrConn	`First inner connectivity property of betweenness`					
	−1	T9, t9.ver1.in	[MOW76, SST83]	-	59	2.5	10%	49%
	−2		[MOW76, SST83, Qua89b]	-	57	2.4	8%	51%
	−3	T9	[MOW76, SST83, Qua89b]	-	124	2.5	14%	38%
GEO010		CollInvar	`Collinearity is invariant`					
	−1	T10, t10.ver1.in	[MOW76, SST83]	-	64	2.6	10%	44%
	−2		[MOW76, SST83, Qua89b]	-	62	2.5	9%	46%
	−3	T10	[MOW76, SST83, Qua89b]	-	136	2.6	15%	35%
GEO011		AxPtsNotColl	`The axiom set points are not collinear`					
	−1	T11, t11.ver1.in	[MOW76, SST83]	-	63	2.6	11%	46%
	−2		[MOW76, SST83, Qua89b]	-	61	2.5	9%	47%
	−3	T11	[MOW76, SST83, Qua89b]	-	140	2.6	15%	34%
	−4		[MOW76, SST83, Qua89b]	-	61	2.5	9%	49%
	−5	t11.ver2.in	[MOW76, SST83, Qua89b]	-	39	2.3	5%	43%
GEO012		Coll4Pts	`Collinearity for 4 points`					
	−1	T12, t12.ver1.in	[MOW76, SST83]	-	68	2.5	10%	46%
	−2		[MOW76, SST83, Qua89b]	-	64	2.5	9%	47%
	−3	T12	[MOW76, SST83, Qua89b]	-	149	2.5	14%	34%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
GEO013	Coll5Pts	Collinearity for 5 points					
−1	T13, t13.ver1.in	[MOW76, SST83]	-	67	2.5	10%	45%
−2		[MOW76, SST83, Qua89b]	-	65	2.4	9%	47%
−3	T13	[MOW76, SST83, Qua89b]	-	154	2.5	16%	33%
GEO014	EqidRefl	Ordinary reflexivity of equidistance					
−2	D1	[SST83, Qua89b]	-	54	2.5	9%	52%
GEO015	EqidSymm1	Equidistance is symmetric between its argument pairs					
−2		[SST83, Qua89b]	-	55	2.5	9%	51%
−3	D2	[SST83, Qua89b]	-	56	2.4	8%	51%
GEO016	EqidSymm2	Equidistance is symmetric within its argument pairs					
−2		[SST83, Qua89b]	-	55	2.5	9%	51%
−3	D3	[SST83, Qua89b]	-	57	2.4	8%	50%
GEO017	EqidSymmCor1	Corollary 1 to symmetries of equidistance					
−2		[SST83, Qua89b]	-	55	2.5	9%	51%
−3	D4.1	[SST83, Qua89b]	-	58	2.4	8%	50%
GEO018	EqidSymmCor2	Corollary 2 to symmetries of equidistance					
−2		[SST83, Qua89b]	-	55	2.5	9%	51%
−3	D4.2	[SST83, Qua89b]	-	58	2.4	8%	50%
GEO019	EqidSymmCor3	Corollary 3 to symmetries of equidistance					
−2		[SST83, Qua89b]	-	55	2.5	9%	51%
−3	D4.3	[SST83, Qua89b]	-	58	2.4	8%	50%
GEO020	EqidSymmCor4	Corollary 4 to symmetries of equidistance					
−2		[SST83, Qua89b]	-	55	2.5	9%	51%
−3	D4.4	[SST83, Qua89b]	-	58	2.4	8%	50%
GEO021	EqidSymmCor5	Corollary 5 to symmetries of equidistance					
−2		[SST83, Qua89b]	-	55	2.5	9%	51%
−3	D4.5	[SST83, Qua89b]	-	58	2.4	8%	50%
GEO022	EqidTrans	Ordinary transitivity of equidistance					
−2		[SST83, Qua89b]	-	56	2.4	8%	51%
−3	D5	[SST83, Qua89b]	-	64	2.4	7%	46%
GEO024	NullSegsCong	All null segments are congruent					
−2		[SST83, Qua89b]	-	54	2.5	9%	52%
−3	D7	[SST83, Qua89b]	-	73	2.3	6%	49%
GEO025	SumEqSeg	Addition of equal segments					
−2		[SST83, Qua89b]	-	58	2.4	8%	50%
−3	D8	[SST83, Qua89b]	-	78	2.2	6%	47%
GEO026	ExtUnq	Extension is unique					
−2		[SST83, Qua89b]	-	58	2.4	8%	52%
−3	D9	[SST83, Qua89b]	-	79	2.2	6%	47%
GEO027	ExtUnqCor1	Corollary 1 to unique extension					
−2		[SST83, Qua89b]	-	56	2.4	8%	52%
−3	D10.1	[SST83, Qua89b]	-	78	2.3	7%	47%
GEO028	ExtUnqCor2	Corollary 2 to unique extension					
−2		[SST83, Qua89b]	-	56	2.4	8%	52%
−3	D10.2	[SST83, Qua89b]	-	78	2.3	7%	47%
GEO029	ExtUnqCor3	Corollary 3 to unique extension					
−2		[SST83, Qua89b]	-	55	2.5	9%	53%
−3	D10.3	[SST83, Qua89b]	-	77	2.3	7%	48%
GEO030	Out5SegCor	Corollary to the outer five-segment axiom					
−2		[SST83, Qua89b]	-	58	2.4	8%	52%
−3	D11	[SST83, Qua89b]	-	106	2.3	13%	43%
GEO031	2ndInr5Seg	Second inner five-segment theorem					
−2		[SST83, Qua89b]	-	60	2.3	8%	50%
−3	D12	[SST83, Qua89b]	-	109	2.3	13%	42%
GEO032	DiffEqSeg	Equal difference between pairs of equal length line segments					
−2		[SST83, Qua89b]	-	58	2.4	8%	50%
−3	D13	[SST83, Qua89b]	-	108	2.4	13%	41%
GEO033	1stInr5Seg	First inner five-segment theorem					
−2		[SST83, Qua89b]	-	60	2.3	8%	50%
−3	D14	[SST83, Qua89b]	-	111	2.4	13%	40%
GEO034	1stInr5SegCor	Corollary to the first inner five-segment theorem					
−2		[SST83, Qua89b]	-	57	2.4	8%	51%
−3	D15	[SST83, Qua89b]	-	109	2.4	13%	40%
GEO035	NullExt	A null extension does not extend a line					
−2		[SST83, Qua89b]	-	54	2.5	9%	53%
−3	E1	[SST83, Qua89b]	-	63	2.4	7%	46%
GEO036	AxPtsEx	The 3 axiom set points are distinct					
−2		[SST83, Qua89b]	-	54	2.5	11%	53%
−3	E2	[SST83, Qua89b]	-	95	2.4	14%	44%
GEO037	ExtSegEx	A segment can be extended					
−2		[SST83, Qua89b]	-	54	2.5	9%	52%
−3	E3	[SST83, Qua89b]	-	98	2.4	13%	44%
GEO038	SegConsCor1	Corollary 1 to the segment contruction axiom					
−2		[SST83, Qua89b]	-	55	2.5	9%	52%
−3	B0	[SST83, Qua89b]	-	65	2.4	7%	46%
GEO039	IdBtwnCor	Corollary the identity axiom for betweenness					
−2		[SST83, Qua89b]	-	56	2.4	8%	52%
−3	B1	[SST83, Qua89b]	-	84	2.3	10%	48%
GEO040	BtwnASym	Antisymmetry of betweenness in its first two arguments					
−2		[SST83, Qua89b]	-	56	2.4	8%	52%
−3	B2	[SST83, Qua89b]	-	87	2.3	10%	47%
GEO041	BtwnASymCor	Corollary to antisymmetry of betweenness in its first 2 arguments					
−2		[SST83, Qua89b]	-	56	2.4	8%	52%
−3	B3	[SST83, Qua89b]	-	88	2.3	10%	47%

Syntactic name V#	Semantic name / Other names	References	Description	V	Cl	Av	nH	Eq
GEO042	1stBtwnInrTrans		First inner transitivity property of betweenness					
−2		[SST83, Qua89b]		-	56	2.4	8%	51%
−3	B4	[SST83, Qua89b]		-	91	2.3	12%	46%
GEO043	1stBtwnInrTransCor		Corollary to first inner transitivity property of betweenness					
−2		[SST83, Qua89b]		-	56	2.4	8%	51%
−3	B5	[SST83, Qua89b]		-	92	2.3	11%	45%
GEO044	1stBtwnOutTrans		First outer transitivity property for betweenness					
−2		[SST83, Qua89b]		-	57	2.4	8%	51%
−3	B6	[SST83, Qua89b]		-	94	2.3	11%	45%
GEO045	2ndBtwnOutTrans		Second outer transitivity property of betweenness					
−2		[SST83, Qua89b]		-	57	2.4	8%	51%
−3	B7	[SST83, Qua89b]		-	95	2.3	12%	45%
GEO046	2ndBtwnInrTrans		Second inner transitivity property of betweenness					
−2		[SST83, Qua89b]		-	56	2.4	8%	51%
−3	B8	[SST83, Qua89b]		-	95	2.4	13%	44%
GEO047	2ndBtwnInrTransCor		Corollary to second inner inner transitivity of betweenness					
−2		[SST83, Qua89b]		-	56	2.4	8%	51%
−3	B9	[SST83, Qua89b]		-	96	2.4	13%	43%
GEO048	InrPtsTri		Inner points of triangle					
−2		[SST83, Qua89b]		-	58	2.4	8%	50%
−3	B10	[SST83, Qua89b]		-	105	2.3	12%	43%
GEO049	SimSits		Theorem of similar situations					
−2		[SST83, Qua89b]		-	58	2.4	8%	50%
−3	B11	[SST83, Qua89b]		-	121	2.4	12%	40%
GEO050	1stBtwnOutConn		First outer connectivity property of betweenness					
−2		[Tar59, SST83, Qua89b]		-	58	2.4	8%	51%
−3	B12	[Tar59, SST83, Qua89b]		-	122	2.4	12%	40%
GEO051	2ndBtwnOutConn		Second outer connectivity property of betweenness					
−2		[SST83, Qua89b]		-	58	2.4	8%	51%
−3	B13	[SST83, Qua89b]		-	123	2.5	13%	39%
GEO052	2ndBtwnInrConn		Second inner connectivity property of betweenness					
−2		[SST83, Qua89b]		-	57	2.4	8%	51%
−3	B14	[SST83, Qua89b]		-	125	2.5	15%	38%
GEO053	EndPtUnq		Unique endpoint					
−2		[SST83, Qua89b]		-	56	2.4	8%	52%
−3	B15	[SST83, Qua89b]		-	126	2.6	15%	37%
GEO054	SegConsCor2		Corollary 2 to the segment construction axiom					
−2		[SST83, Qua89b]		-	57	2.4	8%	54%
−3	R2.1	[SST83, Qua89b]		-	68	2.4	7%	48%
GEO055	SegConsCor3		Corollary 3 to the segment construction axiom					
−2		[SST83, Qua89b]		-	57	2.4	8%	54%
−3	R2.2	[SST83, Qua89b]		-	68	2.4	7%	48%
GEO056	NullExtCor1		Corollary 1 to null extension					
−2		[SST83, Qua89b]		-	58	2.4	8%	55%
−3	R3.1	[SST83, Qua89b]		-	71	2.3	7%	48%
GEO057	NullExtCor2		Corollary 2 of null extension					
−2		[SST83, Qua89b]		-	57	2.4	8%	54%
−3	R3.2	[SST83, Qua89b]		-	70	2.3	7%	48%
GEO058	ReflcFixPtUnq		U is the only fixed point of reflection(U,V)					
−2		[SST83, Qua89b]		-	58	2.4	8%	55%
−3	R4	[SST83, Qua89b]		-	73	2.3	6%	49%
GEO059	DblReflcCong		Congruence for double reflection					
−2		[SST83, Qua89b]		-	57	2.4	8%	54%
−3	R5	[SST83, Qua89b]		-	79	2.4	11%	48%
GEO060	ReflcIvln		Reflection is an involution					
−2	R6	[SST83, Qua89b]		-	57	2.4	8%	54%
GEO061	PtIntsc		Theorem of point insertion					
−2		[SST83, Qua89b]		-	61	2.4	8%	53%
−3	I2	[SST83, Qua89b]		-	114	2.5	13%	41%
GEO062	IntscId		Insertion identity					
−2		[SST83, Qua89b]		-	60	2.4	8%	55%
−3	I3	[SST83, Qua89b]		-	116	2.5	12%	41%
GEO063	IntscCong		Insertion respects congruence in its last two arguments					
−2		[SST83, Qua89b]		-	60	2.4	8%	55%
−3	I4	[SST83, Qua89b]		-	117	2.5	12%	41%
GEO064	CollCor1		Corollary 1 to collinearity					
−2		[SST83, Qua89b]		-	62	2.5	9%	47%
−3	C2.1	[SST83, Qua89b]		-	133	2.6	15%	36%
GEO065	CollCor2		Corollary 2 to collinearity					
−2		[SST83, Qua89b]		-	62	2.5	9%	47%
−3	C2.2	[SST83, Qua89b]		-	133	2.6	15%	36%
GEO066	CollCor3		Corollary 3 to collinearity					
−2		[SST83, Qua89b]		-	62	2.5	9%	47%
−3	C2.3	[SST83, Qua89b]		-	133	2.6	15%	36%
GEO067	2PtsColl		Any two points are collinear					
−2		[SST83, Qua89b]		-	62	2.6	9%	46%
−3	C3	[SST83, Qua89b]		-	142	2.6	14%	34%
GEO068	CollSimSits		Theorem of similar situations for collinear U, V, W					
−2		[SST83, Qua89b]		-	65	2.4	9%	46%
−3	C4	[SST83, Qua89b]		-	149	2.5	14%	34%
GEO069	CollEqn3		A property of collinearity					
−2		[SST83, Qua89b]		-	64	2.5	9%	47%
−3	C5	[SST83, Qua89b]		-	151	2.5	15%	33%

Syntactic name V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
GEO070	PtsNotColl	Non-collinear points in the bisecting diagonal theorem					
−2		[SST83, Qua89b]	-	68	2.4	8%	46%
−3	W1	[SST83, Qua89b]	-	158	2.5	16%	33%
GEO071	PtsNotCollCor1	Corollary 1 to non-collinear points theorem					
−2		[SST83, Qua89b]	-	61	2.3	8%	51%
−3	W2.1	[SST83, Qua89b]	-	159	2.5	16%	33%
GEO072	PtsNotCollCor2	Corollary 2 to non-collinear points theorem					
−2		[SST83, Qua89b]	-	61	2.3	8%	51%
−3	W2.2	[SST83, Qua89b]	-	159	2.5	16%	33%
GEO073	DiagBsct	The diagonals of a non-degenerate rectancle bisect					
−1	Test Problem 11, Bisecting Diagonal Theorem	[MOW76, SST83, Wos88]	-	63	2.4	9%	48%
−2		[SST83, Qua89b]	-	61	2.3	8%	50%
−3	W3	[SST83, Qua89b]	-	161	2.6	18%	33%
GEO074	OutPasch	Prove the Outer Pasch Axiom					
−2	Q2	[SST83, Qua89b]	-	61	2.4	8%	54%
GEO075	EqidRefl	Show reflexivity for equidistance is dependent					
−2	Q3.1	[SST83, Qua89b]	-	53	2.5	9%	52%
GEO076	PtNotOnLines	There is no point on every line					
−4	G15	[Ben92]	-	60	4.0	30%	37%
GEO077	3PtsNotColl	Three points not collinear if not on line					
−4	G11A	[Ben92]	-	69	3.6	26%	37%
GEO078	3PlPtsNotColl	Every plane contains 3 noncollinear points					
−4		[Ben92]	-	60	4.1	31%	37%
−5	G16	[Ben92]	-	61	4.2	32%	36%
GEO079	AltAngleEq	The alternate interior angles in a trapezoid are equal					
−1	GEOMETRY THEOREM	[Sla67]	-	6	1.8	–	–

Domain GRA (1 abstract problems, 1 problems)

Syntactic name V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
GRA001	Labels	Clauses from a labelled graph					
−1	Pelletier 74	[Tse83, Pel86]	-	12	2.7	58%	–

Domain GRP (193 abstract problems, 313 problems)

Syntactic name V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
GRP001	SqrComm	X^ 2 = identity => commutativity					
−1	wos10, G1, CADE-11 Comp. 1, THEOREM 1, xsquared.ver1.in	[Rob63, Wosb, MOW76, WM76] [Ove90, Ove93, LM93]	-	20	2.0	–	40%
−2	GP1, Problem 1, GT1, xsquared.ver2.in	[MOW76, LO85b, LW92]	-	14	1.4	–	100%
−3	Problem 228-231	[BLM+86]	-	328	2.4	8%	43%
−4	Pelletier 65, x2_quant.in	[Wosb, Pel86]	-	10	1.5	–	100%
−5	Example 1, Example 4, Chang-Lee-2, GROUP2, ROB2, EX2	[Luc68, Lov69, Cha70] [MRS72, RRY+72, WM76]	-	7	1.9	–	–
GRP002	O3CmtrEqId	Commutator equals identity in groups of order 3					
−1	G6, Theorem 1, Test Pr. 2, Commutator Theorem, CADE-11 Comp. 2, TH. 2, commutator.ver1.in	[MOW76, OMW76, Wos88] [Ove90, Ove93, LM93]	-	25	1.9	–	34%
−2	commutator.ver2.in	[MOW76]	-	18	1.3	–	100%
−3	CADE-11 Comp. Eq-1, THEOREM EQ-1, PROBLEM 1, comm.in	[Ove90, Ove93, LM93, Zha93]	-	14	1.6	–	100%
−4	Problem 4, Test Problem 2, Commutator Theorem, GT3	[MOW76, LO85b, Wos88, LW92]	-	16	1.5	–	100%
GRP003	LIdEqRId	The left identity is also a right identity					
−1	Example 2, Chang-Lee-3, EX3	[Luc68, Cha70, CL73]	-	5	2.2	–	–
−2		[Ver92]	-	8	2.3	–	–
GRP004	RInvEx	Left inverse and identity => Right inverse exists					
−1	Example 3, Chang-Lee-4, EX4	[Luc68, Cha70, CL73]	-	5	2.2	–	–
−2		[Ver92]	-	8	2.3	–	–
GRP005	SubSIdEl	Identity is in this subset of a group					
−1	Example 5, Chang-Lee-5, EX5	[Luc68, Cha70, CL73]	-	9	2.0	–	–
GRP006	InvEl	Inverse is in this group					
−1	Chang-Lee-6, EX6	[Cha70, CL73]	-	9	2.0	–	–
GRP007	IdUnq	The identity element is unique					
−1	Problem 3, wos3	[Wosb, MOW76, WM76]	-	20	2.0	–	42%
GRP008	Unknown	Unknown meaning					
−1	Problem 4, wos4	[Wosb, MOW76, WM76]	-	24	2.3	4%	38%
GRP009	LInvUnq	The left inverse of an element is unique					
−1	Problem 6, wos6	[Wosb, MOW76, WM76]	-	20	2.0	–	42%
GRP010	InvSymm	Inverse is a symmetric relationship					
−1	Problem 7, wos7	[Wosb, MOW76, WM76]	-	19	2.1	–	41%
−4	Pelletier 64	[Wosb, Pel86]	-	11	1.5	–	100%
GRP011	LCanc	Left cancellation					
−4	Pelletier 63	[Wosb, Pel86]	-	11	1.5	–	100%
GRP012	InvOfProd	Inverse of products = Product of inverses					
−1	Problem 9, wos9	[Wosb, MOW76, WM76]	-	20	2.0	–	40%
−2	ls36, ls36	[LS74, WM76]	-	20	2.0	–	42%
−3		[MOW76]	-	18	2.1	–	44%
−4		[MOW76]	-	12	1.5	–	100%
GRP013	CmtrEqId	Commutator equals identity in these conditions					
−1	Problem 11, wos11	[Wosb, MOW76, WM76]	-	22	2.0	–	37%
GRP014	ProdAssc	Product is associative in this group theory					
−1	CADE-11 Comp. Eq-4, THEOREM EQ-4, PR. 4	[Ove90, Ove93, LM93, Zha93]	-	8	1.8	–	100%
GRP015	GroupEx	x,<<x x,X> x,X> is a group					
−1	Problem 224-225	[BLM+86]	-	326	2.4	8%	43%
GRP016	ReflHomom	There is a homomorphism from a group to itself					
−1	Problem 226-227	[BLM+86]	-	326	2.4	8%	43%
GRP017	InvUnq	The inverse of each element is unique					
−1	G2, invers1.ver1.in	[MOW76]	-	22	1.9	–	40%

Syntactic name	V#	Semantic name / Other names	Description	References	V	Cl	Av	nH	Eq
GRP018		XTimesId	X times identity is X						
	−1	Identity established,		[MOW76, OMW76]	-	18	2.1	–	44%
GRP019		IdTimesX	Identity times X is X						
	−1	Identity established,		[MOW76, OMW76]	-	18	2.1	–	44%
GRP020		InvXTimesX	Inverse of X times X is the identity						
	−1	Identity established,		[MOW76, OMW76]	-	18	2.1	–	44%
GRP021		XTimesInvX	X times inverse of X is the identity						
	−1	Identity established,		[MOW76, OMW76]	-	18	2.1	–	44%
GRP022		InvIvln	Inverse is an involution						
	−1	Identity established, wos8		[Wosb, MOW76, OMW76, WM76]	-	18	2.1	–	44%
	−2	Established lemma, Problem 2		[MOW76, LO85b]	-	12	1.5	–	100%
GRP023		InvOfId	The inverse of the identity is the identity						
	−1	Identity established,		[MOW76, OMW76]	-	18	2.1	–	44%
	−2	Established lemma		[MOW76]	-	12	1.5	–	100%
GRP024		CmtrAssc	Associativity of commutator						
	−4	THEOREM (Levi)		[Kur56, MOW76, ML92]	-	16	1.6	6%	100%
GRP025		O2Isom	All groups of order 2 are isomorphic						
	−1	G8		[MOW76]	-	48	1.8	4%	37%
	−2	G8		[MOW76]	-	58	1.8	3%	50%
	−3	order2.ver3.in		[MOW76]	-	47	1.8	4%	–
	−4	order2.ver4.in		[MOW76]	-	60	1.8	3%	49%
GRP026		O3Isom	All groups of order 3 are isomorphic						
	−1	G9		[MOW76]	-	61	1.7	3%	35%
	−2	G9		[MOW76]	-	82	1.8	2%	60%
	−3	order3.ver3.in		[MOW76]	-	60	1.7	3%	–
	−4	order3.ver4.in		[MOW76]	-	84	1.8	2%	59%
GRP027		O5Cyclic	All groups of order 5 are cyclic						
	−1			[MOW76]	-	41	2.0	2%	45%
	−2	cyclic.ver3.in			-	39	2.0	2%	–
GRP028		SemiGRIdEx1	In semigroups, left and right solutions => right id exists						
	−1	ALGEBRA THEOREM, Chang-Lee-1, GROUP1, EX1		[Sla67, Cha70, RRY+72, WM76]	-	4	1.8	–	–
	−2			[MOW76]	-	20	2.2	–	54%
	−3	Example 1		[Luc68, MOW76]	-	6	2.0	–	–
GRP029		SemiGRIdEx2	In semigroups, left id and inverse => right id exists						
	−1	Problem 1, wos1, G5, ident2.ver1.in		[Wosb, MOW76, WM76]	-	17	2.2	–	47%
	−2	G5		[MOW76]	-	16	2.3	–	–
GRP030		SemiGLIdEqRId	In semigroups, left id and inverse => left id=right id						
	−1	Problem 2, wos2, G3, ident1.ver1.in		[Wosb, MOW76, WM76]	-	16	2.3	–	44%
GRP031		SemiGRInvEx	In semigroups, left inverse and id => right inverse exists						
	−1	Problem 5, wos5, G4, invers2.ver1.t		[Wosb, MOW76, WM76]	-	16	2.3	–	44%
	−2	ls23, ls23		[LS74, WM76]	-	7	2.1	–	–
GRP032		SubGIdEx	In subgroups, there is an identity						
	−3	Problem 12, wos12		[Wosb, WM76]	-	21	2.2	–	37%
GRP033		SubGGrpIdEx	In subgroups, the identity is the group identity						
	−3	Problem 13, wos13		[Wosb, WM76]	-	22	2.3	–	–
	−4	Problem 13		[Wosb]	-	23	2.3	–	36%
GRP034		SubGInvClsd	In subgroups, inverse is closed						
	−3	Problem 14, wos14, wos_nie		[Wosb, MOW76, WM76]	-	21	2.2	–	37%
	−4	ls26, ls26		[LS74, WM76]	-	9	2.0	–	–
GRP035		SubGProdClsd	In subgroups, product is closed						
	−3	Problem 15, wos15		[Wosb, MOW76, WM76]	-	23	2.1	–	35%
GRP036		SubGIdUnq	In subgroups, the identity element is unique						
	−3	Problem 16, wos16		[Wosb, WM76]	-	27	2.1	–	34%
GRP037		SubGInvUnq	In subgroups, the inverse of an element is unique						
	−3	Problem 17, wos17		[Wosb, WM76]	-	30	2.2	–	33%
GRP038		SubGGrpEl	In subgroups, if a and b are members, then a.b^ -1 is a member						
	−3	Problem 18, wos18		[Wosb, WM76]	-	25	2.0	–	33%
GRP039		SubGI2Norm	Subgroups of index 2 are normal						
	−1			[MOW76]	-	28	2.1	7%	35%
	−2	NU2		[MOW76, LW92]	-	22	1.8	9%	65%
	−3	wos19		[Wosb, WM76]	-	32	2.1	6%	35%
	−4	G7, Theorem 3, Test Problem 1, index.ver1.in		[MOW76, OMW76, Wos88]	-	29	2.1	6%	34%
	−5	index.ver2.in		[MOW76]	-	23	1.8	8%	63%
	−6	subgroup.in			-	22	2.2	9%	–
	−7	GP2		[MOW76]	-	25	1.7	8%	65%
GRP040		SubGO2InvIvln	In subgroups of order 2, inverse is an involution						
	−3			[Wosb]	-	29	2.1	6%	36%
	−4	Problem 20, wos20		[Wosb, WM76]	-	33	2.1	6%	34%
GRP041		EqRefl	Reflexivity is dependent						
	−2			[Ver92]	-	8	2.3	–	–
GRP042		EqSymm	Symmetry is dependent						
	−2			[Ver92]	-	9	2.1	–	–
GRP043		EqTrans	Transitivity is dependent						
	−2			[Ver92]	-	10	2.0	–	–
GRP044		ProdSubs1	Product subsitution 1 is dependent						
	−2			[Ver92]	-	10	2.0	–	–
GRP045		ProdSubs2	Product subsitution 2 is dependent						
	−2			[Ver92]	-	10	2.0	–	–
GRP046		MultSubs1	Multiply substitution 1 is dependent						
	−2			[Ver92]	-	9	2.1	–	–
GRP047		MultSubs2	Multiply substitution 2 is dependent						
	−2			[Ver92]	-	9	2.1	–	–
GRP048		InvSubs	Inverse substitution is dependent						
	−2			[Ver92]	-	9	2.1	–	–

Syntactic name	V#	Semantic name	Other names	Description	References	V	Cl	Av	nH	Eq
GRP049	–1	ProdInvAx1	C1	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP050	–1	ProdInvAx2	Axiom C2	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP051	–1	ProdInvAx3	C3, Axiom 2.1	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP052	–1	ProdInvAx4	C4	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP053	–1	ProdInvAx5	C5	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP054	–1	ProdInvAx6	C6	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP055	–1	ProdInvAx7	C7	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP056	–1	ProdInvAx8	C8	Single axiom for group theory, in product & inverse	[Kun92, McC93]	-	8	2.0	–	100%
GRP057	–1	ProdInvAx9	Axiom 1.2	Single axiom for group theory, in product & inverse	[Neu81, McC93]	-	8	2.0	–	100%
GRP058	–1	ProdInvAx10	GT4, Axiom 3.1.1, sax1.in	Single axiom for group theory, in product & inverse	[LW92, McC93]	-	8	2.0	–	100%
GRP059	–1	ProdInvAx11	Axiom 3.1.2	Single axiom for group theory, in product & inverse	[McC93]	-	8	2.0	–	100%
GRP060	–1	ProdInvAx12	Axiom 3.2.3	Single axiom for group theory, in product & inverse	[McC93]	-	8	2.0	–	100%
GRP061	–1	ProdInvAx13	Axiom 3.1.4	Single axiom for group theory, in product & inverse	[McC93]	-	8	2.0	–	100%
GRP062	–1	ProdInvAx14	Axiom 3.1.5	Single axiom for group theory, in product & inverse	[McC93]	-	8	2.0	–	100%
GRP063	–1	DivAx1	Axiom 1.1	Single axiom for group theory, in division	[HN52, McC93]	-	11	1.9	–	100%
GRP064	–1	DivAx2	Axiom 3.2.1, sax2.in	Single axiom for group theory, in division	[McC93]	-	11	1.9	–	100%
GRP065	–1	DivAx3	Axiom 3.2.2	Single axiom for group theory, in division	[McC93]	-	11	1.9	–	100%
GRP066	–1	DivIdAx1	Axiom 3.3.1	Single axiom for group theory, in division and identity	[McC93]	-	12	1.8	–	100%
GRP067	–1	DivIdAx2	Axiom 3.3.2	Single axiom for group theory, in division and identity	[McC93]	-	12	1.8	–	100%
GRP068	–1	DivIdAx3	Axiom 3.3.3	Single axiom for group theory, in division and identity	[McC93]	-	12	1.8	–	100%
GRP069	–1	DivIdAx4	Axiom 3.3.4	Single axiom for group theory, in division and identity	[McC93]	-	12	1.8	–	100%
GRP070	–1	DivInvAx1	Axiom 3.4.1	Single axiom for group theory, in division and inverse	[McC93]	-	11	1.9	–	100%
GRP071	–1	DivInvAx2	Axiom 3.4.2	Single axiom for group theory, in division and inverse	[McC93]	-	11	1.9	–	100%
GRP072	–1	DivInvAx3	Axiom 3.4.3	Single axiom for group theory, in division and inverse	[McC93]	-	11	1.9	–	100%
GRP073	–1	DivInvAx4	Axiom 3.4.4	Single axiom for group theory, in division and inverse	[McC93]	-	11	1.9	–	100%
GRP074	–1	DivInvAx5	Axiom 3.4.5	Single axiom for group theory, in division and inverse	[McC93]	-	11	1.9	–	100%
GRP075	–1	DblDivIdAx1	Axiom 2.2	Single axiom for group theory, in double division and identity	[Neu86, McC93]	-	12	1.8	–	100%
GRP076	–1	DblDivIdAx2	Axiom 3.5.1	Single axiom for group theory, in double division and identity	[McC93]	-	12	1.8	–	100%
GRP077	–1	DblDivIdAx3	Axiom 3.5.2	Single axiom for group theory, in double division and identity	[McC93]	-	12	1.8	–	100%
GRP078	–1	DblDivIdAx4	Axiom 3.5.3	Single axiom for group theory, in double division and identity	[McC93]	-	12	1.8	–	100%
GRP079	–1	DblDivIdAx5	Axiom 3.5.4	Single axiom for group theory, in double division and identity	[McC93]	-	12	1.8	–	100%
GRP080	–1	DblDivIdAx6	Axiom 3.5.5	Single axiom for group theory, in double division and identity	[McC93]	-	12	1.8	–	100%
GRP081	–1	DblDivInvAx1	Axiom 2.5	Single axiom for group theory, in double division and inverse	[Neu86, McC93]	-	11	1.9	–	100%
GRP082	–1	DblDivInvAx2	Axiom 3.6.1	Single axiom for group theory, in double division and inverse	[McC93]	-	11	1.9	–	100%
GRP083	–1	DblDivInvAx3	Axiom 3.6.2	Single axiom for group theory, in double division and inverse	[McC93]	-	11	1.9	–	100%
GRP084	–1	ProdInvAbnAx1	GT6, Axiom 2.4	Single axiom for Abelian group theory, in product and inverse	[Neu81, LW92, McC93]	-	8	2.1	–	100%
GRP085	–1	ProdInvAbnAx2	GT5, Axiom 3.7.1	Single axiom for Abelian group theory, in product and inverse	[LW92, McC93]	-	8	2.1	–	100%
GRP086	–1	ProdInvAbnAx3	Axiom 3.7.2	Single axiom for Abelian group theory, in product and inverse	[McC93]	-	8	2.1	–	100%
GRP087	–1	ProdInvAbnAx4	Axiom 3.7.3	Single axiom for Abelian group theory, in product and inverse	[McC93]	-	8	2.1	–	100%
GRP088	–1	DivAbnAx1	Axiom 2.3	Single axiom for Abelian group theory, in division	[Tar38, McC93]	-	11	2.0	–	100%
GRP089	–1	DivAbnAx2	Axiom 3.8.1	Single axiom for Abelian group theory, in division	[McC93]	-	11	2.0	–	100%
GRP090	–1	DivAbnAx3	Axiom 3.8.2	Single axiom for Abelian group theory, in division	[McC93]	-	11	2.0	–	100%

Syntactic name	Semantic name	Description					
V#	Other names	References	V	Cl	Av	nH	Eq
GRP091	DivAbnAx4	Single axiom for Abelian group theory, in division					
–1	Axiom 3.8.3	[McC93]	-	11	2.0	–	100%
GRP092	DivAbnAx5	Single axiom for Abelian group theory, in division					
–1	Axiom 3.8.4	[McC93]	-	11	2.0	–	100%
GRP093	DivIdAbnAx1	Single axiom for Abelian group theory, in division and identity					
–1	Axiom 3.9.1	[McC93]	-	12	1.9	–	100%
GRP094	DivIdAbnAx2	Single axiom for Abelian group theory, in division and identity					
–1	Axiom 3.9.2	[McC93]	-	12	1.9	–	100%
GRP095	DivIdAbnAx3	Single axiom for Abelian group theory, in division and identity					
–1	Axiom 3.9.3	[McC93]	-	12	1.9	–	100%
GRP096	DivInvAbnAx1	Single axiom for Abelian group theory, in division and inverse					
–1	Axiom 3.10.1	[McC93]	-	11	2.0	–	100%
GRP097	DivInvAbnAx2	Single axiom for Abelian group theory, in division and inverse					
–1	Axiom 3.10.2	[McC93]	-	11	2.0	–	100%
GRP098	DivInvAbnAx3	Single axiom for Abelian group theory, in division and inverse					
–1	Axiom 3.10.3	[McC93]	-	11	2.0	–	100%
GRP099	DblDivIdAbnAx1	Single axiom for Abelian group theory, in double div and id					
–1	Axiom 3.11.1	[McC93]	-	12	1.9	–	100%
GRP100	DblDivIdAbnAx2	Single axiom for Abelian group theory, in double div and id					
–1	Axiom 3.11.2	[McC93]	-	12	1.9	–	100%
GRP101	DblDivIdAbnAx3	Single axiom for Abelian group theory, in double div and id					
–1	Axiom 3.11.3	[McC93]	-	12	1.9	–	100%
GRP102	DblDivIdAbnAx4	Single axiom for Abelian group theory, in double div and id					
–1	Axiom 3.11.4	[McC93]	-	12	1.9	–	100%
GRP103	DblDivIdAbnAx5	Single axiom for Abelian group theory, in double div and id					
–1	Axiom 3.11.5	[McC93]	-	12	1.9	–	100%
GRP104	DblDivInvAbnAx1	Single axiom for Abelian group theory, in double div and inv					
–1	Axiom 3.12.1	[McC93]	-	11	2.0	–	100%
GRP105	DblDivInvAbnAx2	Single axiom for Abelian group theory, in double div and inv					
–1	Axiom 3.12.2	[McC93]	-	11	2.0	–	100%
GRP106	DblDivInvAbnAx3	Single axiom for Abelian group theory, in double div and inv					
–1	Axiom 3.12.3	[McC93]	-	11	2.0	–	100%
GRP107	DblDivInvAbnAx4	Single axiom for Abelian group theory, in double div and inv					
–1	axiom 3.12.4	[McC93]	-	11	2.0	–	100%
GRP108	DblDivInvAbnAx5	Single axiom for Abelian group theory, in double div and inv					
–1	Axiom 3.12.5	[McC93]	-	11	2.0	–	100%
GRP109	DblDivInvAbnAx6	Single axiom for Abelian group theory, in double div and inv					
–1	Axiom 3.12.6	[McC93]	-	11	2.0	–	100%
GRP110	DblDivInvAbnAx7	Single axiom for Abelian group theory, in double div and inv					
–1	Axiom 3.12.7	[McC93]	-	11	2.0	–	100%
GRP111	DblDivInvAbnAx8	Single axiom for Abelian group theory, in double div and inv					
–1	Axiom 3.12.8	[McC93]	-	11	2.0	–	100%
GRP112	ProdInvAx15	Single axiom for group theory, in product & inverse					
–1	GT2	[MP68, LW92, McC93]	-	8	2.1	–	100%
GRP113	O4Eqn	Lemma for proving all groups of order 4 are cyclic					
–1	Test Problem 7,	[Wos88]	-	22	1.8	4%	100%
GRP114	PosTimesNeg	Product of positive and negative parts of X equals X					
–1		[Wos94a]	-	33	1.4	–	100%
GRP115	O3AxO3	Derive order 3 from a single axiom for groups order 3					
–1	groups.exp3.in part 1	[Wosa]	-	7	1.7	–	100%
GRP116	O3AxLId	Derive left identity from a single axiom for groups order 3					
–1	groups.exp3.in part 2	[Wosa]	-	7	1.7	–	100%
GRP117	O3AxRId	Derive right identity from a single axiom for groups order 3					
–1	groups.exp3.in part 3	[Wosa]	-	7	1.7	–	100%
GRP118	O3AxAssoc	Derive associativity from a single axiom for groups order 3					
–1	groups.exp3.in part 4	[Wosa]	-	7	1.7	–	100%
GRP119	O4AxO4	Derive order 4 from a single axiom for groups order 4					
–1	groups.exp4.in part 1	[Wosa]	-	8	1.6	–	100%
GRP120	O4AxLId	Derive left identity from a single axiom for groups order 4					
–1	groups.exp4.in part 2	[Wosa]	-	8	1.6	–	100%
GRP121	O4AxRId	Derive right identity from a single axiom for groups order 4					
–1	groups.exp4.in part 3	[Wosa]	-	8	1.6	–	100%
GRP122	O4AxAssoc	Derive associativity from a single axiom for groups order 4					
–1	groups.exp4.in part 4	[Wosa]	-	8	1.6	–	100%
GRP123	321COILS	(3,2,1) conjugate orthogonality					
–1.003	QG1, QG1, QG1, Bennett QG1	[FSB93, Sla93, Zha94a, SFS95]	-	16	2.1	6%	–
–2.003		[FSB93, Sla93, Zha94a, SFS95]	-	22	1.9	4%	–
–3.003		[FSB93, Sla93, Zha94a, SFS95]	-	32	2.2	6%	–
–4.003		[FSB93, Sla93, Zha94a, SFS95]	-	18	2.4	16%	–
–6.003	QG1a	[FSB93, Sla93, SFS95]	-	20	2.1	10%	–
–7.003		[FSB93, Sla93, SFS95]	-	26	1.9	7%	–
–8.003		[FSB93, Sla93, SFS95]	-	36	2.2	8%	–
–9.003		[FSB93, Sla93, SFS95]	-	22	2.4	18%	–
GRP124	312COILS	(3,1,2) conjugate orthogonality					
–1.003	QG2, QG2, QG2, Bennett QG2	[FSB93, Sla93, SFS95]	-	16	2.1	6%	–
–2.003		[FSB93, Sla93, SFS95]	-	22	1.9	4%	–
–3.003		[FSB93, Sla93, SFS95]	-	32	2.2	6%	–
–4.003		[FSB93, Sla93, SFS95]	-	18	2.4	16%	–
–6.003	QG2a	[FSB93, Sla93, SFS95]	-	20	2.1	10%	–
–7.003		[FSB93, Sla93, SFS95]	-	26	1.9	7%	–
–8.003		[FSB93, Sla93, SFS95]	-	36	2.2	8%	–
–9.004		[FSB93, Sla93, SFS95]	-	29	2.2	13%	–

Syntactic name V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
GRP125	Schroeder	(a.b).(b.a) = a					
–1.003	QG3, QG3, QG3, Bennett QG3	[FSB93, Sla93, SFS95]	-	15	1.8	6%	–
–2.003		[FSB93, Sla93, SFS95]	-	21	1.7	4%	–
–3.003		[FSB93, Sla93, SFS95]	-	31	2.1	6%	–
–4.003		[FSB93, Sla93, SFS95]	-	19	2.3	15%	–
GRP126	SteinLaw3	(a.b).(b.a) = b					
–1.003	QG4, QG4, QG4, Bennett QG4	[FSB93, Sla93, SFS95]	-	15	1.8	6%	–
–2.003		[FSB93, Sla93, SFS95]	-	21	1.7	4%	–
–3.003		[FSB93, Sla93, SFS95]	-	31	2.1	6%	–
–4.003		[FSB93, Sla93, SFS95]	-	19	2.3	15%	–
GRP127	QG5	((b.a).b).b) = a					
–1.003	QG5, QG5, QG5, Bennett QG5	[Ben85, FSB93, Sla93, SFS95]	-	15	1.8	6%	–
–2.003		[Ben85, FSB93, Sla93, SFS95]	-	21	1.7	4%	–
–3.003		[Ben85, FSB93, Sla93, SFS95]	-	31	2.1	6%	–
–4.003		[Ben85, FSB93, Sla93, SFS95]	-	19	2.3	15%	–
GRP128	SchroederLaw1	(a.b).b = a.(a.b)					
–1.003	QG6, QG6, QG6, Bennett QG6	[BZ92, FSB93, Sla93, SFS95]	-	14	1.9	7%	–
–2.003		[FSB93, Sla93, SFS95]	-	20	1.7	5%	–
–3.003		[FSB93, Sla93, SFS95]	-	30	2.1	6%	–
–4.003		[FSB93, Sla93, SFS95]	-	18	2.3	16%	–
GRP129	QG7	a.(b.a) = (b.a).b					
–1.002	QG7, QG7, QG7, Bennett QG7	[FSB93, Sla93, SFS95]	-	9	2.2	11%	–
–2.002		[FSB93, Sla93, SFS95]	-	12	2.1	8%	–
–3.002		[FSB93, Sla93, SFS95]	-	21	2.5	9%	–
–4.002		[FSB93, Sla93, SFS95]	-	13	2.6	23%	–
GRP130	QG8	(a.(a.b)).b = a					
–1.002	QG8, Bennett QG8	[FSB93, Sla93, SFS95]	-	9	2.2	11%	–
–2.002		[FSB93, Sla93, SFS95]	-	12	2.1	8%	–
–3.002		[FSB93, Sla93, SFS95]	-	21	2.5	9%	–
–4.002		[FSB93, Sla93, SFS95]	-	13	2.6	23%	–
GRP131	321COILSNoIdem	(3,2,1) conjugate orthogonality, no idempotence					
–1.002	QG1-ni	[FSB93, Sla93, Zha94a, SFS95]	-	10	2.7	10%	–
–2.002		[FSB93, Sla93, Zha94a, SFS95]	-	13	2.5	7%	–
GRP132	312COILSNoIdem	(3,1,2) conjugate orthogonality, no idempotence					
–1.002	QG2-ni	[FSB93, Sla93, SFS95]	-	10	2.7	10%	–
–2.002		[FSB93, Sla93, SFS95]	-	13	2.5	7%	–
GRP133	SchroederNoIdem	(a.b).(b.a) = a, no idempotence					
–1.002	QG3-ni	[FSB93, Sla93, SFS95]	-	9	2.2	11%	–
–2.002		[FSB93, Sla93, SFS95]	-	12	2.1	8%	–
GRP134	SteinLaw3NoIdem	(a.b).(b.a) = b, no idempotence					
–1.002	QG4-ni	[FSB93, Sla93, SFS95]	-	9	2.2	11%	–
–2.002		[FSB93, Sla93, SFS95]	-	12	2.1	8%	–
GRP135	QG5NoIdem	((b.a).b).b) = a, no idempotence					
–1.002	QG5-ni	[Ben85, FSB93, Sla93, SFS95]	-	9	2.2	11%	–
–2.002		[Ben85, FSB93, Sla93, SFS95]	-	12	2.1	8%	–
GRP136	ASymLub	Prove anti-symmetry axiom using the LUB transformation					
–1	ax_antisyma	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP137	ASymGlb	Prove anti-symmetry axiom using the GLB transformation					
–1	ax_antisymb	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP138	Glb1Lub	Prove greatest lower-bound axiom using the LUB transformation					
–1	ax_glb1a	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP139	Glb1Glb	Prove greatest lower-bound axiom using the GLB transformation					
–1	ax_glb1b	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP140	Glb1C	Prove greatest lower-bound axiom using a transformation					
–1	ax_glb1c	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP141	Glb1D	Prove greatest lower-bound axiom using a transformation					
–1	ax_glb1d	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP142	Glb2Lub	Prove greatest lower-bound axiom using the LUB transformation					
–1	ax_glb2a	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP143	Glb2Glb	Prove greatest lower-bound axiom using the GLB transformation					
–1	ax_glb2b	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP144	Glb3Lub	Prove greatest lower-bound axiom using the LUB transformation					
–1	ax_glb3a	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP145	Glb3Glb	Prove greatest lower-bound axiom using the GLB transformation					
–1	ax_glb3b	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP146	Lub1Lub	Prove least upper-bound axiom using the LUB transformation					
–1	ax_lub1a	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP147	Lub1Glb	Prove least upper-bound axiom using the GLB transformation					
–1	ax_lub1b	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP148	Lub3C	Prove least upper-bound axiom using a transformation					
–1	ax_lub1c	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP149	Lub3D	Prove least upper-bound axiom using a transformation					
–1	ax_lub1d	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP150	Lub2Lub	Prove least upper-bound axiom using the LUB transformation					
–1	ax_lub2a	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP151	Lub2Glb	Prove least upper-bound axiom using the GLB transformation					
–1	ax_lub2b	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP152	Lub3Lub	Prove least upper-bound axiom using the LUB transformation					
–1	ax_lub3a	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP153	Lub3Glb	Prove least upper-bound axiom using the GLB transformation					
–1	ax_lub3b	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP154	Mono1Lub	Prove monotonicity axiom using the LUB transformation					
–1	ax_mono1a	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP155	Mono1Glb	Prove monotonicity axiom using the GLB transformation					
–1	ax_mono1b	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP156	Mono1C	Prove monotonicity axiom using a transformation					
–1	ax_mono1c	[Fuc94, Sch95]	-	27	1.4	–	100%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
GRP157	Mono2Lub	Prove monotonicity axiom using the LUB transformation					
−1	ax_mono2a	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP158	Mono2Glb	Prove monotonicity axiom using the GLB transformation					
−1	ax_mono2b	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP159	Mono2C	Prove monotonicity axiom using a transformation					
−1	ax_mono2c	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP160	ReflLub	Prove reflexivity axiom using the LUB transformation					
−1	ax_refla	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP161	ReflGlb	Prove reflexivity axiom using the GLB transformation					
−1	ax_reflb	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP162	TransLub	Prove transitivity axiom using the LUB transformation					
−1	ax_transa	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP163	TransGlb	Prove transitivity axiom using the GLB transformation					
−1	ax_transb	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP164	LOGLattDist	The lattice of each LOG is distributive					
−1	distrnu	[Fuc94, Sch95, Dah95]	-	26	1.4	–	100%
−2	distrun	[Fuc94, Sch95]	-	26	1.4	–	100%
GRP165	AppMono	An application of monotonicity					
−1	lat1a	[Fuc94, Sch95]	-	27	1.4	–	100%
−2	lat1b	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP166	MultPosInc	Multiplication with a positive element increases a value					
−1	lat2a	[Fuc94, Sch95, Dah95]	-	28	1.4	–	100%
−2	lat2b	[Fuc94, Sch95]	-	28	1.4	–	100%
−3	lat3a	[Fuc94, Sch95]	-	28	1.4	–	100%
−4	lat3b	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP167	ProdPosNeg	Product of positive and negative parts					
−1		[Fuc94, Sch95, Dah95]	-	32	1.4	–	100%
−2	lat4	[Fuc94, Sch95]	-	35	1.3	–	100%
−3		[Fuc94, Sch95]	-	26	1.4	–	100%
−4	p19	[Fuc94, Sch95]	-	29	1.3	–	100%
−5		[Fuc94, Sch95, Dah95]	-	33	1.4	–	100%
GRP168	InrGrpAutoM	Inner group automorphisms are order preserving					
−1	p01a	[Fuc94, Sch95, Dah95]	-	27	1.4	–	100%
−2	p01b	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP169	InvRevEq	Inverses reverse inequalities					
−1	p02a	[Fuc94, Sch95, Dah95]	-	27	1.4	–	100%
−2	p02b	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP170	GenMono	General form of monotonicity					
−1	p03a	[Fuc94, Sch95]	-	28	1.4	–	100%
−2	p03b	[Fuc94, Sch95]	-	28	1.4	–	100%
−3	p03c	[Fuc94, Sch95]	-	28	1.4	–	100%
−4	p03d	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP171	PosElSemiG	Positive elements form a semigroup					
−1	p04a	[Fuc94, Sch95]	-	28	1.4	–	100%
−2	p04c	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP172	NegElSemiG	Negative elements form a semigroup					
−1	p04b	[Fuc94, Sch95]	-	28	1.4	–	100%
−2	p04d	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP173	SubGNegEl	Each subgroup of negative elements is trivial					
−1	p05a	[Fuc94, Sch95, Dah95]	-	28	1.4	–	100%
GRP174	SubGPosEl	Each subgroup of positive elements is trivial					
−1	p05b	[Fuc94, Sch95]	-	28	1.4	–	100%
GRP175	PosInrAutoM	Positivity is preserved under inner automorphisms					
−1	p06a	[Fuc94, Sch95]	-	27	1.4	–	100%
−2	p06b	[Fuc94, Sch95]	-	27	1.4	–	100%
−3	p06c	[Fuc94, Sch95]	-	27	1.4	–	100%
−4	p06d	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP176	GenDist	General form of distributivity					
−1		[Fuc94, Sch95, Dah95]	-	26	1.4	–	100%
−2	p07	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP177	LOGMono1	A consequence of monotonicity					
−1	p08a	[Fuc94, Sch95]	-	29	1.3	–	100%
−2	p08b	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP178	LOGMono2	A consequence of monotonicity					
−1	p09a	[Fuc94, Sch95]	-	30	1.3	–	100%
−2	p09b	[Fuc94, Sch95]	-	30	1.3	–	100%
GRP179	GLBtoLUB	For converting between GLB and LUB					
−1	p10	[Fuc94, Sch95, Dah95]	-	26	1.4	–	100%
−2		[Fuc94, Sch95]	-	26	1.4	–	100%
−3	p18	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP180	GLBtoLUB1	Consequence of converting between GLB and LUB					
−1		[Fuc94, Sch95]	-	26	1.4	–	100%
−2	p11	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP181	DistLatt	Distributivity of a lattice					
−1		[Fuc94, Sch95]	-	28	1.4	–	100%
−2	p12	[Fuc94, Sch95]	-	31	1.3	–	100%
−3		[Fuc94, Sch95]	-	30	1.3	–	100%
−4	p12x	[Fuc94, Sch95]	-	33	1.3	–	100%
GRP182	PosNegId	Positive part of the negative part is identity					
−1		[Fuc94, Sch95, Dah95]	-	26	1.4	–	100%
−2	p17a	[Fuc94, Sch95, Dah95]	-	29	1.3	–	100%
−3		[Fuc94, Sch95]	-	26	1.4	–	100%
−4	p17b	[Fuc94, Sch95]	-	29	1.3	–	100%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
GRP183	OrthElSubG	Orthogonal elements form a subgroup with orthogonal parts					
–1		[Fuc94, Sch95]	-	26	1.4	–	100%
–2	p20	[Fuc94, Sch95]	-	29	1.3	–	100%
–3		[Fuc94, Sch95]	-	26	1.4	–	100%
–4	p20x	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP184	OrthElComm	Orthogonal elements commute and form a subgroup					
–1		[Fuc94, Sch95]	-	26	1.4	–	100%
–2	p21	[Fuc94, Sch95]	-	29	1.3	–	100%
–3		[Fuc94, Sch95]	-	26	1.4	–	100%
–4	p21x	[Fuc94, Sch95]	-	31	1.3	–	100%
GRP185	AppMonoDist	Application of monotonicity and distributivity					
–1		[Fuc94, Sch95]	-	26	1.4	–	100%
–2	p22a	[Fuc94, Sch95]	-	29	1.3	–	100%
–3		[Fuc94, Sch95]	-	26	1.4	–	100%
–4	p22b	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP186	AppDistGrp	Application of distributivity and group theory					
–1		[Fuc94, Sch95]	-	26	1.4	–	100%
–2	p23	[Fuc94, Sch95]	-	29	1.3	–	100%
–3		[Fuc94, Sch95]	-	26	1.4	–	100%
–4	p23x	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP187	OrthElComm	Orthogonal elements commute					
–1	p33	[Fuc94, Sch95, Dah95]	-	27	1.4	–	100%
GRP188	LOGLatt1	Consequence of lattice theory					
–1		[Fuc94, Sch95]	-	26	1.4	–	100%
–2	p38a	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP189	LOGLatt2	Consequence of lattice theory					
–1		[Fuc94, Sch95]	-	26	1.4	–	100%
–2	p38b	[Fuc94, Sch95]	-	29	1.3	–	100%
GRP190	LOGEst1	Something useful for estimations					
–1	p39a	[Fuc94, Sch95]	-	27	1.4	–	100%
–2	p39c	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP191	LOGEst2	Something useful for estimations					
–1	p39b	[Fuc94, Sch95]	-	27	1.4	–	100%
–2	p39d	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP192	EvenElGrp	Even elements implies trivial group					
–1	p40a	[Fuc94, Sch95]	-	27	1.4	–	100%
GRP193	LOGDistMono	A combination of distributivity and monotonicity					
–1	p8_9a	[Fuc94, Sch95]	-	31	1.3	–	100%
–2	p8_9b	[Fuc94, Sch95]	-	31	1.3	–	100%

Domain HEN (12 abstract problems, 64 problems)

HEN001	XDivId	X/identity = zero					
–1	H1, hp1.ver1.in	[MOW76]	-	20	2.4	–	36%
–3	hp1.ver2.in	[MOW76]	-	15	1.9	–	57%
–5	hp1.ver3.in	[MOW76]	-	11	1.6	–	100%
HEN002	0DivX	zero/X = zero					
–1	hp2.ver1.in	[MOW76]	-	20	2.4	–	36%
–2	H2	[MOW76]	-	21	2.3	–	35%
–3	hp2.ver2.in	[MOW76]	-	15	1.9	–	57%
–4		[MOW76]	-	16	1.8	–	58%
–5	hp2.ver3.in	[MOW76]	-	11	1.6	–	100%
HEN003	XDivX	X/X = zero					
–1		[MOW76]	-	20	2.4	–	36%
–2	H3, hp3.ver1.in	[MOW76]	-	22	2.2	–	34%
–3	HP3	[MOW76]	-	15	1.9	–	57%
–4	hp3.ver2.in	[MOW76]	-	17	1.8	–	60%
–5	hp3.ver3.in	[MOW76]	-	11	1.6	–	100%
HEN004	XDiv0	X/zero = X					
–1		[MOW76]	-	20	2.4	–	36%
–2	H4, hp4.ver1.in	[MOW76]	-	23	2.2	–	34%
–3	HP4	[MOW76]	-	15	1.9	–	57%
–4		[MOW76]	-	18	1.7	–	61%
–5	hp4.ver3.in	[MOW76]	-	12	1.6	–	100%
–6	hp4.ver2.in	[MOW76]	-	17	1.8	–	60%
HEN005	LeTrans	The relation less_equal is transitive					
–1	hp5.ver1.in	[MOW76]	-	22	2.2	–	34%
–2	H5	[MOW76]	-	26	2.0	–	32%
–3	HP5	[MOW76]	-	17	1.8	–	50%
–4		[MOW76]	-	21	1.6	–	55%
–5	hp5.ver3.in	[MOW76]	-	13	1.5	–	100%
–6	hp5.ver2.in	[MOW76]	-	19	1.7	–	53%
HEN006	Eqn1	X/Y <= Z => X/Z <= Y					
–1		[MOW76]	-	23	2.2	–	34%
–2	H6	[MOW76]	-	28	2.0	–	29%
–3	HP6	[MOW76]	-	16	1.8	–	51%
–4		[MOW76]	-	21	1.7	–	52%
–5	hp6.ver3.in	[MOW76]	-	13	1.5	–	100%
–6	hp6.ver2.in	[MOW76]	-	19	1.7	–	56%
–7	hp6.ver1.in	[MOW76]	-	27	2.0	–	31%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
HEN007	Eqn2	X <= Y => Z/Y <= Z/X					
–1		[MOW76]	-	23	2.2	–	34%
–2	H7	[MOW76]	-	29	2.1	–	27%
–3	HP7	[MOW76]	-	16	1.8	–	51%
–4	hp7.ver2.in	[MOW76]	-	22	1.7	–	50%
–5	hp7.ver3.in	[MOW76]	-	13	1.7	–	100%
–6	hp7.ver1.in	[MOW76]	-	28	2.0	–	29%
HEN008	Eqn3	X <= Y => X/Z <= Y/Z					
–1	hp8.ver1.in	[MOW76]	-	23	2.2	–	34%
–2	H8	[MOW76]	-	30	2.2	–	26%
–3	HP8	[MOW76]	-	16	1.8	–	51%
–4		[MOW76]	-	23	1.7	–	47%
–5	hp8.ver3.in	[MOW76]	-	12	1.6	–	100%
–6	hp8.ver2.in	[MOW76]	-	19	1.7	–	56%
HEN009	IdDivX1	Define X' as identity/X. Then X' = X'''					
–1		[MOW76]	-	23	2.2	–	36%
–2	H9, hp9.ver1.in	[MOW76]	-	31	2.2	–	26%
–3	HP9	[MOW76]	-	19	1.7	–	62%
–4		[MOW76]	-	23	1.8	–	48%
–5	hp9.ver3.in	[MOW76]	-	14	1.8	–	100%
–6	hp9.ver2.in	[MOW76]	-	24	1.6	–	59%
HEN010	IdDivX2	Define X' as identity/X. Then X' = X'/(identity/X')					
–1		[MOW76]	-	23	2.2	–	36%
–2	H10	[MOW76]	-	32	2.3	–	26%
–3	HP10	[MOW76]	-	15	1.9	–	57%
–4		[MOW76]	-	24	1.8	–	50%
–5	hp10.ver3.in	[MOW76]	-	14	1.8	–	100%
–6	hp10.ver2.in	[MOW76]	-	23	1.7	–	53%
–7	hp10.ver1.in	[MOW76]	-	31	2.2	–	26%
HEN011	OpComm	This operation is commutative					
–1		[MOW76]	-	26	2.0	–	34%
–2	H11, hp11.ver1.in	[MOW76]	-	36	2.2	–	25%
–3	HP11	[MOW76]	-	20	1.6	–	63%
–4	hp11.ver2.in	[MOW76]	-	25	1.7	–	51%
–5	hp11.ver3.in	[MOW76]	-	19	1.6	–	100%
HEN012	XLeX	X <= X					
–1			-	20	2.4	–	36%
–3	new.ver2.in		-	15	1.9	–	53%

Domain LAT (5 abstract problems, 10 problems)

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
LAT001	Eqn1	If X' = U v V and Y' = U ^ V, then U' = X v (Y ^ V)					
–1	L1a	[Bum65, GOBS69, McC88]	-	28	1.6	–	77%
LAT002	ExEqn1	If X' = U v V and Y' = U ^ V, then U' exists					
–1	L1b	[Bum65, GOBS69, McC88]	-	28	1.6	–	77%
LAT003	Eqn2	A fairly complex equation to establish					
–1	L2	[Bum65, GOBS69, McC88]	-	38	1.8	2%	62%
LAT004	Eqn3	A fairly complex equation to establish					
–1	L3	[Bum65, GOBS69, McC88]	-	38	1.8	2%	62%
LAT005	SAMsLem	SAM's lemma					
–1	SAM's lemma, SAMslemma.ver1.in	[GOBS69, MOW76]	-	29	2.1	–	–
–2	SAM's lemma, sam.in, sam_hyp.in	[GOBS69, MOW76, LM92]	-	31	1.8	–	–
–3	SAM's lemma	[GOBS69, McC88]	-	28	1.6	–	79%
–4	Test Problem 12, SAM's lemma	[McC88, Wos88]	-	27	1.3	–	100%
–5	SAMslemma.ver1.in	[GOBS69, MOW76]	-	44	2.1	–	24%
–6	Test Problem 12, SAM's lemma	[Wos88]	-	50	2.1	–	21%

Domain LCL (256 abstract problems, 278 problems)

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
LCL001	WR_CAM	The Whitehead-Russell system => the Meredith axiom					
–1	AN-50	[Mer53, MW92, McC92b]	-	6	1.3	–	–
LCL002	CAM_AN1	AN-CAMerideth => AN-1					
–1	AN-51	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL003	CAM_AN2	AN-CAMerideth => AN-2					
–1	AN-52	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL004	CAM_AN3	AN-CAMerideth => AN-3					
–1	AN-53	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL005	CAM_AN4	AN-CAMerideth => AN-4					
–1	AN-54	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL006	Wj_EC1	EC-1 depends on the Wajsberg system					
–1	EC-69	[MW92, McC92b]	-	4	1.5	–	–
LCL007	Wj_EC2	EC-2 depends on the Wajsberg system					
–1	EC-70	[MW92, McC92b]	-	4	1.5	–	–
LCL008	YQL_EC4	EC-4 depends on YQL					
–1	EC-71	[MW92, McC92b]	-	3	1.7	–	–
LCL009	YQL_EC5	EC-5 depends on YQL					
–1	EC-72	[MW92, McC92b]	-	3	1.7	–	–
LCL010	YQF_YQL	YQL depends on YQF					
–1	EC-73, ec_yq.in	[MW92, McC92b]	-	3	1.7	–	–
LCL011	YQJ_YQF	YQF depends on YQJ					
–1	EC-74	[MW92, McC92b]	-	3	1.7	–	–
LCL012	UM_YQJ	YQJ depends on UM					
–1	EC-75	[MW92, McC92b]	-	3	1.7	–	–
LCL013	XGF_UM	UM depends on XGF					
–1	EC-76	[MW92, McC92b]	-	3	1.7	–	–
LCL014	WN_XGF	XGF depends on WN					
–1	EC-77	[MW92, McC92b]	-	3	1.7	–	–
LCL015	YRM_WN	WN depends on YRM					
–1	EC-78	[MW92, McC92b]	-	3	1.7	–	–

Syntactic name	V#	Semantic name	Other names	Description	References	V	Cl	Av	nH	Eq
LCL016	−1	YRO_YRM	EC-79	YRM depends on YRO	[MW92, McC92b]	-	3	1.7	–	–
LCL017	−1	PYO_YRO	EC-80	YRO depends on PYO	[MW92, McC92b]	-	3	1.7	–	–
LCL018	−1	PYM_PYO	EC-81	PYO depends on PYM	[MW92, McC92b]	-	3	1.7	–	–
LCL019	−1	XGK_PYM	EC-82	PYM depends on XGK	[MW92, McC92b]	-	3	1.7	–	–
LCL020	−1	XHK_XGK	EC-83	XGK depends on XHK	[MW92, McC92b]	-	3	1.7	–	–
LCL021	−1	XHN_XHK	EC-84	XHK depends on XHN	[MW92, McC92b]	-	3	1.7	–	–
LCL022	−1	YQL_EC1	ec.in part 1	EC-1 depends on YQL		-	3	1.7	–	–
LCL023	−1	YQL_EC2	ec.in part 2	EC-2 depends on YQL		-	3	1.7	–	–
LCL024	−1	XGK_PYO	Test Problem 16, CADE-11 Comp. 4, THEOREM 4	PYO depends on XGK	[Wos88, Ove90, Ove93, LM93]	-	3	1.7	–	–
LCL025	−1	Ch_C01	C0-37	C0-1 depends on the Church system	[MW92, McC92b]	-	5	1.4	–	–
LCL026	−1	Ch_C03	C0-38	C0-3 depends on the Church system	[MW92, McC92b]	-	5	1.4	–	–
LCL027	−1	Ch_C04	C0-39	C0-4 depends on the Church system	[MW92, McC92b]	-	5	1.4	–	–
LCL028	−1	Ch_CAM	C0-40	C0-CAMerideth depends on the Church system	[MW92, McC92b]	-	5	1.4	–	–
LCL029	−1	TB_C05	C0-41	C0-5 depends on the Tarski-Bernays system	[MW92, McC92b]	-	6	1.3	–	–
LCL030	−1	TB_C06	C0-42	C0-6 depends on the Tarski-Bernays system	[MW92, McC92b]	-	6	1.3	–	–
LCL031	−1	TB_CAM	C0-43	C0-CAMerideth depends on the Tarski-Bernays system	[MW92, McC92b]	-	6	1.3	–	–
LCL032	−1	CAM_C01	C0-44	C0-1 depends on the Merideth axiom	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL033	−1	CAM_C02	C0-45	C0-2 depends on the Merideth axiom	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL034	−1	CAM_C03	C0-46	C0-3 depends on the Merideth axiom	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL035	−1	CAM_C04	C0-47	C0-4 depends on the Merideth axiom	[Mer53, MW92, McC92b]	-	3	1.7	–	–
LCL036	−1	CAM_C05	C0-48	C0-5 depends on the Merideth axiom	[MW92, McC92b]	-	3	1.7	–	–
LCL037	−1	CAM_C06	C0-49	C0-6 depends on the Merideth axiom	[MW92, McC92b]	-	3	1.7	–	–
LCL038	−1	Ov_C01	CADE-11 Comp. 5, THEOREM 5	C0-1 depends on a single axiom	[Ove90, Ove93, LM93]	-	3	1.7	–	–
LCL039	−1	Modal	Pelletier 69	A theorem from Morgan	[Mor84, Pel86]	-	8	1.4	–	–
LCL040	−1	Fr_CN21	CN-1	CN-21 depends on the rest of Frege's system	[MW92, McC92b]	-	7	1.3	–	–
LCL041	−1	Hl_CN30	CN-2	CN-30 depends on the rest of Hilbert's system	[MW92, McC92b]	-	7	1.3	–	–
LCL042	−1	Hl_CN35	CN-3	CN-35 depends on Hilbert's system	[MW92, McC92b]	-	7	1.3	–	–
LCL043	−1	Hl_CN39	CN-4	CN-39 depends on Hilbert's system	[MW92, McC92b]	-	7	1.3	–	–
LCL044	−1	Hl_CN40	CN-5	CN-40 depends on Hilbert's system	[MW92, McC92b]	-	7	1.3	–	–
LCL045	−1	Hl_CN46	CN-6	CN-46 depends on Hilbert's system	[MW92, McC92b]	-	7	1.3	–	–
LCL046	−1	Lk_CN16	CN-7, cn.in part 1	CN-16 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–
LCL047	−1	Lk_CN18	CN-8, cn.in part 2	CN-18 depends on the Lukasiewicz system	[MW92, Wos92, McC92b]	-	5	1.4	–	–
LCL048	−1	Lk_CN19	CN-9, cn.in part 3	CN-19 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–
LCL049	−1	Lk_CN20	CN-10	CN-20 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–
LCL050	−1	Lk_CN21	CN-11	CN-21 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–
LCL051	−1	Lk_CN22	CD-12, CN-12	CN-22 depends on the Lukasiewicz system	[LM92, MW92, McC92b]	-	5	1.4	–	–
LCL052	−1	Lk_CN24	CD-13, CN-13	CN-24 depends on the Lukasiewicz system	[LM92, MW92, McC92b]	-	5	1.4	–	–
LCL053	−1	Lk_CN30	CN-14	CN-30 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–
LCL054	−1	Lk_CN35	CN-15	CN-35 depends on the Lukasiewicz system	[MW92, Wos92, McC92b]	-	5	1.4	–	–
LCL055	−1	Lk_CN37	CN-16	CN-37 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–
LCL056	−1	Lk_CN39	CN-17	CN-39 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–
LCL057	−1	Lk_CN40	CN-18	CN-40 depends on the Lukasiewicz system	[MW92, McC92b]	-	5	1.4	–	–

Syntactic name	Semantic name	Description					
V#	Other names	References	V	Cl	Av	nH	Eq
LCL058	Lk_CN46	`CN-46 depends on the Lukasiewicz system`					
–1	CN-19, cn19.in	[MW92, McC92b]	-	5	1.4	–	–
LCL059	Lk_CN49	`CN-49 depends on the Lukasiewicz system`					
–1	CN-20	[MW92, Wos92, McC92b]	-	5	1.4	–	–
LCL060	Lk_CN54	`CN-54 depends on the Lukasiewicz system`					
–1	CN-21	[MW92, McC92b]	-	5	1.4	–	–
LCL061	Lk_CN59	`CN-59 depends on the Lukasiewicz system`					
–1	CN-22	[MW92, McC92b]	-	5	1.4	–	–
LCL062	Lk_CN60	`CN-60 depends on the Lukasiewicz system`					
–1	CN-23	[MW92, McC92b]	-	5	1.4	–	–
LCL063	Lk_CAM	`CN-CAMerideth depends on the Lukasiewicz system`					
–1	CN-24	[MW92, McC92b]	-	5	1.4	–	–
LCL064	Ch_CN1	`CN-1 depends on the Church system`					
–1	CN-25	[MW92, McC92b]	-	5	1.4	–	–
–2	morgan.six.ver1.in		-	4	1.5	–	–
LCL065	Ch_CN2	`CN-2 depends on the Church system`					
–1	CN-26	[MW92, McC92b]	-	5	1.4	–	–
LCL066	Ch_CN3	`CN-3 depends on the Church system`					
–1	CN-27	[MW92, McC92b]	-	5	1.4	–	–
LCL067	Lk2_CN1	`CN-1 depends on the second Lukasiewicz system`					
–1	CN-28	[MW92, McC92b]	-	5	1.4	–	–
LCL068	Lk2_CN2	`CN-2 depends on the second Lukasiewicz system`					
–1	CN-29	[MW92, McC92b]	-	5	1.4	–	–
LCL069	Lk2_CN3	`CN-3 depends on the second Lukasiewicz system`					
–1	CN-30	[MW92, McC92b]	-	5	1.4	–	–
LCL070	Ws_CN1	`CN-1 depends on the Wos system`					
–1	CN-31	[MW92, McC92b]	-	5	1.4	–	–
LCL071	Ws_CN2	`CN-2 depends on the Wos system`					
–1	CN-32	[MW92, McC92b]	-	5	1.4	–	–
LCL072	Ws_CN3	`CN-3 depends on the Wos system`					
–1	CN-33	[MW92, McC92b]	-	5	1.4	–	–
LCL073	CAM_CN1	`CN-1 depends on the single Merideth axiom`					
–1	CN-34	[MW92, McC92b]	-	3	1.7	–	–
LCL074	CAM_CN2	`CN-2 depends on the single Merideth axiom`					
–1	CN-35	[MW92, McC92b]	-	3	1.7	–	–
LCL075	CAM_CN3	`CN-3 depends on the single Merideth axiom`					
–1	CN-36	[MW92, McC92b]	-	3	1.7	–	–
LCL076	Ch_CN40	`CN-40 depends on the Church system`					
–1	Pelletier 66	[Mor84, Pel86]	-	5	1.4	–	–
–2	morgan.three.ver1.in, morgan.three.ver2.in		-	6	1.3	–	–
–3	morgan.four.ver1.in		-	6	1.7	–	–
LCL077	Ch_CN39	`CN-39 depends on the Church system`					
–1	Pelletier 67, morgan.five.ver1.in	[Mor84, Pel86]	-	5	1.4	–	–
–2	morgan.two.ver1.in	[Mor84]	-	6	1.7	–	–
LCL078	Ch1_CN40	`CN-40 depends on CN-18 CN-35 CN-46`					
–1	Pelletier 68, morgan.five.ver2.in	[Mor84, Pel86]	-	5	1.4	–	–
LCL079	Ch_TR	`Transitivity can be derived from Church's system`					
–1	morgan.one.ver2.in		-	7	1.3	–	–
LCL080	TB_Lk1	`The 1st Lukasiewicz axiom depends on Tarski-Bernays system`					
–1	IC-63	[Luk48, MW92, McC92b]	-	5	1.4	–	–
–2		[Luk48, MW92]	-	6	1.3	–	–
LCL081	Lk1_IC1	`IC-1 depends on the 1st Lukasiewicz axiom`					
–1	I1, IC-64, ls1	[Luk48, Pfe88, MW92, McC92b]	-	3	1.7	–	–
LCL082	Lk1_IC2	`IC-2 depends on the 1st Lukasiewicz axiom`					
–1	S1, IC-1.1, IC-65, ls2	[Luk48, Pfe88, WWM+90, MW92, McC92b]	-	3	1.7	–	–
LCL083	Lk1_IC3	`IC-3 depends on the 1st Lukasiewicz axiom`					
–1	P1, IC-1.2, IC-66, ls3	[Luk48, Pfe88, WWM+90, MW92, McC92b]	-	3	1.7	–	–
–2	IP1, ls4	[Luk48, Pfe88]	-	4	1.5	–	–
LCL084	Lk1_IC4	`IC-4 depends on the 1st Lukasiewicz axiom`					
–1	H1, IC-1.3, IC-67, Imp-4, ls5	[Luk48, Pfe88, WWM+90] [LM92, MW92, McC92b]	-	3	1.7	–	–
–2	IH1, ls6	[Luk48, Pfe88]	-	4	1.5	–	–
–3	IPH1, ls7	[Luk48, Pfe88]	-	5	1.4	–	–
LCL085	Lk1_IC5	`IC-5 depends on the 1st Lukasiewicz axiom`					
–1	IC-68	[Luk48, MW92, McC92b]	-	3	1.7	–	–
LCL086	Lk4_IC1	`IC-1 depends on the 4th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL087	Lk4_IC2	`IC-2 depends on the 4th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL088	Lk4_IC3	`IC-3 depends on the 4th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL089	Lk4_IC4	`IC-4 depends on the 4th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL090	Lk5_IC1	`IC-1 depends on the 5th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL091	Lk5_IC2	`IC-2 depends on the 5th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL092	Lk5_IC3	`IC-3 depends on the 5th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL093	Lk5_IC4	`IC-4 depends on the 5th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL094	Lk4_IC5	`IC-5 depends on the 4th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–
LCL095	Lk5_IC5	`IC-5 depends on the 5th Lukasiewicz axiom`					
–1		[Luk48, Pfe88]	-	3	1.7	–	–

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
LCL096	Kl_LG1	LG-1 depends on LG-2, LG-3, LG-4					
–1	LG-89	[MW92, McC92a, McC92b]	-	5	1.4	–	–
LCL097	Kl_LG4	LG-4 depends on LG-2, LG-3					
–1	CD-90, LG-90	[LM92, MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL098	LG3_LG4	LG-4 depends on LG-3					
–1	LG-91	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL099	Mc1_LG5	LG-5 depends on the 1st McCune system					
–1	LG-92	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL100	Mc2_LG3	LG-3 depends on the 2nd McCune system					
–1	LG-93	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL101	Mc3_P1	P-1 depends on the 3rd McCune system					
–1	LG-94	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL102	Mc4_P1	P-1 depends on the 4th McCune system					
–1	LG-95	[MW92, McC92a, McC92b]	-	5	1.4	–	–
LCL103	Mc5_LG2	LG-2 depends on the 5th McCune system					
–1	LG-96	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL104	Mc6_P1	P-1 depends on the 6th McCune system					
–1	LG-97	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL105	Mc7_LG2	LG-2 depends on the 7th McCune system					
–1	LG-98	[MW92, McC92a, McC92b]	-	5	1.4	–	–
LCL106	Q1Q4_Q2	Q-2 depends on Q-1, Q-4					
–1	LG-99	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL107	McAx_P1	P-1 depends on the single McCune axiom					
–1	LG-100	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL108	McAx_Q3	Q-3 depends on the single McCune axiom					
–1	LG-101	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL109	CAM_MV4	MV-4 depends on the Merideth system					
–1	MV-55, Luka5	[MW92, McC92b]	-	6	1.3	–	–
–2	CADE-11 Comp. Eq-5, Luka-5, MV4, THEOREM EQ-5, PROBLEM 5	[Ove90, LM92, LW92] [Ove93, LM93, Zha93]	-	11	1.5	–	100%
–3		[Bon91, MW92]	-	21	1.4	–	100%
–4	Lattice structure theorem 8	[FRT84, Bon91]	-	21	1.8	–	83%
–5	Lattice structure theorem 8	[FRT84, Bon91]	-	29	1.7	–	71%
–6	Lattice structure theorem 8	[FRT84, AB90, Bon91]	-	24	1.4	–	100%
LCL110	CAM_MV24	MV-24 depnds on the Merideth system					
–1	MV-56, mv.in part 1	[MW92, McC92b]	-	6	1.3	–	–
–2	MV1.1	[FRT84, MW92, LW92]	-	11	1.5	–	100%
LCL111	CAM_MV25	MV-25 depends on the Merideth system					
–1	CADE-11 Comp. 6, MV-57, THEOREM 6, mv.in part 2, mv25.in, ovb6	[Ove90, MW92, McC92b, Ove93, LM93]	-	6	1.3	–	–
–2	Lemma 6, MV2	[FRT84, Bon91, MW92, LW92]	-	11	1.5	–	100%
LCL112	CAM_MV29	MV-29 depnds on the Merideth system					
–1	MV-58, mv.in part 3	[MW92, McC92b]	-	6	1.3	–	–
–2	MV1.2	[FRT84, MW92, LW92, McC92b]	-	11	1.5	–	100%
LCL113	CAM_MV33	MV-33 depnds on the Merideth system					
–1	MV-59	[MW92, McC92b]	-	6	1.3	–	–
–2		[FRT84, MW92]	-	11	1.5	–	100%
LCL114	CAM_MV36	MV-36 depnds on the Merideth system					
–1	CADE-11 Comp. 7, MV-60, THEOREM 7	[Ove90, MW92, McC92b, Ove93, LM93]	-	6	1.3	–	–
–2	MV3	[FRT84, MW92, LW92]	-	11	1.5	–	100%
LCL115	CAM_MV39	MV-39 depnds on the Merideth system					
–1	MV-61	[MW92, McC92b]	-	6	1.3	–	–
–2		[FRT84, MW92]	-	11	1.5	–	100%
LCL116	CAM_MV50	MV-50 depnds on the Merideth system					
–1	MV-62	[MW92, McC92b]	-	6	1.3	–	–
–2		[FRT84, MW92]	-	11	1.5	–	100%
LCL117	YQM_QYF	QYF depends on YQM					
–1	R-85	[MW92, McC92b]	-	3	1.7	–	–
LCL118	WO_YQM	YQM depends on WO					
–1	R-86	[MW92, McC92b]	-	3	1.7	–	–
LCL119	XGJ_WO	WO depends on XGJ					
–1	RC-1, R-87	[WWM+90, MW92, McC92b]	-	3	1.7	–	–
LCL120	QYF_XGJ	XGJ depends on QYF					
–1	R-88	[MW92, McC92b]	-	3	1.7	–	–
LCL121	LG2_LG1	LG-1 depends on LG-2					
–1	RG-102	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL122	LG2_LG3	LG-3 depends on LG-2					
–1	RG-103	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL123	LG2_LG4	LG-4 depends on LG-2					
–1	RG-104	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL124	LG2_LG5	LG-5 depends on LG-2					
–1	RG-105	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL125	Mc1_LG2	LG-2 depends on the 1st McCune system					
–1	RG-106	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL126	Mc2_LG2	Q-2 depends on the 2nd McCune system					
–1	RG-107	[MW92, McC92a, McC92b]	-	4	1.5	–	–
LCL127	LG2_S2	LG-2 depends on S-2					
–1	RG-108	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL128	LG2_S3	LG-2 depends on S-3					
–1	RG-109	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL129	LG2_S4	LG-2 depends on S-4					
–1	RG-110	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL130	LG2_P4	LG-2 depends on P-4					
–1	RG-111	[MW92, McC92a, McC92b]	-	3	1.7	–	–

Syntactic name	V#	Semantic name	Other names	Description	References	V	Cl	Av	nH	Eq
LCL131	–1	LG2_S6	RG-112	LG-2 depends on S-6	[MW92, McC92a, McC92b]	-	3	1.7	–	–
LCL132	–1	WjAlg1Eqn1	Lemma 1	A lemma in Wajsberg algebras	[FRT84, Bon91]	-	11	1.5	–	100%
LCL133	–1	WjAlg1Eqn2	Lemma 2	A lemma in Wajsberg algebras	[FRT84, Bon91]	-	12	1.5	–	100%
LCL134	–1	WjAlg1Eqn3	Lemma 3	A lemma in Wajsberg algebras	[FRT84, Bon91]	-	11	1.5	–	100%
LCL135	–1	WjAlg1Eqn4	Lemma 4	A lemma in Wajsberg algebras	[FRT84, Bon91, MW92]	-	11	1.5	–	100%
LCL136	–1	WjAlg1Eqn5	Lemma 5	A lemma in Wajsberg algebras	[FRT84, Bon91, MW92]	-	12	1.5	–	100%
LCL137	–1	WjAlg1Eqn6		A lemma in Wajsberg algebras	[FRT84, MW92]	-	11	1.5	–	100%
LCL138	–1	WjAlg1Eqn7	Lemma 7	A lemma in Wajsberg algebras	[FRT84, Bon91]	-	11	1.5	–	100%
LCL139	–1	WjAlg1Eqn8	Lemma 8	A lemma in Wajsberg algebras	[FRT84, Bon91]	-	11	1.5	–	100%
LCL140	–1	WjAlg1Eqn9	Lemma 9	A lemma in Wajsberg algebras	[FRT84, Bon91]	-	11	1.5	–	100%
LCL141	–1	WjAlg1Eqn10	Lemma 10	A lemma in Wajsberg algebras	[FRT84, Bon91, MW92]	-	11	1.5	–	100%
LCL142	–1	WjLattEqn1	Lattice structure theorem 1	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	22	1.7	–	78%
LCL143	–1	WjLattEqn2	Lattice structure theorem 2	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	22	1.7	–	78%
LCL144	–1	WjLattEqn3	Lattice structure theorem 3	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	22	1.8	4%	75%
LCL145	–1	WjLattEqn4	Lattice structure theorem 4	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL146	–1	WjLattEqn5	Lattice structure theorem 5	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL147	–1	WjLattEqn6	Lattice structure theorem 6	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL148	–1	WjLattEqn7	Lattice structure theorem 7	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL149	–1	WjLattEqn9	Lattice structure theorem 9	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL150	–1	WjLattEqn10	Lattice structure theorem 10	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL151	–1	WjLattEqn11	Lattice structure theorem 11	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL152	–1	WjLattEqn12	Lattice structure theorem 12	A theorem in the lattice structure of Wajsberg algebras	[FRT84, Bon91]	-	21	1.8	–	83%
LCL153	–1	WjAlg2Ax1	W' axiom 1	The 1st alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL154	–1	WjAlg2Ax2	W' axiom 2	The 2nd alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL155	–1	WjAlg2Ax3	W' axiom 3	The 3rd alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL156	–1	WjAlg2Ax4	W' axiom 4	The 4th alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL157	–1	WjAlg2Ax5	W' axiom 5	The 5th alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL158	–1	WjAlg2Ax6	W' axiom 6	The 6th alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL159	–1	WjAlg2Ax7	W' axiom 7	The 7th alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL160	–1	WjAlg2Ax8	W' axiom 8	The 8th alternative Wajsberg algebra axiom	[FRT84, AB90, Bon91]	-	31	1.5	–	100%
LCL161	–1	WjAlg1Ax1	W axiom 1	The 1st Wajsberg algebra axiom, from the alternative axioms	[FRT84, AB90, Bon91]	-	24	1.4	–	100%
LCL162	–1	WjAlg1Ax2	W axiom 2	The 2nd Wajsberg algebra axiom, from the alternative axioms	[FRT84, AB90, Bon91]	-	24	1.4	–	100%
LCL163	–1	WjAlg1Ax3	W axiom 3	The 3rd Wajsberg algebra axiom, from the alternative axioms	[FRT84, AB90, Bon91]	-	24	1.4	–	100%
LCL164	–1	WjAlg1Ax4	W axiom 4	The 4th Wajsberg algebra axiom, from the alternative axioms	[FRT84, AB90, Bon91]	-	24	1.4	–	100%
LCL165	–1	WjAlg1Eqn11	Third problem	A theorem in Wajsberg algebras	[FRT84, AB90, Bon91]	-	21	1.5	–	100%
LCL166	–1	XHN_UM	EC-1	UM depends on XHN	[WWM+90, MW92]	-	3	1.7	–	–
LCL167	–1	XHK_YRO	EC-2	YRO depends on XHK	[WWM+90, MW92]	-	3	1.7	–	–
LCL168	–1	XEHNotAx	RC-2	XEH is not a single axiom for the R-calculus	[WWM+90, MW92]	-	6	1.3	–	–
LCL169	–1	PropEqn2.01	Problem 2.01	Principia Mathematica 2.01	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL170	–1	PropEqn2.02	Problem 2.02	Principia Mathematica 2.02	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL171	–1	PropEqn2.03	Problem 2.03	Principia Mathematica 2.03	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL172	–1	PropEqn2.04	Problem 2.04	Principia Mathematica 2.04	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
LCL173	PropEqn2.05	Principia Mathematica 2.05					
−1	Problem 2.05	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL174	PropEqn2.06	Principia Mathematica 2.06					
−1	Problem 2.06	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL175	PropEqn2.07	Principia Mathematica 2.07					
−1	Problem 2.07	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL176	PropEqn2.1	Principia Mathematica 2.1 and 2.08					
−1	Problem 2.1, Problem 2.08	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL177	PropEqn2.11	Principia Mathematica 2.11					
−1	Problem 2.11	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL178	PropEqn2.12	Principia Mathematica 2.12					
−1	Problem 2.12	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL179	PropEqn2.13	Principia Mathematica 2.13					
−1	Problem 2.13	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL180	PropEqn2.14	Principia Mathematica 2.14					
−1	Problem 2.14	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL181	PropEqn2.15	Principia Mathematica 2.15					
−1	Problem 2.15	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
−2	Pelletier 4	[WR27, SRM73, Pel86]	-	4	1.5	25%	–
LCL182	PropEqn2.16	Principia Mathematica 2.16					
−1	Problem 2.16	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL183	PropEqn2.17	Principia Mathematica 2.17					
−1	Problem 2.17	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL184	PropEqn2.18	Principia Mathematica 2.18					
−1	Problem 2.18	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL185	PropEqn2.2	Principia Mathematica 2.2					
−1	Problem 2.2	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL186	PropEqn2.21	Principia Mathematica 2.21					
−1	Problem 2.21	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL187	PropEqn2.24	Principia Mathematica 2.24					
−1	Problem 2.24	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL188	PropEqn2.25	Principia Mathematica 2.25					
−1	Problem 2.25	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL189	PropEqn2.26	Principia Mathematica 2.26 and 2.27					
−1	Problem 2.26, Problem 2.27	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL190	PropEqn2.3	Principia Mathematica 2.3					
−1	Problem 2.3	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL191	PropEqn2.31	Principia Mathematica 2.31					
−1	Problem 2.31	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL192	PropEqn2.32	Principia Mathematica 2.32 and 2.33					
−1	Problem 2.32, Problem 2.33	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL193	PropEqn2.36	Principia Mathematica 2.36					
−1	Problem 2.36	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL194	PropEqn2.37	Principia Mathematica 2.37					
−1	Problem 2.37	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL195	PropEqn2.38	Principia Mathematica 2.38					
−1	Problem 2.38	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL196	PropEqn2.4	Principia Mathematica 2.4					
−1	Problem 2.4	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL197	PropEqn2.41	Principia Mathematica 2.41					
−1	Problem 2.41	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL198	PropEqn2.42	Principia Mathematica 2.42 and 2.43					
−1	Problem 2.42, Problem 2.43	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL199	PropEqn2.45	Principia Mathematica 2.45					
−1	Problem 2.45	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL200	PropEqn2.46	Principia Mathematica 2.46					
−1	Problem 2.46	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL201	PropEqn2.47	Principia Mathematica 2.47					
−1	Problem 2.47	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL202	PropEqn2.48	Principia Mathematica 2.48					
−1	Problem 2.48	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL203	PropEqn2.49	Principia Mathematica 2.49					
−1	Problem 2.49	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL204	PropEqn2.5	Principia Mathematica 2.5					
−1	Problem 2.5	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL205	PropEqn2.51	Principia Mathematica 2.51					
−1	Problem 2.51	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL206	PropEqn2.52	Principia Mathematica 2.52					
−1	Problem 2.52	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL207	PropEqn2.521	Principia Mathematica 2.521					
−1	Problem 2.521	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL208	PropEqn2.53	Principia Mathematica 2.53					
−1	Problem 2.53	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL209	PropEqn2.54	Principia Mathematica 2.54					
−1	Problem 2.54	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL210	PropEqn2.55	Principia Mathematica 2.55					
−1	Problem 2.55	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL211	PropEqn2.56	Principia Mathematica 2.56					
−1	Problem 2.56	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL212	PropEqn2.6	Principia Mathematica 2.6					
−1	Problem 2.6	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL213	PropEqn2.61	Principia Mathematica 2.61					
−1	Problem 2.61	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL214	PropEqn2.61	Principia Mathematica 2.61					
−1	Problem 2.61	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
LCL215	PropEqn2.62	Principia Mathematica 2.62 and 2.63					
–1	Problem 2.62, Problem 2.63	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL216	PropEqn2.64	Principia Mathematica 2.64					
–1	Problem 2.64	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL217	PropEqn2.65	Principia Mathematica 2.65					
–1	Problem 2.65	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL218	PropEqn2.67	Principia Mathematica 2.67					
–1	Problem 2.67	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL219	PropEqn2.68	Principia Mathematica 2.68					
–1	Problem 2.68	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL220	PropEqn2.69	Principia Mathematica 2.69					
–1	Problem 2.69	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL221	PropEqn2.73	Principia Mathematica 2.73					
–1	Problem 2.73	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL222	PropEqn2.74	Principia Mathematica 2.74					
–1	Problem 2.74	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL223	PropEqn2.75	Principia Mathematica 2.75					
–1	Problem 2.75	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL224	PropEqn2.76	Principia Mathematica 2.76					
–1	Problem 2.76	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL225	PropEqn2.77	Principia Mathematica 2.77					
–1	Problem 2.77	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL226	PropEqn2.8	Principia Mathematica 2.8					
–1	Problem 2.8	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL227	PropEqn2.81	Principia Mathematica 2.81					
–1	Problem 2.81	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL228	PropEqn2.82	Principia Mathematica 2.82					
–1	Problem 2.82	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL229	PropEqn2.83	Principia Mathematica 2.83					
–1	Problem 2.83	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL230	PropEqn2.85	Principia Mathematica 2.85					
–1	Problem 2.85	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
–2	Pelletier 5	[WR27, SRM73, Pel86]	-	4	1.5	25%	–
LCL231	PropEqn2.86	Principia Mathematica 2.86					
–1	Problem 2.86	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL232	PropEqn3.1	Principia Mathematica 3.1					
–1	Problem 3.1	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL233	PropEqn3.11	Principia Mathematica 3.11					
–1	Problem 3.11	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL234	PropEqn3.2	Principia Mathematica 3.2 and 3.12					
–1	Problem 3.2, Problem 3.12	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL235	PropEqn3.13	Principia Mathematica 3.13					
–1	Problem 3.13	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL236	PropEqn3.14	Principia Mathematica 3.14					
–1	Problem 3.14	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL237	PropEqn3.21	Principia Mathematica 3.21					
–1	Problem 3.21	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL238	PropEqn3.22	Principia Mathematica 3.22					
–1	Problem 3.22	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL239	PropEqn3.24	Principia Mathematica 3.24					
–1	Problem 3.24	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL240	PropEqn3.26	Principia Mathematica 3.26					
–1	Problem 3.26	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL241	PropEqn3.27	Principia Mathematica 3.27					
–1	Problem 3.27	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL242	PropEqn3.3	Principia Mathematica 3.3					
–1	Problem 3.3	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL243	PropEqn3.31	Principia Mathematica 3.31					
–1	Problem 3.31	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL244	PropEqn3.33	Principia Mathematica 3.33					
–1	Problem 3.33	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL245	PropEqn3.34	Principia Mathematica 3.34					
–1	Problem 3.34	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL246	PropEqn3.35	Principia Mathematica 3.35					
–1	Problem 3.35	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL247	PropEqn3.37	Principia Mathematica 3.37					
–1	Problem 3.37	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL248	PropEqn3.4	Principia Mathematica 3.4					
–1	Problem 3.4	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL249	PropEqn3.41	Principia Mathematica 3.41					
–1	Problem 3.41	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL250	PropEqn3.42	Principia Mathematica 3.42					
–1	Problem 3.42	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL251	PropEqn3.43	Principia Mathematica 3.43					
–1	Problem 3.43	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL252	PropEqn3.44	Principia Mathematica 3.44					
–1	Problem 3.44	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL253	PropEqn3.45	Principia Mathematica 3.45					
–1	Problem 3.45	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL254	PropEqn3.47	Principia Mathematica 3.47					
–1	Problem 3.47	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL255	PropEqn3.48	Principia Mathematica 3.48					
–1	Problem 3.48	[WR27, NSS63, O'R89, SE94]	-	9	1.6	–	–
LCL256	Lk_NotNotImplies	A formula that can be derived from the Lukasiewicz system					
–1		[MW92]	-	5	1.4	–	–

Syntactic name / V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq

Domain LDA (14 abstract problems, 23 problems)

Syntactic name / V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
LDA001	LDAlgEqn1	`Verify 3*2*U = UUU, where U = 2*2`					
−1	Problem 1	[Jec93a]	-	10	1.5	–	100%
LDA002	LDAlgEqn2	`Verify 3*2(U2)(UU(UU)) = U1(U3)(UU(UU))`					
−1	Problem 2	[Jec93a]	-	17	1.3	–	100%
LDA003	LeftSegEqn1	`Show that 3 is a left segment of U = 2*2`					
−1	Problem 3	[Jec93a]	-	14	1.8	–	64%
LDA004	LeftSegEqn2	`Show that 3*2(U2) is a left segment of U1(U3)`					
−1	Problem 4	[Jec93a]	-	19	1.6	–	70%
LDA005	EmbdgAlgEqn1	`Let g=cr(t). Show that tt(tsg) < t(tsg) (for any s)`					
−1	Problem 5	[Jec93a]	-	25	1.7	8%	61%
−2		[Jec93a]	-	25	1.6	8%	70%
LDA006	EmbdgAlgEqn2	`Let g = cr(t). Show that tsg is not in the range of t`					
−1	Problem 6	[Jec93a]	-	25	1.7	8%	64%
−2		[Jec93a]	-	25	1.6	8%	72%
LDA007	EmbdgAlgEqn3	`Let g = cr(t). Show that t(tsg) = tt(ts)(tg)`					
−1	Problem 7	[Jec93a]	-	27	1.6	7%	65%
−2		[Jec93a]	-	27	1.6	7%	73%
−3	Problem 8	[Jec93a]	-	12	1.4	–	100%
LDA008	EmbdgAlgEqn4	`Let g = cr(t) = cr(T). If Ta < Tsg, then ta < tsg`					
−1	Problem 9	[Jec93a]	-	26	1.7	7%	60%
−2		[Jec93a]	-	27	1.6	7%	63%
LDA009	EmbdgAlgEqn5	`Let g = cr(t). If g < sg, then st(ts)g < stt(sg)`					
−1	Problem 10	[Jec93a]	-	28	1.6	7%	62%
−2		[Jec93a]	-	28	1.5	7%	69%
LDA010	EmbdgAlgEqn6	`Let g = cr(t). Show that stts(sttt)(stts)g < stt(sg)`					
−1	Problem 11	[Jec93a]	-	28	1.6	7%	62%
−2		[Jec93a]	-	28	1.5	7%	69%
LDA011	EmbdgAlgEqn7	`Let g = cr(t). Show that stts(sttt)(stts)stts(sttt)g < stt(sg)`					
−1	Problem 12	[Jec93a]	-	28	1.6	7%	62%
−2		[Jec93a]	-	28	1.5	7%	69%
LDA012	EmbdgAlgEqn8	`Let g = cr(t). Show that stts(sttt)g = g`					
−1	Problem 13	[Jec93a]	-	28	1.6	7%	64%
−2		[Jec93a]	-	28	1.5	7%	72%
LDA013	EmbdgAlgEqn9Base	`Let g = cr(t). Show that aag <= ag, t=a`					
−1	Conjecture 1	[Jec93a]	-	21	1.8	9%	57%
LDA014	EmbdgAlgEqn9Indn	`Let g = cr(t). Show that aag <= ag, t=a`					
−1	Conjecture 1	[Jec93a]	-	33	1.5	6%	64%

Domain MSC (9 abstract problems, 12 problems)

Syntactic name / V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
MSC001	BHand1	`A Blind Hand Problem`					
−1	APABHP, APABHP	[Pop70, MRS72, WM76]	-	18	2.0	5%	–
MSC002	BHand2	`A Blind Hand Problem`					
−1	DBABHP, DBABHP	[Pop70, MRS72, WM76]	-	14	2.1	7%	–
−2		[Pop70, MRS72]	-	10	2.0	10%	–
MSC003	HasParts1	`Show that the boy, John, has 2 hands`					
−1	HASPARTS-T1, HASPARTS-T1	[RRY+72, WM76]	-	8	2.0	12%	–
MSC004	HasParts2	`Show that the boy, John, has 10 fingers`					
−1	HASPARTS-T2, HASPARTS-T2	[RRY+72, WM76]	-	8	2.0	12%	–
MSC005	XOR	`The evaluation of XOR expressions`					
−1	Problem 5.1	[Pla82]	-	7	2.1	–	–
MSC006	NonObv	`A "non-obvious" problem`					
−1	nonob.lop	[PR86]	-	6	2.0	16%	–
MSC007	Pigeon	`Cook pigeon-hole problem`					
−1.005	Pelletier 72 (Size 4), pigeon.in (Size 4)	[CR79, Pel86]	-	45	2.2	11%	–
−2.002	Pelletier 73 (Size 4)	[CR79, Pel86, Pel88]	-	16	2.3	–	41%
MSC008	LatSq	`The (in)constructability of Graeco-Latin Squares`					
−1.002		[Rob63]	-	17	2.6	35%	–
−2.002	LATINSQ	[Rob63]	-	16	2.5	43%	–
MSC009	FamilyTBox	`Definitions of a family structure`					
−1	KL-ONE-example	[FLTZ93]	-	28	2.5	14%	–

Domain NUM (285 abstract problems, 309 problems)

Syntactic name / V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
NUM001	SumAssc	`(A + B) + C = A + (B + C)`					
−1	Chang-Lee-10a, ls28, ls28	[Cha70, LS74, WM76]	-	13	1.8	–	–
NUM002	SumDiff1	`(X - Y) + Z = X + (Z - Y)`					
−1	Chang-Lee-10b, ls29, Problem 29, ls29	[Cha70, LS74, WM76]	-	13	1.8	–	–
NUM003	SumDiff2	`A + (B - C) = (A - C) + B`					
−1	Chang-Lee-10c	[Cha70, LS74]	-	13	1.8	–	–
NUM004	SumDiff3	`(A + B) - C = A + (B - C)`					
−1	Chang-Lee-10d, Problem 29	[Cha70, LS74]	-	13	1.8	–	–
NUM005	GCD	`Greatest Common Divisor`					
−1	gcd, GCD	[Wan85, WB87]	-	40	2.2	5%	36%
NUM006	Goldbach	`Goldbach conjecture`					
−1	Problem 246-248	[BLM+86]	-	408	2.6	14%	39%
NUM007	LCM	`Least Common Multiple`					
−1	lcm, LCM	[Wan85, WB87]	-	46	2.4	8%	33%
NUM008	Peano1	`Peano axiom 0`					
−1	Problem 232	[BLM+86]	-	406	2.6	14%	39%
NUM009	Peano2	`Peano axiom 1`					
−1	Problem 233	[BLM+86]	-	406	2.6	14%	39%

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
NUM010		Peano3	Peano axiom 2					
	−1	Problem 234-235	[BLM+86]	-	407	2.6	14%	39%
NUM011		Peano4	Peano axiom 3					
	−1	Problem 236-237	[BLM+86]	-	407	2.6	14%	39%
NUM012		Peano5	Peano axiom 4					
	−1	Problem 238-241	[BLM+86]	-	409	2.6	14%	39%
NUM013		Peano6	Peano axiom 5					
	−1	Problem 242-244	[BLM+86]	-	408	2.6	14%	39%
NUM014		ValIsPrm	If a is a prime and a = b^ 2/c^ 2 then a divides b					
	−1	Example 6, Chang-Lee-7, NUM1, Example 2	[Luc68, Cha70, RRY+72, LS74, FLSY74]	-	7	1.9	14%	–
NUM015		PrmDivEx	Any number greater than 1 has a prime divisor					
	−1	Example 2, Example 3, Example 7, Chang-Lee-8, PRIM	[Luc68, Lov69, Cha70] [RRY+72, CL73, FLSY74]	-	9	2.1	33%	–
NUM016		InfPrmEx	There exist infinitely many primes					
	−1	Example 8b, ls17, Problem 17, ls17	[Luc68, Cha70, LS74, WM76]	-	12	1.8	25%	–
	−2	Example 8a, Chang-Lee-9	[Luc68, Cha70, CL73]	-	8	1.9	37%	–
NUM017		SqRtPrmIrr	Square root of this prime is irrational					
	−1	Problem 26, wos26	[Rob63, Wosb, LS74, WM76]	-	24	2.4	–	–
	−2		[Rob63]	-	28	2.4	–	33%
NUM018		Inf2PrmEx	There is an infinite number of twin prime numbers					
	−1	Problem 245	[BLM+86]	-	406	2.6	14%	39%
NUM019		EqSymm	Symmetry of equality can be derived					
	−1	ls41, Problem 41, ls41	[LS74, WM76]	-	11	1.4	–	–
NUM020		SuccX	a + 1 = successor(a)					
	−1	ls55, ls55	[LS74, WM76]	-	12	1.4	–	–
NUM021		NotDiv	If a <= b < c, then c cannot divide a					
	−1	ls65, ls65	[LS74, WM76]	-	19	1.7	5%	–
NUM022		LtDiv	Numerator divisble by smaller denominators					
	−1	ls651	[LS74, WM76]	-	10	2.0	10%	–
NUM023		0LtX	Zero is less than all successor numbers					
	−1	ls68, ls68	[LS74, WM76]	-	15	1.6	–	–
NUM024		XNotLtX	No number is less than itself					
	−1	ls75, ls75	[LS74, WM76]	-	16	1.6	–	–
NUM025		LtASym	If a<b then not b<a					
	−1	ls76t1, ls76t1	[LS74, WM76]	-	16	1.6	–	–
	−2	Problem 76t1	[LS74]	-	16	1.6	12%	–
NUM026		LtMult	Less preserved over multiplication by a number					
	−1	ls76t2, ls76t2	[LS74, WM76]	-	17	1.5	–	–
NUM027		Eqn1	If a >= b and b*c <= a*c, then c = 0					
	−1	ls87, ls87	[LS74, WM76]	-	21	1.7	9%	–
NUM028		SymnEqn1	Symmetrization property 1					
	−1	SY1	[Qua92a]	-	266	2.1	4%	44%
NUM029		SymnEqn2	Symmetrization property 2					
	−1	SY2	[Qua92a]	-	266	2.1	4%	44%
NUM030		SymnEqn3	Symmetrization property 3					
	−1	SY3	[Qua92a]	-	266	2.1	4%	44%
NUM031		SymnEqn4	Symmetrization property 4					
	−1	SY4	[Qua92a]	-	266	2.1	4%	44%
NUM032		SymnEqn5	Symmetrization property 5					
	−1	SY5	[Qua92a]	-	266	2.1	4%	44%
NUM033		SymnEqn6	Symmetrization property 6					
	−1	SY6	[Qua92a]	-	267	2.1	4%	44%
NUM034		SymnIdem	Symmetrization is idempotent					
	−1	SY7	[Qua92a]	-	265	2.1	4%	44%
NUM035		DomEqRngSymn	Domain equals range of symmetrization					
	−1	SY8	[Qua92a]	-	265	2.1	4%	44%
NUM036		SymnEqn7	Symmetrization property 7					
	−1	SY9	[Qua92a]	-	265	2.1	4%	44%
NUM037		SymnEqn8	Symmetrization property 8					
	−1	SY10.1	[Qua92a]	-	265	2.1	4%	44%
NUM038		SymnEqn9	Symmetrization property 9					
	−1	SY10.2	[Qua92a]	-	265	2.1	4%	44%
NUM039		IrreflClEqn1	Irreflexive class property 1					
	−1	IR1	[Qua92a]	-	267	2.1	4%	44%
NUM040		IrreflClEqn2	Irreflexive class property 2					
	−1	IR2	[Qua92a]	-	267	2.1	4%	44%
NUM041		IrreflClEqn3	Irreflexive class property 3					
	−1	IR3.1	[Qua92a]	-	266	2.1	4%	44%
NUM042		IrreflClEqn4	Irreflexive class property 4					
	−1	IR3.2	[Qua92a]	-	266	2.1	4%	44%
NUM043		IrreflClEqn5	Irreflexive class property 5					
	−1	IR4	[Qua92a]	-	266	2.1	4%	44%
NUM044		IrreflClEqn6	Irreflexive class property 6					
	−1	IR5	[Qua92a]	-	266	2.1	4%	44%
NUM045		IrreflClEqn7	Irreflexive class property 7					
	−1	IR6	[Qua92a]	-	266	2.1	4%	44%
NUM046		ConnClEqn1	Connected class property 1					
	−1	CR1	[Qua92a]	-	269	2.1	4%	44%
NUM047		ConnClEqn2	Connected class property 2					
	−1	CR2	[Qua92a]	-	267	2.1	4%	44%
NUM048		ConnClEqn3	Connected class property 3					
	−1	CR3	[Qua92a]	-	266	2.1	4%	44%
NUM049		ConnClEqn4	Connected class property 4					
	−1	CR4	[Qua92a]	-	266	2.1	4%	44%

Syntactic name	V#	Semantic name	Other names	Description	References	V	Cl	Av	nH	Eq
NUM050	−1	ConnClEqn5	CR5	Connected class property 5	[Qua92a]	-	266	2.1	4%	44%
NUM051	−1	ConnNullCl	CR6	Everything is connected to the null class	[Qua92a]	-	265	2.1	4%	44%
NUM052	−1	TransOrdEqn1	TO1	Transitive ordering property 1	[Qua92a]	-	270	2.1	4%	44%
NUM053	−1	TransOrdEqn2	TO2	Transitive ordering property 2	[Qua92a]	-	267	2.1	4%	44%
NUM054	−1	ASymClEqn1	AS1	Asymmetric class property 1	[Qua92a]	-	268	2.1	4%	44%
NUM055	−1	ASymClEqn2	AS2	Asymmetric class property 2	[Qua92a]	-	267	2.1	4%	44%
NUM056	−1	ASymClEqn3	AS3	Asymmetric class property 3	[Qua92a]	-	266	2.1	4%	44%
NUM057	−1	SegsEqn1	SG1	Segments property 1	[Qua92a]	-	265	2.1	4%	44%
NUM058	−1	SegsEqn2	SG2	Segments property 2	[Qua92a]	-	266	2.1	4%	44%
NUM059	−1	SegsEqn3	SG3	Segments property 3	[Qua92a]	-	266	2.1	4%	44%
NUM060	−1	SegsEqn4	SG4.1	Segments property 4	[Qua92a]	-	266	2.1	4%	44%
NUM061	−1	SegsEqn5	SG4.2	Segments property 5	[Qua92a]	-	268	2.1	4%	44%
NUM062	−1	SegsEqn6	SG5	Segments property 6	[Qua92a]	-	266	2.1	4%	44%
NUM063	−1	SegsEqn7	SG6	Segments property 7	[Qua92a]	-	266	2.1	4%	44%
NUM064	−1	LeastUnq	WE1	Least(xr,u) is unique	[Qua92a]	-	269	2.1	4%	44%
NUM065	−1	WellOrdEqn1	WE2.1	Well ordering property 1	[Qua92a]	-	269	2.1	4%	44%
NUM066	−1	WellOrdEqn1Cor	WE2.2 cor	Corollary to well ordering property 1	[Qua92a]	-	268	2.1	4%	44%
NUM067	−1	WellOrdEqn2	WE3.1	Well ordering property 2	[Qua92a]	-	268	2.1	4%	44%
NUM068	−1	WellOrdEqn3	WE3.2	Well ordering property 3	[Qua92a]	-	268	2.1	4%	44%
NUM069	−1	WellOrdEqn3Cor	WE3 cor.	Corollary to well ordering property 3	[Qua92a]	-	268	2.1	4%	44%
NUM070	−1	WellOrdASym	WE4.1	A well-order is asymmetric	[Qua92a]	-	266	2.1	4%	44%
NUM071	−1	WellOrdIrrefl	WE4.2	Well ordering is irreflexive	[Qua92a]	-	267	2.1	4%	44%
NUM072	−1	WellOrdEqn4	WE5	Well ordering property 4	[Qua92a]	-	270	2.1	4%	44%
NUM073	−1	WellOrdEqn4Cor	WE5 cor.	Corollary to well ordering property 4	[Qua92a]	-	270	2.1	4%	44%
NUM074	−1	WellOrdEqn5	WE6	Well ordering property 5	[Qua92a]	-	266	2.1	4%	44%
NUM075	−1	WellOrdEqn6	WE7	Well ordering property 6	[Qua92a]	-	267	2.1	4%	44%
NUM076	−1	WellOrdEqn7	WE8	Well ordering property 7	[Qua92a]	-	267	2.1	4%	44%
NUM077	−1	WellOrdEqn7Cor1	WE8 cor. 1	Corollary 1 to well ordering property 7	[Qua92a]	-	267	2.1	4%	44%
NUM078	−1	WellOrdEqn7Cor2	WE8 cor. 2	Corollary 2 to well ordering property 7	[Qua92a]	-	267	2.1	4%	44%
NUM079	−1	WellOrdEqn8	WE9.1	Well ordering property 8	[Qua92a]	-	266	2.1	4%	44%
NUM080	−1	WellOrdEqn9	WE9.2	Well ordering property 9	[Qua92a]	-	265	2.1	4%	44%
NUM081	−1	WellOrdEqn9Cor	WE9 cor.	Corollary to well ordering property 9	[Qua92a]	-	266	2.1	4%	44%
NUM082	−1	LeastUnqInSubS	WE10	Uniqueness of the least element of a non-empty subset	[Qua92a]	-	269	2.1	4%	44%
NUM083	−1	TransClEqn1	TR1	Transitive class property 1	[Qua92a]	-	267	2.1	4%	44%
NUM084	−1	AltTransClDef1	TR2	Alternate transitive class definition, part 1	[Qua92a]	-	266	2.1	4%	44%
NUM085	−1	AltTransClDef2	TR3	Alternate transitive class definition, part 2	[Qua92a]	-	266	2.1	4%	44%
NUM086	−1	TransClEqn2	TR4	Transitive class property 2	[Qua92a]	-	267	2.1	4%	44%
NUM087	−1	TransClEqn3	TR5	Transitive class property 3	[Qua92a]	-	267	2.1	4%	44%
NUM088	−1	TransClEqn4	TR6	Transitive class property 4	[Qua92a]	-	267	2.1	4%	44%
NUM089	−1	SectsEqn1	SE1	Sections property 1	[Qua92a]	-	269	2.1	4%	44%
NUM090	−1	SectsEqn1Cor	SE1 cor	Corollary to sections property 1	[Qua92a]	-	268	2.1	4%	44%
NUM091	−1	SectsEqn2	SE2	Sections property 2	[Qua92a]	-	267	2.1	4%	44%

Syntactic name V#	Semantic name / Other names	References	Description	V	Cl	Av	nH	Eq
NUM092 −1	SectsEqn2Cor1 SE2 cor. 1	[Qua92a]	Corollary 1 to sections property 2	-	267	2.1	4%	44%
NUM093 −1	SectsEqn2Cor2 SE2 cor. 2	[Qua92a]	Corollary 2 to sections property 2	-	267	2.1	4%	44%
NUM094 −1	SectsEqn3 SE3.1	[Qua92a]	Sections property 3	-	268	2.1	4%	44%
NUM095 −1	SectsEqn4 SE3.2	[Qua92a]	Sections property 4	-	268	2.1	4%	44%
NUM096 −1	SectsEqn5 SE4	[Qua92a]	Sections property 5	-	268	2.1	4%	44%
NUM097 −1	SectsEqn5Cor SE4 cor.	[Qua92a]	Corollary to sections property 5	-	268	2.1	4%	44%
NUM098 −1	OrdlEqn1 ORD1	[Qua92a]	Ordinal property 1	-	265	2.1	4%	44%
NUM099 −1	OrdlEqn1Cor ORD1 cor	[Qua92a]	Corollary to ordinal property 1	-	265	2.1	4%	44%
NUM100 −1	OrdlEqn2 ORD2	[Qua92a]	Ordinal property 2	-	265	2.1	4%	44%
NUM101 −1	OrdlEqn3 ORD5.1	[Qua92a]	Ordinal property 3	-	269	2.1	4%	44%
NUM102 −1	OrdlEqn4 ORD5.2	[Qua92a]	Ordinal property 4	-	268	2.1	4%	44%
NUM103 −1	OrdlEqn4Cor ORD5 cor	[Qua92a]	Corollary to ordinal property 4	-	268	2.1	4%	44%
NUM104 −1	OrdlEqn5 ORD6	[Qua92a]	Ordinal property 5	-	269	2.1	4%	44%
NUM105 −1	OrdlEqn6 ORD7.1	[Qua92a]	Ordinal property 6	-	266	2.1	4%	44%
NUM106 −1	OrdlEqn7 ORD7.2	[Qua92a]	Ordinal property 7	-	267	2.1	4%	44%
NUM107 −1	OrdlEqn8 ORD8.1	[Qua92a]	Ordinal property 8	-	266	2.1	4%	44%
NUM108 −1	OrdlEqn9 ORD8.2	[Qua92a]	Ordinal property 9	-	269	2.1	4%	44%
NUM109 −1	OrdlEqn10 ORD9	[Qua92a]	Ordinal property 10	-	269	2.1	4%	44%
NUM110 −1	OrdlEqn10Cor ORD9 cor	[Qua92a]	Corollary to ordinal property 10	-	265	2.1	4%	44%
NUM111 −1	OrdlEqn11 ORD11	[Qua92a]	Ordinal property 11	-	267	2.1	4%	44%
NUM112 −1	OrdlEqn12 ORD12	[Qua92a]	Ordinal property 12	-	265	2.1	4%	44%
NUM113 −1	OrdlEqn13 ORD13	[Qua92a]	Ordinal property 13	-	269	2.1	4%	43%
NUM114 −1	OrdlEqn13Cor ORD13 cor.	[Qua92a]	Corollary to ordinal property 13	-	266	2.1	4%	44%
NUM115 −1	OrdClNotSet ORD14	[Qua92a]	The class of ordinals is not a set.	-	265	2.1	4%	44%
NUM116 −1	OrdClNotSetCor ORD14 cor	[Qua92a]	Corollary to the class of ordinals is not set	-	265	2.1	4%	44%
NUM117 −1	OrdClNumCor ORD15	[Qua92a]	Corollary to ordinal class and numbers	-	270	2.1	4%	43%
NUM118 −1	OrdlEqn14 ORD16	[Qua92a]	Ordinal property 14	-	268	2.1	4%	44%
NUM119 −1	TransClEqn4Cor ORD17	[Qua92a]	Corollary to transitive class property 4	-	266	2.1	4%	44%
NUM120 −1	TrnsfIndn1 ORD18.1	[Qua92a]	Transfinite induction, part 1	-	266	2.1	4%	44%
NUM121 −1	TrnsfIndn2 ORD18.2	[Qua92a]	Transfinite induction, part 2	-	266	2.1	4%	44%
NUM122 −1	TrnsfIndn3 ORD18.3	[Qua92a]	Transfinite induction, part 3	-	266	2.1	4%	44%
NUM123 −1	AltTrnsfIndn3 ORD18.4	[Qua92a]	Alternate transfinite induction 3	-	266	2.1	4%	44%
NUM124 −1	SmTrnsfInd ORD18.5	[Qua92a]	Condensed statement of transfinite induction	-	266	2.1	4%	44%
NUM125 −1	CmpltIndnOmega ORD18.6	[Qua92a]	Complete induction upto omega	-	266	2.1	4%	44%
NUM126 −1	Alt1TrnsfInd1 ORD18-5.1	[Qua92a]	Alternate 1 for transfinite induction, part 1	-	266	2.1	4%	44%
NUM127 −1	Alt1TrnsfInd2 ORD18-5.2	[Qua92a]	Alternate 1 for transfinite induction, part 2	-	266	2.1	4%	44%
NUM128 −1	Alt1TrnsfInd3 ORD18-5.3	[Qua92a]	Alternate 1 for transfinite induction, part 3	-	266	2.1	4%	44%
NUM129 −1	Alt2TrnsfInd1 ORD18-6.1	[Qua92a]	Alternate 2 for transfinite induction, part 1	-	267	2.1	4%	44%
NUM130 −1	Alt2TrnsfInd2 ORD18-6.2	[Qua92a]	Alternate 2 for transfinite induction, part 2	-	267	2.1	4%	44%
NUM131 −1	Alt2TrnsfInd3 ORD18-6.3	[Qua92a]	Alternate 2 for transfinite induction, part 3	-	267	2.1	4%	44%
NUM132 −1	UnionSuccRelOrdl ORD20	[Qua92a]	Union of successor relation ordinal	-	266	2.1	4%	44%
NUM133 −1	UnionSuccRelOrdlCor ORD20 cor.	[Qua92a]	Corollary to union of successor ordinal	-	268	2.1	4%	44%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
NUM134	−1	SuccRelOrdl	ORD21	[Qua92a]	Successor relation of an ordinal is an ordinal	-	266	2.1	4%	44%
NUM135	−1	NullClSmOrdl	ORD22	[Qua92a]	The null class is the smallest ordinal	-	265	2.1	4%	44%
NUM136	−1	OrdlTrans	ORD23	[Qua92a]	Transitivity of ordinals	-	268	2.1	4%	44%
NUM137	−1	Cond1CmpltIndn	ORD24.1	[Qua92a]	Condition 1 for complete induction	-	268	2.1	4%	44%
NUM138	−1	Cond2CmpltIndn	ORD24.2	[Qua92a]	Condition 2 for complete induction	-	266	2.1	4%	44%
NUM139	−1	Cond3CmpltIndn	ORD24.3	[Qua92a]	Condition 3 for complete induction	-	266	2.1	4%	44%
NUM140	−1	SuccSet1	SUC1.1	[Qua92a]	The successor of a set is a set, part 1	-	266	2.1	4%	44%
NUM141	−1	SuccSet2	SUC1.2	[Qua92a]	The successor of a set is a set, part 2	-	266	2.1	4%	44%
NUM142	−1	SuccSet3	SUC1.3	[Qua92a]	The successor of a set is a set, part 3	-	265	2.1	4%	44%
NUM143	−1	SuccSetCor	SUC1 cor.	[Qua92a]	Corollary to the successor of a set being a set	-	265	2.1	4%	44%
NUM144	−1	SuccPprCl	SUC2	[Qua92a]	The successor of a proper class is a class	-	266	2.1	4%	44%
NUM145	−1	SuccPprClCor	SUC2 cor.	[Qua92a]	Corollary to the successor of a proper class being a class	-	266	2.1	4%	44%
NUM146	−1	SuccTransSet	SUC3	[Qua92a]	The successor of a transitive set is transitive	-	266	2.1	4%	44%
NUM147	−1	SuccOrdl	SUC4	[Qua92a]	The successor of an ordinal is an ordinal	-	266	2.1	4%	44%
NUM148	−1	PredOrdl	SUC5	[Qua92a]	The predecessor of an ordinal is an ordinal	-	266	2.1	4%	44%
NUM149	−1	SuccEqn1	SUC6	[Qua92a]	Successor property 1	-	265	2.1	4%	44%
NUM150	−1	SuccEqn1Cor1	SUC6 cor. 1	[Qua92a]	Corollary 1 to successor property 1	-	265	2.1	4%	44%
NUM151	−1	SuccEqn1Cor2	SUC6 cor. 2	[Qua92a]	Corollary 2 to successor property 1	-	266	2.1	4%	44%
NUM152	−1	SuccEqn1Cor3	SUC6 cor. 3	[Qua92a]	Corollary 3 to successor property 1	-	266	2.1	4%	44%
NUM153	−1	SuccEqn1Cor4	SUC6 cor. 4	[Qua92a]	Corollary 4 to successor property 1	-	266	2.1	4%	44%
NUM154	−1	SuccEqn1Cor5	SUC6 cor. 5	[Qua92a]	Corollary 5 to successor property 1	-	265	2.1	4%	44%
NUM155	−1	NoOrdlBtwn	SUC7	[Qua92a]	There is no ordinal between x and x + 1	-	268	2.1	4%	44%
NUM156	−1	Cond1K1Ordl	SUC9.1	[Qua92a]	Membership condition 1 for kind 1 ordinals	-	265	2.1	4%	44%
NUM157	−1	Cond2K1Ordl	SUC9.2	[Qua92a]	Membership condition 2 for kind 1 ordinals	-	266	2.1	4%	44%
NUM158	−1	Cond3K1Ordl	SUC9.3	[Qua92a]	Membership condition 3 for kind 1 ordinals	-	267	2.1	4%	44%
NUM159	−1	Cond4K1Ordl	SUC9.4	[Qua92a]	Membership condition 4 for kind 1 ordinals	-	265	2.1	4%	44%
NUM160	−1	K1OrdlCl	SUC10	[Qua92a]	Kind 1 ordinals is a class of ordinals	-	265	2.1	4%	44%
NUM161	−1	K1OrdlClCor	SUC10 cor.	[Qua92a]	Corollary to kind 1 ordinals being a class of ordinals	-	265	2.1	4%	44%
NUM162	−1	SuccEqn2	SUC11	[Qua92a]	Successor property 2	-	265	2.1	4%	44%
NUM163	−1	IndvClsdUnion	SUC12.1	[Qua92a]	Inductive is closed under union	-	267	2.1	4%	44%
NUM164	−1	IndvClsdIntsc	SUC12.2	[Qua92a]	Inductive is closed under intersection	-	267	2.1	4%	44%
NUM165	−1	OmegaDefCor1	SUC13.1	[Qua92a]	Corollary to omega definition, part 1	-	266	2.1	4%	44%
NUM166	−1	OmegaDefCor2	SUC13.2	[Qua92a]	Corollary to omega definition, part 2	-	265	2.1	4%	44%
NUM167	−1	SuccEqn3	SUC14	[Qua92a]	Successor property 3	-	265	2.1	4%	44%
NUM168	−1	SuccEqn3Cor	SUC14 cor.	[Qua92a]	Corollary to successor property 3	-	265	2.1	4%	44%
NUM169	−1	SuccEqn4	SUC15.1	[Qua92a]	Successor property 4	-	266	2.1	4%	44%
NUM170	−1	SuccEqn5	SUC15.2	[Qua92a]	Successor property 5	-	267	2.1	4%	44%
NUM171	−1	SuccEqn6	SUC15.3	[Qua92a]	Successor property 6	-	265	2.1	4%	44%
NUM172	−1	SuccRelSet	SUC16	[Qua92a]	The successor relation of a set is different from the set	-	266	2.1	4%	44%
NUM173	−1	SuccEqn7	SUC17	[Qua92a]	Successor property 7	-	266	2.1	4%	44%
NUM174	−1	SuccEqn8	SUC18	[Qua92a]	Successor property 8	-	265	2.1	4%	44%
NUM175	−1	SuccEqn9	SUC19	[Qua92a]	Successor property 9	-	265	2.1	4%	44%

Syntactic name	V#	Semantic name	Other names	Description	References	V	Cl	Av	nH	Eq
NUM176	−1	SuccEqn10	SUC20	Successor property 10	[Qua92a]	-	266	2.1	4%	44%
NUM177	−1	Cond1IndvCl	SUC21.1	Condition 1 for a class to be inductive	[Qua92a]	-	267	2.1	4%	44%
NUM178	−1	Cond2IndvCl	SUC21.2	Condition 2 for a class to be inductive	[Qua92a]	-	266	2.1	4%	44%
NUM179	−1	Cond3IndvCl	SUC21.3	Condition 3 for a class to be inductive	[Qua92a]	-	266	2.1	4%	44%
NUM180	−1	LmtOrdl	LIM2.1	Limit ordinals are ordinals	[Qua92a]	-	265	2.1	4%	44%
NUM181	−1	NullClNotLmt	LIM2.2	The null class is not a limit ordinal	[Qua92a]	-	265	2.1	4%	44%
NUM182	−1	LmtOrdlEqSucc	LIM2.3	Only limit ordinals equal their successors	[Qua92a]	-	266	2.1	4%	44%
NUM183	−1	OrdlK1OrLmt	LIM2.4	Ordinals are either kind 1 or limit	[Qua92a]	-	267	2.1	4%	44%
NUM184	−1	OrdlK1OrLmtCor	LIM2.4 cor.	Corollary to ordinals are either kind 1 or limit	[Qua92a]	-	265	2.1	4%	44%
NUM185	−1	LmtOrdlNotMemb	LIM3	Limit ordinals are not members	[Qua92a]	-	265	2.1	4%	44%
NUM186	−1	OmegaEqn1	OM1	Omega property 1	[Qua92a]	-	265	2.1	4%	44%
NUM187	−1	SuccEqn8Lem	OM2	Lemma for successor property 8	[Qua92a]	-	267	2.1	4%	44%
NUM188	−1	OmegaTrans	OM3	Omega is transitive	[Qua92a]	-	265	2.1	4%	44%
NUM189	−1	OmegaOrdl	OM4	Omega is an ordinal	[Qua92a]	-	265	2.1	4%	44%
NUM190	−1	OmegaNotNullCl	OM5	Omega is not the null class	[Qua92a]	-	265	2.1	4%	44%
NUM191	−1	OmegaLmtOrdl	OM6	Omega is a limit ordinal	[Qua92a]	-	265	2.1	4%	44%
NUM192	−1	OmegaSmLmtOrdl	OM7	Omega is the smallest limit ordinal	[Qua92a]	-	266	2.1	4%	44%
NUM193	−1	SumOrdls	LUB1	The sum of ordinals is an ordinal	[Qua92a]	-	265	2.1	4%	44%
NUM194	−1	UnionClOrdls	LUB2	The union of a class of ordinals is a class of ordinals	[Qua92a]	-	266	2.1	4%	44%
NUM195	−1	UnionClOrdlsTrans	LUB3	The union of a class of ordinals is transitive	[Qua92a]	-	266	2.1	4%	44%
NUM196	−1	UnionSetOrdls	LUB4	The union of a set of ordinals is an ordinal	[Qua92a]	-	267	2.1	4%	44%
NUM197	−1	UnionPprClOrdls	LUB4-5	The union of a proper class of ordinals is the class of ordinals	[Qua92a]	-	267	2.1	4%	44%
NUM198	−1	UnionSetOrdlsGt	LUB5.1	The union of a set of ordinals is >= each ordinal in the set	[Qua92a]	-	269	2.1	4%	44%
NUM199	−1	LubEqn1	LUB5.2	Least upper bound property 1	[Qua92a]	-	267	2.1	4%	44%
NUM200	−1	LubEqn2	LUB6	If every element of x is <= y, then sum class(x) <= y	[Qua92a]	-	267	2.1	4%	44%
NUM201	−1	LubEqn3	LUB7	Least upper bound property 3	[Qua92a]	-	268	2.1	4%	44%
NUM202	−1	LubSuccRel	LUB8	If the lub of a set of ordinals is a successor, it's in the set	[Qua92a]	-	268	2.1	4%	44%
NUM203	−1	LubSuccRelCor	LUB8 cor.	Corollary to least upper bound being a successor relation	[Qua92a]	-	269	2.1	4%	44%
NUM204	−1	LubEqn5	LUB9	Least upper bound property 5	[Qua92a]	-	266	2.1	4%	44%
NUM205	−1	LubEqn5Cor1	LUB9 cor. 1	Corollary 1 to least upper bound property 5	[Qua92a]	-	266	2.1	4%	44%
NUM206	−1	LubEqn5Cor2	LUB9 cor. 2	Corollary 2 to least upper bound property 5	[Qua92a]	-	266	2.1	4%	44%
NUM207	−1	LubEqn6	LUB10	Least upper bound property 6	[Qua92a]	-	267	2.1	4%	44%
NUM208	−1	LubEqn7	LUB11	Least upper bound property 7	[Qua92a]	-	266	2.1	4%	44%
NUM209	−1	LubEqn7Cor	LUB11 cor.	Corollary to least upper bound property 7	[Qua92a]	-	267	2.1	4%	44%
NUM210	−1	LubEqn8Lem1	LUB12.1	Lemma 1 for least upper bound property 8	[Qua92a]	-	267	2.1	4%	44%
NUM211	−1	LubEqn8Lem2	LUB12.2	Lemma 2 for least upper bound property 8	[Qua92a]	-	267	2.1	4%	44%
NUM212	−1	LubEqn8Lem3	LUB12.3	Lemma 3 for least upper bound property 8	[Qua92a]	-	267	2.1	4%	44%
NUM213	−1	Alt3TrnsfInd	LUB13	Alternate 3 for transfinite induction	[Qua92a]	-	268	2.1	4%	44%
NUM214	−1	IndnY	LUB14	Induction up to y	[Qua92a]	-	269	2.1	4%	44%
NUM215	−1	IndnYCor	LUB14 cor.	Corollary to induction upto y	[Qua92a]	-	267	2.1	4%	44%
NUM216	−1	RestDefCor1	TRECDEF1 cor.1	Corollary 1 to rest definition	[Qua92a]	-	266	2.1	4%	44%
NUM217	−1	RestDefCor2	TRECDEF1 cor.2	Corollary 2 to rest definition	[Qua92a]	-	265	2.1	4%	44%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
NUM218	RestFunc	Rest of is a function					
−1	TREC2	[Qua92a]	-	265	2.1	4%	44%
NUM219	DomRestOfEqDom	The domain of rest_of(X) is the domain of X					
−1	TREC3	[Qua92a]	-	265	2.1	4%	44%
NUM220	DomRestOfEqDomCor	Corollary to the domain of rest_of(X) being the domain of X					
−1	TREC3 cor.	[Qua92a]	-	265	2.1	4%	44%
NUM221	RestOfEqn1	Rest_of property 1					
−1	TREC3-5	[Qua92a]	-	266	2.1	4%	44%
NUM222	RestOfMono	Rest_of is monotonic.					
−1	TREC3-7	[Qua92a]	-	266	2.1	4%	44%
NUM223	RestRelFunc	Rest relation is a function					
−1	TREC3-9.1	[Qua92a]	-	265	2.1	4%	44%
NUM224	RestRelEqn1	Rest relation property 1					
−1	TREC3-9.2	[Qua92a]	-	265	2.1	4%	44%
NUM225	RestRelEqn2	Rest relation property 2					
−1	TREC3-9.3	[Qua92a]	-	265	2.1	4%	44%
NUM226	RestRelEqn3	Rest relation property 3					
−1	TREC3-9.4	[Qua92a]	-	266	2.1	4%	44%
NUM227	RestRelEqn4	Rest relation property 4					
−1	TREC3-9.5	[Qua92a]	-	265	2.1	4%	44%
NUM228	RecrEqnFuncDefCor	Corollary to recursion equation functions definition					
−1	TRECDEF4 cor.	[Qua92a]	-	266	2.1	4%	44%
NUM229	TrnsfRecrLem0	Transfinite recursion lemma 0					
−1	TREC.LEMMA0	[Qua92a]	-	267	2.1	4%	44%
NUM230	TrnsfRecrLem1	Transfinite recursion lemma 1					
−1	TREC.LEMMA1	[Qua92a]	-	269	2.1	4%	44%
NUM231	TrnsfRecrLem2	Transfinite recursion lemma 2					
−1	TREC.LEMMA2	[Qua92a]	-	270	2.1	4%	44%
NUM232	TrnsfRecrLem3	Transfinite recursion lemma 3					
−1	TREC.LEMMA3	[Qua92a]	-	268	2.1	4%	44%
NUM233	TrnsfRecrLem4	Transfinite recursion lemma 4					
−1	TREC.LEMMA4	[Qua92a]	-	269	2.1	4%	44%
NUM234	TrnsfRecrLem5	Transfinite recursion lemma 5					
−1	TREC.LEMMA5	[Qua92a]	-	269	2.1	4%	44%
NUM235	TrnsfRecrLem6	Transfinite recursion lemma 6					
−1	TREC.LEMMA6	[Qua92a]	-	268	2.1	4%	44%
NUM236	TrnsfRecrLem6Cor1	Corollary 1 to transfinite recursion lemma 6					
−1	TREC.LEMMA6 cor.1	[Qua92a]	-	267	2.1	4%	44%
NUM237	TrnsfRecrLem6Cor2	Corollary 2 to transfinite recursion lemma 6					
−1	TREC.LEMMA6 cor.2	[Qua92a]	-	267	2.1	4%	44%
NUM238	TrnsfRecrLem7	Transfinite recursion lemma 7					
−1	TREC.LEMMA7	[Qua92a]	-	269	2.1	4%	44%
NUM239	TrnsfRecrLem8	Transfinite recursion lemma 8					
−1	TREC.LEMMA8	[Qua92a]	-	268	2.1	4%	44%
NUM240	TrnsfRecrLem9_1	Transfinite recursion lemma 9.1					
−1	TREC.LEMMA9.1	[Qua92a]	-	266	2.1	4%	44%
NUM241	TrnsfRecrLem9_2	Transfinite recursion lemma 9.2					
−1	TREC.LEMMA9.2	[Qua92a]	-	265	2.1	4%	44%
NUM242	TrnsfRecrLem9_3	Transfinite recursion lemma 9.3					
−1	TREC.LEMMA9.3	[Qua92a]	-	270	2.1	4%	44%
NUM243	TrnsfRecrLem10	Transfinite recursion lemma 10					
−1	TREC.LEMMA10	[Qua92a]	-	269	2.1	4%	44%
NUM244	TrnsfRecrLem11	Transfinite recursion lemma 11					
−1	TREC.LEMMA11	[Qua92a]	-	269	2.1	4%	44%
NUM245	TrnsfRecrEqn1	Transfinite recursion property 1					
−1		[Qua92a]	-	267	2.1	4%	44%
−2	TREC5.1	[Qua92a]	-	283	2.2	6%	42%
NUM246	TrnsfRecrEqn2	Transfinite recursion property 2					
−1		[Qua92a]	-	270	2.1	4%	44%
−2	TREC5.2	[Qua92a]	-	286	2.2	6%	42%
NUM247	TrnsfRecrEqn3	Transfinite recursion property 3					
−1		[Qua92a]	-	265	2.1	4%	44%
−2	TREC6	[Qua92a]	-	281	2.2	6%	42%
NUM248	TrnsfRecrEqn4	Transfinite recursion property 4					
−1		[Qua92a]	-	265	2.1	4%	44%
−2	TREC7	[Qua92a]	-	281	2.2	6%	42%
NUM249	TrnsfRecrEqn5	Transfinite recursion property 5					
−1		[Qua92a]	-	265	2.1	4%	44%
−2	TREC7-5	[Qua92a]	-	281	2.2	6%	42%
NUM250	TrnsfRecrEqn6	Transfinite recursion property 6					
−1		[Qua92a]	-	265	2.1	4%	44%
−2	TREC8	[Qua92a]	-	281	2.2	6%	42%
NUM251	TrnsfRecrEqn7	Transfinite recursion property 7					
−1		[Qua92a]	-	265	2.1	4%	44%
−2	TREC9	[Qua92a]	-	281	2.2	6%	42%
NUM252	TrnsfRecrEqn8	Transfinite recursion property 8					
−1		[Qua92a]	-	266	2.1	4%	44%
−2	TREC10	[Qua92a]	-	282	2.2	6%	42%
NUM253	TrnsfRecrEqn9	Transfinite recursion property 9					
−1		[Qua92a]	-	266	2.1	4%	44%
−2	TREC11	[Qua92a]	-	282	2.2	6%	42%
NUM254	TrnsfRecrEqn10	Transfinite recursion property 10					
−1		[Qua92a]	-	266	2.1	4%	44%
−2	TREC12	[Qua92a]	-	282	2.2	6%	42%

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
NUM255		TrnsfRecrEqn11	Transfinite recursion property 11					
	–1		[Qua92a]	-	266	2.1	4%	44%
	–2	TREC13	[Qua92a]	-	282	2.2	6%	42%
NUM256		TrnsfRecrEqn12	Transfinite recursion property 12					
	–1		[Qua92a]	-	267	2.1	4%	44%
	–2	TREC14	[Qua92a]	-	283	2.2	6%	42%
NUM257		TrnsfRecrEqn13	Transfinite recursion property 13					
	–1		[Qua92a]	-	266	2.1	4%	44%
	–2	TREC15	[Qua92a]	-	282	2.2	6%	42%
NUM258		TrnsfRecrEqn14	Transfinite recursion property 14					
	–1		[Qua92a]	-	266	2.1	4%	44%
	–2	TREC16	[Qua92a]	-	282	2.2	6%	42%
NUM259		TrndfRecrFuncUnq	The uniqueness of the function defined by transfinite recursion					
	–1		[Qua92a]	-	268	2.1	4%	44%
	–2	TREC17	[Qua92a]	-	284	2.2	6%	42%
NUM260		Alt4TrnsfIndn1	Alternate 4 for transfinite induction, part 1					
	–1		[Qua92a]	-	265	2.1	4%	44%
	–2	TREC18.1	[Qua92a]	-	281	2.2	6%	42%
NUM261		Alt4TrnsfIndn2	Alternate 4 for transfinite induction, part 2					
	–1		[Qua92a]	-	265	2.1	4%	44%
	–2	TREC18.2	[Qua92a]	-	281	2.2	6%	42%
NUM262		Alt4TrnsfIndn3	Alternate 4 for transfinite induction, part 3					
	–1		[Qua92a]	-	265	2.1	4%	44%
	–2	TREC18.3	[Qua92a]	-	281	2.2	6%	42%
NUM263		Alt4TrnsfIndn4	Alternate 4 for transfinite induction, part 4					
	–1		[Qua92a]	-	266	2.1	4%	44%
	–2	TREC18.4	[Qua92a]	-	282	2.2	6%	42%
NUM264		Alt4TrnsfIndn5	Alternate 4 for transfinite induction, part 5					
	–1		[Qua92a]	-	266	2.1	4%	44%
	–2	TREC18.5	[Qua92a]	-	282	2.2	6%	42%
NUM265		OrdlAddEqn1	Ordinal addition property 1					
	–1	OA6.1	[Qua92a]	-	265	2.1	4%	44%
NUM266		OrdlAddEqn2	Ordinal addition property 2					
	–1	OA6.2	[Qua92a]	-	266	2.1	4%	44%
NUM267		OrdlAddEqn3	Ordinal addition property 3					
	–1	OA6.3	[Qua92a]	-	266	2.1	4%	44%
NUM268		OrdlAddEqn4	Ordinal addition property 4					
	–1	OA6.4	[Qua92a]	-	266	2.1	4%	44%
NUM269		OrdlAddEqn5	Ordinal addition property 5					
	–1	OA7	[Qua92a]	-	267	2.1	4%	44%
NUM270		OrdlAddEqn6	Ordinal addition property 6					
	–1	OA8	[Qua92a]	-	265	2.1	4%	44%
NUM271		OrdlAddEqn7Lem1	Lemma 1 for ordinal addition property 7					
	–1	OA9 lemma 1	[Qua92a]	-	268	2.1	4%	44%
NUM272		OrdlAddEqn7Lem2	Lemma 2 for ordinal addition property 7					
	–1	OA9 lemma 2	[Qua92a]	-	268	2.1	4%	44%
NUM273		OrdlAddEqn7Lem3	Lemma 3 for ordinal addition property 7					
	–1	OA9 lemma 3	[Qua92a]	-	268	2.1	4%	44%
NUM274		OrdlAddEqn7Lem4	Lemma 4 for ordinal addition property 7					
	–1	OA9 lemma 4	[Qua92a]	-	268	2.1	4%	44%
NUM275		OrdlAddEqn7Lem5	Lemma 5 for ordinal addition property 7					
	–1	OA9 lemma 5	[Qua92a]	-	268	2.1	4%	44%
NUM276		OrdlAddEqn7Lem6	Lemma 6 for ordinal addition property 7					
	–1	OA9 lemma 6	[Qua92a]	-	268	2.1	4%	44%
NUM277		OrdlAddEqn7_1	Ordinal addition property 7_1					
	–1	OA9.1	[Qua92a]	-	268	2.1	4%	44%
	–2	OA10	[Qua92a]	-	274	2.1	4%	44%
NUM278		OrdlAddEqn7_2	Ordinal addition property 7_2					
	–1	OA9.2	[Qua92a]	-	266	2.1	4%	44%
NUM279		OrdlAddEqn8	Ordinal addition property 8					
	–1		[Qua92a]	-	265	2.1	4%	44%
NUM280		OrdlMultEqn1	Ordinal multiplication property 1					
	–1	OM2.1	[Qua92a]	-	265	2.1	4%	44%
NUM281		OrdlMultEqn2	Ordinal multiplication property 2					
	–1	OM2.2	[Qua92a]	-	266	2.1	4%	44%
NUM282		OrdlMultEqn3	Ordinal multiplication property 3					
	–1	OM2.3	[Qua92a]	-	266	2.1	4%	44%
NUM283		Factorial	Calculation of factorial					
	–1.005	facX.lop (Size X)		-	7	1.7	–	–
NUM284		Fibonacci	Calculation of fibonacci numbers					
	–1.010	fibX.lop (Size X)		-	6	2.0	–	–
NUM285		BiCond	a0 + ... + a5 = b1 + ... + b5, expression in logic					
	–1			-	54	2.7	57%	–

Domain PLA (23 abstract problems, 30 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
PLA001		Bread	Cheyenne to DesMoines, buying a loaf of bread on the way					
	–1		[Pla81]	-	16	1.4	–	–
PLA002		Going	Getting from here to there, in all weather					
	–1	Problem 5.7	[Pla82]	-	17	2.1	5%	–
	–2		[Pla82]	-	23	2.8	4%	–
PLA003		Monkey	Monkey and Bananas Problem					
	–1			-	11	1.8	–	–

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
PLA004	Blocks_CBA	Block C on B on A					
–1		[G.J73, SE94]	-	31	1.7	–	–
–2		[G.J73, SE94]	-	31	1.7	–	–
PLA005	Blocks_CA_DB	Block C on A and D on B					
–1		[G.J73, SE94]	-	31	1.7	–	–
–2		[G.J73, SE94]	-	31	1.7	–	–
PLA006	Blocks_CTable	Block C on Table					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA007	Blocks_AD	Block A on D					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA008	Blocks_BD_AC	Block B on D and A on C					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA009	Blocks_AB_D	Block A on B and D clear					
–1		[G.J73, SE94]	-	31	1.7	–	–
–2		[G.J73, SE94]	-	31	1.7	–	–
PLA010	Blocks_ADB	Block A on D on B					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA011	Blocks_DCB	Block D on C on B					
–1		[G.J73, SE94]	-	31	1.7	–	–
–2		[G.J73, SE94]	-	31	1.7	–	–
PLA012	Blocks_DBC	Block D on B on C					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA013	Blocks_ACB	Block A on C on B					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA014	Blocks_ABC	Block A on B on C					
–1		[G.J73, SE94]	-	31	1.7	–	–
–2		[G.J73, SE94]	-	31	1.7	–	–
PLA015	Blocks_ABD	Block A on B on D					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA016	Blocks_DA	Block D on A					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA017	Blocks_AC	Block A on C					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA018	Blocks_AB_DC	Block A on B and D on C					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA019	Blocks_DC	Block D on C					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA020	Blocks_D	Block D clear					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA021	Blocks_BD_CA	Block B on D and C on A					
–1		[G.J73, SE94]	-	31	1.7	–	–
PLA022	Blocks_ACD	Block A on C on D					
–1		[G.J73, SE94]	-	31	1.7	–	–
–2		[G.J73, SE94]	-	31	1.7	–	–
PLA023	Blocks_DAC	Block D on A on C					
–1		[G.J73, SE94]	-	31	1.7	–	–

Domain PRV (9 abstract problems, 9 problems)

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
PRV001	Unknown	PV1					
–1	PV1	[MOW76]	-	14	2.6	14%	–
PRV002	Unknown	E1					
–1	E1, v1.lop	[MOW76]	-	29	1.8	6%	39%
PRV003	Unknown	E2					
–1	E2, v2.lop	[MOW76]	-	27	1.9	7%	41%
PRV004	Unknown	E3					
–1	E3, v3.lop	[MOW76]	-	29	1.8	6%	39%
PRV005	Unknown	E4					
–1	E4, v4.lop	[MOW76]	-	27	1.9	7%	41%
PRV006	Unknown	E5					
–1	E5, v5.lop	[MOW76]	-	26	1.9	7%	42%
PRV007	Unknown	E6					
–1	E6, v6.lop	[MOW76]	-	29	1.8	6%	41%
PRV008	Unknown	E7					
–1	E7, v7.lop	[MOW76]	-	23	2.0	8%	46%
PRV009	FIND	A condition from Hoare's FIND program					
–1	Hoares FIND, Problem 5.5	[Ble77, Pla82]	-	9	2.2	11%	–

Domain PUZ (34 abstract problems, 45 problems)

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
PUZ001	Agatha	Dreadbury Mansion					
–1		[Pel86, MB88]	-	12	1.8	16%	–
–2	Pelletier 55	[Pel86, Pel88]	-	26	2.0	11%	37%
–3		[Pel86, MB88]	-	12	1.8	16%	–
PUZ002	Animals	The Animals Puzzle					
–1	animals.ver1.in	[Car86]	-	12	1.8	8%	–
PUZ003	Barber	The Barber Puzzle					
–1	barber.ver1.in		-	8	1.6	–	–
PUZ004	Letters	The Letters Puzzle					
–1	letters.ver1.in	[Car86]	-	12	1.8	8%	–
PUZ005	LionU	Lions and Unicorns					
–1	Lion and the Unicorn	[Smu78b, OSS85]	-	51	2.2	11%	–
PUZ006	MarsVenus1	Determine sex and race on Mars and Venus					
–1	mars_venus.in		-	42	2.3	9%	18%
PUZ007	MarsVenus2	Mixed couples on Mars and Venus					
–1	mars_venus2.in		-	41	2.3	17%	21%

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
PUZ008		MissCann	Missionaries and Cannibals					
	−1	mission.ver1.in	[WOLB92, Rap95]	-	16	1.6	–	–
	−2	mission.ver2.in		-	32	1.9	–	–
	−3		[Rap95]	-	16	3.0	–	–
PUZ009		Oona	Looking for Oona					
	−1	oona.in	[Smu87]	-	18	2.2	33%	–
PUZ010		Zebra	Who owns the zebra?					
	−1	jobs	[SS86, LP92, Lee92]	-	128	2.5	4%	–
PUZ011		Borders1	An ocean that borders on an African and an Asian country					
	−1	Problem 5.6	[Pla82]	-	27	1.1	–	–
PUZ012		Boxes	The Mislabeled Boxes					
	−1	Boxes-of-fruit, Boxes-of-fruit, boxes.ver1.in	[WOLB92, Wos88]	-	18	1.6	11%	–
PUZ013		Boys1	The School Boys : Prove some monitors are awake					
	−1	boys.ver1.in	[Car86]	-	20	2.5	40%	–
PUZ014		Boys2	The School Boys : Prove that all monitors are awake					
	−1	School Boys	[LO85a, Car86]	-	20	2.5	40%	–
PUZ015		Checkers1	Checkerboard and Dominoes : Opposing corners removed					
	−1	chekndom.ver1.in		-	37	1.7	–	65%
	−2.003		[Sti93]	-	31	2.1	22%	–
PUZ016		Checkers2	Checkerboard and Dominoes : Row 1, columns 2 and 3 removed					
	−1	chekndom.ver2.in		-	37	1.7	–	65%
	−2.003		[Sti93]	-	30	2.0	23%	–
PUZ017		Houses	The Houses					
	−1	houses.ver1.in		-	148	2.2	11%	–
PUZ018		Interns	The Interns					
	−1	interns.ver1.in	[Rap95]	-	48	1.5	4%	–
	−2		[Rap95]	-	47	1.5	4%	–
PUZ019		Jobs	The Jobs Puzzles					
	−1	jobs.ver1.in	[WOLB92]	-	63	1.7	6%	–
PUZ020		KKnave1	A knights & knaves problem, if he's a knight, so is she					
	−1	knightknave.in	[Rap95]	-	29	2.3	10%	26%
PUZ021		KKnave2	How to Win a Bride					
	−1	Problem 95, How to Win a Bride	[Smu78b, Ohl85]	-	13	2.4	30%	–
PUZ022		Borders2	An ocean that borders on two adjacent Australian states					
	−1		[Pla82]	-	33	1.2	–	–
PUZ023		KKnave27	Knights and Knaves #27					
	−1	Problem 27, tandl27.ver1.in	[Smu78b]	-	22	3.0	27%	–
PUZ024		KKnave31	Knights and Knaves #31					
	−1	Problem 31, tandl31.ver1.in	[Smu78b]	-	20	3.0	30%	–
PUZ025		KKnave35	Knights and Knaves #35					
	−1	Problem 35, tandl35.ver1.in	[Smu78b]	-	24	2.5	25%	–
PUZ026		KKnave39	Knights and Knaves #39					
	−1	Problem 39, tandl39.ver1.in	[Smu78b]	-	23	2.3	17%	–
PUZ027		KKnave42	Knights and Knaves #42					
	−1	Problem 42, tandl42.ver1.in	[Smu78b]	-	32	2.8	28%	–
PUZ028		Party	People at a party					
	−1		[ICO92]	-	15	1.7	6%	–
	−2	ramsey1.lop		-	39	1.2	2%	–
	−3	ramsey3.lop		-	504	3.0	7%	–
	−4	ramsey3a.lop		-	270	2.9	11%	–
PUZ029		Pigs	The pigs and balloons puzzle					
	−1	pigs.ver1.in	[Car86]	-	15	2.4	26%	–
PUZ030		SaltM	Salt and Mustard Problem					
	−1	Salt and Mustard Problem,	[LO85a, Car86, MB88]	-	43	2.5	30%	–
	−2	salt.in	[Car86]	-	63	3.4	57%	–
PUZ031		SteamR	Schubert's Steamroller					
	−1	Pelletier 47, steamroller.ver1.in, steam.in, SST	[Sti86, Pel86, WB87, MB88]	-	26	2.4	3%	–
PUZ032		KKnave26	Knights and Knaves #26					
	−1	Problem 26, Truthtellers and the Liars, tandl.ver1.in	[Smu78b, LO85a]	-	10	2.0	20%	–
PUZ033		Winds	The Winds and the Windows Puzzle					
	−1	winds.ver1.in	[Car86]	-	13	2.5	15%	–
PUZ034		NQueens	N queens problem					
	−1.003	q1-2.lop (Size 8), q1-9.lop (Size 9), q1-10.lop (Size 10)		-	18	2.2	11%	–

Domain RNG (40 abstract problems, 100 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
RNG001		XTimesAId	X.additive_identity = additive_identity for any X					
	−1	R1, zero.ver1.in	[MOW76]	-	32	2.7	–	28%
	−2	ls37, ls37	[LS74, WM76]	-	18	2.8	–	–
	−3	Example 6a, EX6-T?, ex6.lop, FEX6T1, FEX6T2	[FLSY74, WM76]	-	8	2.8	–	–
	−4	R1	[MOW76]	-	34	2.7	–	28%
	−5	Problem 21, wos21	[Wosb, FLSY74, WM76]	-	30	2.7	–	–
RNG002		AddRCanc	Right cancellation for addition					
	−1	Established lemma,	[MOW76, OMW76]	-	34	2.6	–	28%
RNG003		AddLCanc	Left cancellation for addition					
	−1	Established lemma,	[MOW76, OMW76]	-	34	2.6	–	28%
RNG004		ProdInv	X*Y = -X*-Y					
	−1	R2, minuses.ver1.in	[MOW76]	-	34	2.6	–	28%
	−2	R2	[MOW76]	-	36	2.6	–	29%
	−3	Problem 22, wos22	[Wosb, WM76]	-	34	2.5	–	–
RNG005		SumEqAId	(-X*Y) + (X*Y) = additive_identity					
	−1	Problem 23	[Wosb, MOW76]	-	34	2.6	–	27%
	−2	Problem 23, wos23	[Wosb, WM76]	-	31	2.5	–	–

Syntactic name V#	Semantic name Other names	Description	References	V	Cl	Av	nH	Eq
RNG006	Eqn1	X*(Y+ -Z) = (X*Y) + -(X*Z)						
–1	Problem 25		[Wosb, MOW76]	-	39	2.4	–	25%
–2	Problem 25, wos25		[Wosb, WM76]	-	36	2.4	–	–
–3	Problem 25		[Wosb]	-	36	2.5	–	27%
RNG007	BoolInv	In Boolean rings, X is its own inverse						
–1	lemma.ver3.in, lemma.ver4.in		[MOW76]	-	33	2.6	–	27%
–4	lemma.ver2.in		[PS81]	-	24	1.3	–	100%
–5	lemma.ver1.in		[MOW76, PS81]	-	39	2.4	–	27%
RNG008	BoolComm	Boolean rings are commutative						
–1	Test Problem 8, commute.ver3.in, commute.ver4.in		[MOW76, Wos88]	-	34	2.6	–	27%
–2	R3, Theorem 2		[MOW76, OMW76]	-	36	2.6	–	28%
–3	commute.ver2.in		[MOW76, PS81]	-	27	1.3	–	100%
–4			[MOW76, PS81]	-	25	1.3	–	100%
–5	commute.ver1.in		[MOW76, PS81]	-	40	2.3	–	25%
–6	CADE-11 Comp. 3, THEOREM 3		[MOW76, Ove90, Ove93, LM93]	-	36	2.5	–	27%
–7	Problem 3, Test Problem 8, RT1		[LO85b, Wos88, LW91]	-	20	1.4	–	100%
RNG009	CubeComm	If X*X*X = X then the ring is commutative						
–5	CADE-11 Comp. Eq-7, EQ-7, PROBLEM 7		[PS81, Ove90, Ove93, LM93, Zha93]	-	17	1.5	–	100%
–7	Problem 6, RT2		[LO85b, LW91]	-	20	1.4	–	100%
RNG010	AuxSkewSymm	Skew symmetry of the auxilliary function						
–1			[AH90]	-	32	1.4	–	100%
–2	PROOF VI		[AH90]	-	35	1.4	–	100%
–5	CADE-11 Comp. Eq-9, THEOREM EQ-9, PROBLEM 9		[Ove90, Ove93, LM93, Zha93]	-	44	1.4	–	100%
–6			[Ste87]	-	36	1.5	–	100%
–7			[Ste87]	-	43	1.4	–	100%
RNG011	RAltEqn	In a right alternative ring (((X,X,Y)*X)*(X,X,Y)) = Add Id						
–5	CADE-11 Comp. Eq-10, EQ-10, PROBLEM 10		[Ove90, Ove93, LM93, Zha93]	-	35	1.4	–	100%
RNG012	ProdInv	Product of inverses equal product						
–6	c15		[Ste87]	-	29	1.4	–	100%
RNG013	InvProd1	-X*Y = -(X*Y)						
–6	c16		[Ste87]	-	29	1.4	–	100%
RNG014	InvProd2	-X*Y = -(X*Y)						
–6	c17		[Ste87]	-	29	1.4	–	100%
RNG015	DiffDist1	X*(Y+ -Z) = (X*Y) + -(X*Z)						
–6	c18		[Ste87]	-	29	1.4	–	100%
RNG016	DiffDist2	(X+ -Y)*Z = (X*Z) + -(Y*Z)						
–6	c19		[Ste87]	-	29	1.4	–	100%
RNG017	DiffDist3	-X*(Y+Z) = -(X*Y) + -(X*Z)						
–6	c20		[Ste87]	-	29	1.4	–	100%
RNG018	DiffDist4	(X+Y)* -Z = -(X*Z) + -(Y*Z)						
–6	c21		[Ste87]	-	29	1.4	–	100%
RNG019	LinAssr1	First part of the linearised form of the associator						
–6	c24		[Ste87]	-	29	1.4	–	100%
–7			[Ste87]	-	36	1.4	–	100%
RNG020	LinAssr2	Second part of the linearised form of the associator						
–6	c25		[Ste87]	-	29	1.4	–	100%
–7			[Ste87]	-	36	1.4	–	100%
RNG021	LinAssr3	Third part of the linearised form of the associator						
–6	c26		[Ste87]	-	29	1.4	–	100%
–7			[Ste87]	-	36	1.4	–	100%
RNG023	LAlt	Left alternative						
–6			[Ste87, Ste92]	-	29	1.4	–	100%
–7			[Ste87, Ste92]	-	36	1.4	–	100%
RNG024	RAlt	Right alternative						
–6			[Ste87, Ste92]	-	29	1.4	–	100%
–7			[Ste87, Ste92]	-	36	1.4	–	100%
RNG025	FlexLaw	Middle or Flexible Law						
–1	PROOF I		[AH90]	-	26	1.4	–	100%
–4			[Ste87, Ste92]	-	29	1.4	–	100%
–5			[Ste87, Ste92]	-	36	1.4	–	100%
–6			[Ste87, Ste92]	-	29	1.4	–	100%
–7			[Ste87, Ste92]	-	36	1.4	–	100%
–8			[Ste87]	-	31	1.4	–	100%
–9			[Ste87]	-	38	1.3	–	100%
RNG026	TeichId	Teichmuller Identity						
–6	Teichmuller Identity		[Ste87]	-	29	1.4	–	100%
–7			[Ste87]	-	36	1.4	–	100%
RNG027	RMoufang	Right Moufang identity						
–1			[AH90]	-	26	1.4	–	100%
–2	PROOF IV		[AH90]	-	33	1.4	–	100%
–5			[Ste87, Ste88]	-	29	1.4	–	100%
–6	m1		[Ste87]	-	29	1.4	–	100%
–7			[Ste87]	-	36	1.4	–	100%
–8	m1'		[Ste87, Ste88]	-	29	1.4	–	100%
–9			[Ste87]	-	36	1.4	–	100%
RNG028	LMoufang	Left Moufang identity						
–1			[AH90]	-	26	1.4	–	100%
–2	PROOF III		[AH90]	-	33	1.4	–	100%
–5			[Ste87, Ste88]	-	29	1.4	–	100%
–6	m2		[Ste87]	-	29	1.4	–	100%
–7			[Ste87]	-	36	1.4	–	100%
–8	m2'		[Ste87, Ste88]	-	29	1.4	–	100%
–9			[Ste87]	-	36	1.4	–	100%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
RNG029	MMoufang	Middle Moufang identity					
–1		[AH90]	-	26	1.4	–	100%
–2	PROOF V	[AH90]	-	33	1.4	–	100%
–5		[Ste87, Ste88]	-	29	1.4	–	100%
–6	m3	[Ste87]	-	29	1.4	–	100%
–7		[Ste87]	-	36	1.4	–	100%
RNG030	AssrEqn2	2*assr(X,X,Y)^ 3 = additive identity					
–6	Conjecture 1	[Ste87]	-	28	1.5	–	100%
–7	Conjecture 1	[Ste87]	-	35	1.4	–	100%
RNG031	AssrEqn3	(W*W)*X*(W*W) = additive identity					
–6	Conjecture 2	[Ste87]	-	28	1.5	–	100%
–7	Conjecture 2	[Ste87]	-	35	1.4	–	100%
RNG032	AssrEqn4	6*assr(X,X,Y)^ 6 = additive identity					
–6	Conjecture 3	[Ste87]	-	28	1.5	–	100%
–7	Conjecture 3	[Ste87]	-	35	1.4	–	100%
RNG033	AssrEqn5	A fairly complex equation with associators					
–6	ch	[Ste87]	-	29	1.4	–	100%
–7		[Ste87]	-	36	1.4	–	100%
–8		[Ste87]	-	30	1.4	–	100%
–9		[Ste87]	-	37	1.4	–	100%
RNG034	AssrSkewSymm	A skew symmetry relation of the associator					
–1	PROOF II	[AH90]	-	30	1.4	–	100%
RNG035	FourthComm	If X*X*X*X = X then the ring is commutative					
–7	RT3	[LW91]	-	20	1.4	–	100%
RNG036	FifthComm	If X*X*X*X*X = X then the ring is commutative					
–7	RT4	[LW91]	-	20	1.4	–	100%
RNG037	SumEqAId2	(X* -Y) + (X*Y) = additive_identity					
–1	Problem 24	[Wosb, MOW76]	-	34	2.6	–	27%
–2	Problem 24, wos24	[Wosb, WM76]	-	29	2.7	–	–
RNG038	RngEqn1	Ring property 1					
–1	Problem 27	[Wosb, MOW76]	-	37	2.5	–	33%
–2	Problem 27, wos27	[Wosb, WM76]	-	30	2.6	–	–
RNG039	RngEqn2	Ring property 2					
–1	Problem 28	[Wosb, MOW76]	-	74	1.7	–	23%
–2	Problem 28, wos28	[Wosb, WM76]	-	74	1.7	–	–
RNG040	RngEqn3	Ring property 4					
–1	Problem 29	[Wosb, MOW76]	-	42	2.4	4%	28%
–2	Problem 29, wos29	[Wosb, MOW76, WM76]	-	40	2.2	5%	31%
RNG041	RngEqn4	Unknown					
–1	Problem 30, wos30	[Wosb, MOW76, WM76]	-	41	2.4	4%	30%

Domain ROB (27 abstract problems, 36 problems)

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
ROB001	RobBool	Is every Robbins algebra Boolean?					
–1		[HMT71, Win90]	-	10	1.6	–	100%
ROB002	RobBool1	--X = X => Boolean					
–1	Lemma 2.1	[HMT71, Win90]	-	11	1.5	–	100%
ROB003	RobBool2	X + c=c => Boolean					
–1	Lemma 2.2, RA1, robbins.in	[HMT71, Win90, LW92]	-	11	1.5	–	100%
ROB004	RobBool3	c = -d, c + d=d, and c + c=c => Boolean					
–1	Lemma 2.3	[HMT71, Win90]	-	13	1.5	–	100%
ROB005	RobBool4	c + c=c => Boolean					
–1	CADE-11 Comp. Eq-2, Lemma 2.4, RA3, THEOREM EQ-2, PROBLEM 2, robbins.occ.in	[HMT71, Win90, Ove90, LW92] [Ove93, LM93, Zha93]	-	11	1.5	–	100%
ROB006	RobBool5	c + d=d => Boolean					
–1	Theorem 1.1, RA4	[HMT71, Win90, Wos92, LW92]	-	11	1.5	–	100%
–2	Theorem 1.1	[HMT71, Win90, Wos92]	-	11	1.5	–	100%
–3	Theorem 1.1	[HMT71, Win90, Wos92]	-	23	1.7	–	82%
ROB007	RobBool6	-(a + b)= -b => Boolean					
–1	Theorem 1.2, RA5	[HMT71, Win90, LW92]	-	11	1.5	–	100%
–2	Theorem 1.2	[HMT71, Win90]	-	13	1.5	–	100%
–3	Theorem 1.2	[HMT71, Win90]	-	22	1.7	–	83%
–4	Theorem 1.2	[HMT71, Win90]	-	24	1.6	–	84%
ROB008	Eqn1	If -(a + -(b + c)) = -(a + b + -c) then a+b=a					
–1	Lemma 3.1	[Win90]	-	11	1.5	–	100%
ROB009	Eqn2	If -(a + -(b + c)) = -(b + -(a + c)) then a = b					
–1	Lemma 3.2	[Win90]	-	11	1.5	–	100%
ROB010	Eqn3	If -(a + -b) = c then -(c + -(b + a)) = a					
–1	Lemma 3.3, RA2	[Win90, LW92]	-	11	1.5	–	100%
ROB011	Eqn3Base	If -(a + -b) = c then -(a + -(b + k(a + c))) = c, k=1					
–1	Lemma 3.4	[Win90]	-	19	1.7	–	81%
ROB012	Eqn3Indn	If -(a + -b) = c then -(a + -(b + k(a + c))) = c, k=k + 1					
–1	Lemma 3.4	[Win90]	-	21	1.6	–	79%
–2	Lemma 3.4	[Win90]	-	22	1.6	–	80%
ROB013	Eqn4	If -(a + b) = c then -(c + -(-b + a)) = a					
–1	Lemma 3.5	[Win90]	-	11	1.5	–	100%
ROB014	Eqn5Base	If -(-e + -(d + -e)) = d then -(e + k(d + -(d + -e))) = -e, k=1					
–1	Lemma 3.6	[Win90]	-	19	1.7	–	81%
–2	Lemma 3.6	[Win90]	-	21	1.8	–	81%
ROB015	Eqn5Indn	If -(-e + -(d + -e)) = d then -(e + k(d + -(d + -e))) = -e, k=k+1					
–1	Lemma 3.6	[Win90]	-	21	1.6	–	79%
–2	Lemma 3.6	[Win90]	-	23	1.7	–	79%
ROB016	Eqn6	If -(d + e) = -e then -(e + k(d + -(d + -e))) = -e, for k>0					
–1	Corollary 3.7	[Win90]	-	21	1.7	–	77%
ROB017	Absb1	If -(2f + h) = -(3f + h) = -h then 2f + h = 3f + h					
–1	Lemma 3.8	[Win90]	-	13	1.5	–	100%

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
ROB018		Absb2	`If -(d + e) = -e then e + 2(d + -(d + -e)) absorbs d + -(d + -e)`					
	–1	Corollary 3.9	[Win90]	-	19	1.7	–	81%
ROB019		Absb3	`A complex absorbtion condition`					
	–1	Corollary 3.9	[Win90]	-	19	1.7	–	81%
ROB020		RobBool7	`-(a + -b)=b => Boolean`					
	–1	Corollary 3.10	[HMT71, Win90]	-	11	1.5	–	100%
	–2	Corollary 3.10	[HMT71, Win90]	-	13	1.5	–	100%
ROB021		RobBool8	`(-X = -Y)=>(X = Y) => Boolean`					
	–1		[HMT71, Win90, McC92b]	-	11	1.6	–	100%
ROB022		RobBool9	`c + -c=c => Boolean`					
	–1		[HMT71, Win90, McC92b]	-	11	1.5	–	100%
ROB023		RobBool10	`X + X=X => Boolean`					
	–1	Robbins	[HMT71, Win90, LM92, McC92b]	-	11	1.5	–	100%
ROB024		RobBool11	`-(a + (a + b)) + -(a + -b) = a => Boolean`					
	–1	RA-1	[Win90, WWM$^+$90]	-	11	1.5	–	100%
ROB025		RobBool12	`-(X + Y) = intersection(-X,-Y) => Boolean`					
	–1	RA-2	[Win90, WWM$^+$90]	-	11	1.5	–	–
ROB026		RobBool13	`c + d = c => Boolean`					
	–1		[HMT71, Win90, Wos94b]	-	11	1.5	–	100%
ROB027		RobBool14	`-(-c) = c => Boolean`					
	–1		[HMT71, Win90, Wos94b]	-	11	1.5	–	100%

Domain SET (562 abstract problems, 695 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
SET001		SupSEl	`Set members are superset members`					
	–1	ls100, ls100	[LS74, WM76]	-	9	1.9	11%	–
SET002		UnionEqS	`A set union itself is itself`					
	–1	ls103, ls103	[LS74, WM76]	-	14	2.6	21%	–
SET003		SubSUnion1	`A set is a subset of the union of itself with itself`					
	–1	ls105, ls105	[LS74, WM76]	-	14	2.6	21%	–
SET004		SubSUnion2	`A set is a subset of the union of itself and another set`					
	–1	ls106, ls106	[LS74, WM76]	-	14	2.6	21%	–
SET005		IntscAssc	`Associativity of set intersection`					
	–1	ls108, ls108	[LS74, WM76]	-	16	2.4	18%	–
SET006		IntscSubS	`Intersection is a subset`					
	–1	ls111, ls111	[LS74, WM76]	-	14	2.6	21%	–
SET007		IntscUnion	`Intersection distributes over union`					
	–1	ls112, ls112	[LS74, WM76]	-	23	2.6	21%	–
SET008		DiffEl	`Difference contains no operand elements`					
	–1	ls115, ls115	[LS74, WM76]	-	21	2.7	33%	–
SET009		SubSEqn	`If d is a subset of a, then b-a is a subset of b-d`					
	–1	ls116, ls116	[LS74, WM76]	-	16	2.4	31%	–
SET010		UnionEqn	`c-a union c-b equals c-(the intersection of a and b)`					
	–1	ls118, ls118	[LS74, WM76]	-	29	2.7	31%	–
SET011		Diff_Intsc	`A property of difference and intersection`					
	–1	ls121, ls121	[LS74, WM76]	-	21	2.7	33%	–
SET012		CpmtIvln	`Complement is an involution`					
	–1	S1, EST-S1	[MOW76, WB87]	-	33	2.2	9%	–
	–2	compl.ver1.in	[MOW76]	-	35	2.1	8%	–
	–3		[BLM$^+$86]	-	269	2.3	7%	43%
	–4	compl.ver2.in	[BLM$^+$86]	-	20	2.1	15%	50%
SET013		IntscComm	`The intersection of sets is commutative`					
	–1	S2, EST-S2	[MOW76, WB87]	-	33	2.2	9%	–
	–2	inters.ver1.in	[MOW76]	-	35	2.1	8%	–
	–3		[BLM$^+$86]	-	269	2.3	7%	43%
	–4	inters.ver2.in	[BLM$^+$86]	-	22	2.1	9%	50%
SET014		UnionOfSubS	`Union of subsets is a subset`					
	–2	S4, subset.ver1.in, EST-S4	[MOW76, WB87]	-	35	2.1	8%	–
	–3		[BLM$^+$86]	-	269	2.3	7%	43%
	–4	subset.ver2.in	[BLM$^+$86]	-	35	2.1	11%	44%
SET015		UnionComm	`The union of sets is commutative`					
	–1	S3, EST-S3	[MOW76, WB87]	-	33	2.2	9%	–
	–2	union.ver1.in	[MOW76]	-	35	2.1	8%	–
	–3		[BLM$^+$86]	-	269	2.3	7%	43%
	–4	union.ver2.in	[BLM$^+$86]	-	28	2.1	10%	51%
SET016		1stCpntsEq	`First components of equal ordered pairs are equal`					
	–1	NU3.1	[LW91, LW92]	-	18	1.8	5%	72%
	–3	Lemma 1	[BLM$^+$86]	-	270	2.3	7%	43%
	–6		[Qua92a]	-	162	2.1	4%	48%
	–7	OP4, OP10	[Qua92a]	-	240	2.1	15%	48%
SET017		UOrdPrLCanc	`Left cancellation for non-ordered pairs`					
	–3	Lemma 2	[BLM$^+$86]	-	271	2.4	7%	43%
	–4	Lemma 2	[BLM$^+$86]	-	270	2.3	7%	43%
	–6		[Qua92a]	-	162	2.1	4%	48%
	–7	UP4	[Qua92a]	-	184	2.0	8%	45%
SET018		2ndCpntsEq	`Second components of equal ordered pairs are equal`					
	–1	NU3.2	[LW91, LW92]	-	18	1.8	5%	72%
	–3	Lemma 3	[BLM$^+$86]	-	274	2.3	7%	43%
	–4	Lemma 3	[BLM$^+$86]	-	272	2.3	7%	43%
	–6		[Qua92a]	-	162	2.1	4%	48%
	–7	OP5, OP11	[Qua92a]	-	242	2.1	15%	48%
SET019		SetsEq	`Two sets that contain one another are equal`					
	–3	Lemma 4	[BLM$^+$86]	-	272	2.4	7%	43%
	–4	Lemma 4	[BLM$^+$86]	-	269	2.3	7%	43%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
SET020	1stUnq	1st is unique when x is an ordered pair of sets					
−3	Lemma 5	[BLM+86]	-	273	2.4	7%	43%
−4	Lemma 5	[BLM+86]	-	269	2.3	7%	43%
−6		[Qua92a]	-	161	2.1	4%	48%
−7	OP7.1	[Qua92a]	-	229	2.1	13%	47%
SET021	2ndUnq	2nd is unique when x is an ordered pair of sets					
−3	Lemma 6	[BLM+86]	-	274	2.4	7%	43%
−4	Lemma 6	[BLM+86]	-	269	2.3	7%	43%
−6		[Qua92a]	-	161	2.1	4%	48%
−7	OP7.2	[Qua92a]	-	229	2.1	13%	47%
SET022	1stCpntSet	The first component of an ordered pair is a little set					
−3	Lemma 7	[BLM+86]	-	274	2.4	7%	43%
−4	Lemma 7	[BLM+86]	-	268	2.4	7%	43%
SET023	2ndCpntSet	The second component of an ordered pair is a little set					
−3	Lemma 8	[BLM+86]	-	275	2.4	7%	43%
−4	Lemma 8	[BLM+86]	-	268	2.4	7%	43%
SET024	SetInSgtn	A set belongs to its singleton					
−3	Lemma 9	[BLM+86]	-	276	2.4	7%	42%
−4	Lemma 9	[BLM+86]	-	268	2.4	7%	43%
−6		[Qua92a]	-	161	2.1	4%	47%
−7	SS2	[Qua92a]	-	191	2.1	7%	45%
SET025	OrdPrSet	Ordered pairs are little sets					
−3	Lemma 10	[BLM+86]	-	276	2.4	7%	42%
−4	Lemma 10	[BLM+86]	-	267	2.4	7%	43%
−6		[Qua92a]	-	160	2.1	5%	48%
−7	OP1	[Qua92a]	-	215	2.1	11%	47%
−8	Lemma 11	[BLM+86]	-	278	2.4	7%	42%
−9	Lemma 11	[BLM+86]	-	268	2.4	7%	43%
SET027	SubSTrans	Transitivity of subset					
−3	Lemma 12	[BLM+86]	-	280	2.4	7%	42%
−4	Lemma 12	[BLM+86]	-	269	2.3	7%	43%
−6		[Qua92a]	-	162	2.1	4%	47%
−7	PO3	[Qua92a]	-	167	2.1	4%	46%
SET028	Apply_Img1	Relationship between apply and image, part 1 of 2					
−3	Lemma 13	[BLM+86]	-	279	2.4	7%	42%
−4	Lemma 13	[BLM+86]	-	267	2.4	7%	43%
SET029	Apply_Img2	Relationship between apply and image, part 2 of 2					
−3	Lemma 14	[BLM+86]	-	280	2.4	7%	42%
−4	Lemma 14	[BLM+86]	-	267	2.4	7%	43%
SET030	FuncValSet	Function values are little sets					
−3	Lemma 15	[BLM+86]	-	282	2.4	7%	42%
−4	Lemma 15	[BLM+86]	-	268	2.4	7%	43%
−6	AP8	[Qua92a]	-	189	2.1	4%	46%
SET031	CpsnRel	The composition of two sets is a relation					
−3	Lemma 16	[BLM+86]	-	282	2.4	7%	42%
−4	Lemma 16	[BLM+86]	-	267	2.4	7%	43%
SET032	RngCpsn	Range of composition					
−3	Lemma 17	[BLM+86]	-	283	2.4	7%	42%
−4	Lemma 17	[BLM+86]	-	267	2.4	7%	43%
−6	CO6.3	[Qua92a]	-	188	2.1	4%	46%
SET033	DomCpsn	Domain of composition					
−3	Lemma 18	[BLM+86]	-	285	2.4	7%	42%
−4	Lemma 18	[BLM+86]	-	268	2.4	7%	43%
−6	CO9	[Qua92a]	-	189	2.1	4%	46%
SET034	CpsnFuncs	The composition of functions is a function					
−3	Lemma 19	[BLM+86]	-	287	2.4	6%	41%
−4	Lemma 19	[BLM+86]	-	269	2.3	7%	43%
−6	FU6	[Qua92a]	-	190	2.0	4%	46%
SET035	MapCpsn	Maps for composition					
−3	Lemma 20	[BLM+86]	-	288	2.4	6%	41%
−4	Lemma 20	[BLM+86]	-	269	2.3	7%	43%
−6	MA1	[Qua92a]	-	190	2.0	4%	46%
SET036	ApplyFunc1	Properties of apply for functions, part 1 of 3					
−3	Lemma 21	[BLM+86]	-	291	2.3	6%	41%
−4	Lemma 21	[BLM+86]	-	271	2.3	7%	43%
−6	AP9	[Qua92a]	-	191	2.0	4%	46%
SET037	ApplyFunc2	Properties of apply for functions, part 2 of 3					
−3	Lemma 22	[BLM+86]	-	291	2.4	6%	41%
−4	Lemma 22	[BLM+86]	-	270	2.3	7%	43%
−6	AP10	[Qua92a]	-	190	2.0	4%	46%
SET038	ApplyFunc3	Properties of apply for functions, part 3 of 3					
−3	Lemma 23	[BLM+86]	-	291	2.4	6%	41%
−4	Lemma 23	[BLM+86]	-	269	2.3	7%	43%
−6	MA2	[Qua92a]	-	190	2.0	4%	46%
SET039	ApplyCpsn1	Properties of apply for composition of functions, 1 of 3					
−3	Lemma 24	[BLM+86]	-	292	2.4	6%	41%
−4	Lemma 24	[BLM+86]	-	269	2.3	7%	43%
SET040	ApplyCpsn2	Properties of apply for composition of functions, 2 of 3					
−3	Lemma 25	[BLM+86]	-	292	2.4	6%	41%
−4	Lemma 25	[BLM+86]	-	268	2.4	7%	43%
−6	AP12	[Qua92a]	-	189	2.1	4%	46%
SET041	ApplyCpsn3	Properties of apply for composition of functions, 3 of 3					
−3	Lemma 26	[BLM+86]	-	294	2.4	6%	41%
−4	Lemma 26	[BLM+86]	-	269	2.3	7%	43%
−6	AP11	[Qua92a]	-	190	2.0	4%	46%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
SET042	OrdPrXProd	Ordered pairs are in cross products					
−3	Lemma 27	[BLM+86]	-	295	2.4	6%	40%
−4	Lemma 27	[BLM+86]	-	269	2.3	7%	43%
SET043	Russell	Russell's Paradox					
−5	Pelletier 39, p39.in	[Pel86]	-	2	2.0	50%	–
SET044	ARussellSet	Anti-Russell Sets					
−5	Pelletier 40, p40.in	[Pel86, Pel88]	-	4	2.0	25%	–
SET045	NotUnivSet	No Universal Set					
−5	Pelletier 41, p41.in	[Pel86]	-	4	2.0	25%	–
SET046	NotCirc	No set of non-circular sets					
−5	Pelletier 42, p42.in	[Pel86]	-	3	2.3	66%	–
SET047	EqSymm	Set equality is symmetric					
−5	Pelletier 43, p43.in	[Cha79, Pel86]	-	6	2.7	33%	–
SET050	UnOrdPrAxCor1	Corollary to Unordered pair axiom					
−6		[Qua92a]	-	161	2.1	4%	47%
SET051	UnOrdPrAxCor2	Corollary to Unordered pair axiom					
−6		[Qua92a]	-	161	2.1	4%	47%
SET052	XProdAxCor1	Corollary to Cartesian product axiom					
−6		[Qua92a]	-	161	2.1	4%	47%
SET053	XProdAxCor2	Corollary to Cartesian product axiom					
−6		[Qua92a]	-	161	2.1	4%	47%
SET054	SubCRefl	Subclass is reflexive					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	PO1	[Qua92a]	-	164	2.1	4%	46%
SET055	EqRefl	Equality is reflexive					
−6		[Qua92a]	-	159	2.1	5%	–
−7	EQ1	[Qua92a]	-	165	2.1	4%	–
SET056	EqDef1	Expanded equality definition					
−6		[Qua92a]	-	162	2.1	4%	48%
−7	EQ2.1	[Qua92a]	-	168	2.1	4%	46%
SET057	EqDef2	Expanded equality definition					
−6		[Qua92a]	-	162	2.1	4%	48%
−7	EQ2.2	[Qua92a]	-	168	2.1	4%	46%
SET058	EqDef3	Expanded equality definition					
−6		[Qua92a]	-	162	2.1	4%	48%
−7	EQ2.3	[Qua92a]	-	168	2.1	4%	46%
SET059	EqDef4	Expanded equality definition					
−6		[Qua92a]	-	162	2.1	4%	48%
−7	EQ2.4	[Qua92a]	-	168	2.1	4%	46%
SET060	IntscEmpty	Nothing in the intersection of a set and its complement					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	SP1	[Qua92a]	-	170	2.1	6%	45%
SET061	NullClEx	Existence of the null class					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	SP2	[Qua92a]	-	171	2.1	6%	45%
SET062	NullClSubCl	The null class is a subclass of every class					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	SP3	[Qua92a]	-	172	2.1	6%	45%
SET063	NullClSubClCor1	Corollary to the null class being a subclass of every class					
−6		[Qua92a]	-	161	2.1	4%	48%
−7	SP3 cor.	[Qua92a]	-	174	2.1	6%	45%
SET064	NullClUnq	The null class is unique					
−6		[Qua92a]	-	161	2.1	4%	48%
−7	SP4	[Qua92a]	-	175	2.1	6%	45%
SET065	NullClSet	The null class is a set					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	SP5	[Qua92a]	-	175	2.1	6%	45%
SET066	UOrdPrComm	Unordered pair is commutative					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	UP1	[Qua92a]	-	176	2.1	6%	45%
SET067	UOrdPrArg1	Proper class in an unordered pair, part 1					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	UP2.1	[Qua92a]	-	177	2.1	6%	45%
SET068	UOrdPrArg2	Proper class in an unordered pair, part 2					
−6		[Qua92a]	-	160	2.1	5%	48%
−7	UP2.2	[Qua92a]	-	177	2.1	6%	45%
SET069	UOrdPrArg3	Proper class in an unordered pair, part 3					
−6		[Qua92a]	-	161	2.1	4%	48%
−7	UP2.3	[Qua92a]	-	178	2.1	6%	45%
SET070	UOrdPrArg4	Proper class in an unordered pair, part 4					
−6		[Qua92a]	-	161	2.1	4%	48%
−7	UP2.4	[Qua92a]	-	178	2.1	6%	45%
SET071	NullUOrdPr	Null unordered pair					
−6		[Qua92a]	-	162	2.1	4%	48%
−7	UP3	[Qua92a]	-	183	2.0	7%	45%
SET072	UOrdPrRCanc	Right cancellation for unordered pairs					
−6		[Qua92a]	-	162	2.1	4%	48%
−7	UP5	[Qua92a]	-	185	2.1	8%	45%
SET073	UnOrdPrAxCor3	Corollary to unordered pair axiom					
−6	UP6.1	[Qua92a]	-	161	2.1	4%	48%
−7	UP6.1	[Qua92a]	-	185	2.1	8%	45%
SET074	UnOrdPrAxCor4	Corollary to unordered pair axiom					
−6	UP6.2	[Qua92a]	-	161	2.1	4%	48%
−7	UP6.2	[Qua92a]	-	185	2.1	8%	45%

Syntactic name V#	Semantic name Other names	References	Description	V	Cl	Av	nH	Eq
SET075	UnOrdPrAxCor5		Corollary to unordered pair axiom					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	UP6 cor.	[Qua92a]		-	185	2.1	8%	45%
SET076	UOrdPrSubS		Unorderd pair is a subset					
−6		[Qua92a]		-	162	2.1	4%	47%
−7	UP7	[Qua92a]		-	189	2.1	7%	45%
SET077	SgtnSet		Every singleton is a set					
−6		[Qua92a]		-	160	2.1	5%	48%
−7	SS1	[Qua92a]		-	188	2.1	7%	45%
SET078	SgtnSetCor1		Corollary to every singleton is a set					
−6		[Qua92a]		-	160	2.1	5%	48%
−7	SS1 cor.	[Qua92a]		-	189	2.1	7%	45%
SET079	SetInSgtnCor1		Corollary to a set belongs to its singleton					
−6	SS2 cor.	[Qua92a]		-	161	2.1	4%	48%
−7	SS2 cor.1	[Qua92a]		-	192	2.1	7%	45%
SET080	SetInSgtnCor2		Corollary to a set belongs to its singleton					
−6		[Qua92a]		-	160	2.1	5%	48%
−7	SS2 cor.2	[Qua92a]		-	192	2.1	7%	44%
SET081	ElOfSgtn		Only the element can belong to its singleton					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	SS3	[Qua92a]		-	194	2.1	7%	45%
SET082	SngtOfNonSet		The singleton of a non-set is the null class					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	SS4	[Qua92a]		-	195	2.1	7%	45%
SET083	SgtnDepEl1		A singleton set depends on its element, part 1					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS5.1	[Qua92a]		-	197	2.0	8%	45%
SET084	SgtnDepEl2		A singleton set depends on its element, part 2					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS5.2	[Qua92a]		-	197	2.0	8%	45%
SET085	UOrdPrSgtn		Unordered pair that is a singleton					
−6		[Qua92a]		-	163	2.1	4%	48%
−7	SS5.5	[Qua92a]		-	200	2.0	8%	45%
SET086	SgtnEl1		A singleton set has a member, part 1					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS6.1	[Qua92a]		-	200	2.1	8%	45%
SET087	SgtnEl2		A singleton set has a member, part 2					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS6.2	[Qua92a]		-	200	2.1	8%	45%
SET088	SgtnEl3		A singleton set has a member, part 3					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS6.3	[Qua92a]		-	200	2.1	8%	45%
SET089	SgtnEl4		A singleton set has a member, part 4					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS6.4	[Qua92a]		-	200	2.1	8%	46%
SET090	SgtnElUnq		The member of a singleton set is unique					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS7	[Qua92a]		-	204	2.1	9%	46%
SET091	MembUnq1		Member_of(X) is unique if X is not a singleton, part 1					
−6		[Qua92a]		-	163	2.1	4%	48%
−7	SS8.1	[Qua92a]		-	206	2.1	9%	46%
SET092	MembUnq2		Member_of(X) is unique if X is not a singleton, part 2					
−6		[Qua92a]		-	163	2.1	4%	49%
−7	SS8.2	[Qua92a]		-	206	2.1	9%	46%
SET093	SgtnSetCor2		Corollary to every singleton is a set					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	SS9	[Qua92a]		-	208	2.1	10%	46%
SET094	SgtnEqn1		Property 1 of singleton sets					
−6	SS10	[Qua92a]		-	163	2.1	4%	48%
−7	SS10	[Qua92a]		-	210	2.1	10%	46%
SET095	SgtnEqn2		Property 2 of singleton sets					
−6	SS11	[Qua92a]		-	161	2.1	4%	47%
−7	SS11	[Qua92a]		-	210	2.1	10%	46%
SET096	SubSOfSgtn		There are at most two subsets of a singleton set					
−6	SS12	[Qua92a]		-	162	2.1	4%	48%
−7	SS12	[Qua92a]		-	212	2.1	9%	46%
SET097	ClElEx		A class contains 0, 1, or at least 2 members					
−6	SS13	[Qua92a]		-	162	2.1	4%	48%
−7	SS13	[Qua92a]		-	213	2.1	10%	46%
SET098	ClElExCor1		Corollary 1 to a class contains 0, 1, or at least 2 members					
−6	SS13 cor.	[Qua92a]		-	162	2.1	4%	48%
−7	SS13 cor.1	[Qua92a]		-	214	2.1	10%	46%
SET099	ClElExCor2		Corollary 2 to a class contains 0, 1, or at least 2 members					
−6	SS13	[Qua92a]		-	162	2.1	4%	48%
−7	SS13 cor.2	[Qua92a]		-	214	2.1	10%	47%
SET100	Sgtn_OrdPr		The relationship of singleton sets to ordered pairs					
−6		[Qua92a]		-	160	2.1	5%	48%
−7	SS14	[Qua92a]		-	214	2.1	11%	47%
SET101	SgtnElOrdPr		Singleton of the first is a member of an ordered pair					
−6		[Qua92a]		-	160	2.1	5%	48%
−7	OP2.1	[Qua92a]		-	216	2.1	11%	47%
SET102	OrdPrElOrdPr		Ordered pair member of ordered pair					
−6		[Qua92a]		-	160	2.1	5%	48%
−7	OP2.2	[Qua92a]		-	216	2.1	11%	47%

Syntactic name V#	Semantic name Other names	References	Description	V	Cl	Av	nH	Eq
SET103	OrdPrEl1		Special member 1 of an ordered pair					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	OP3.1	[Qua92a]		-	219	2.1	11%	47%
SET104	OrdPrEl2		Special member 2 of an ordered pair					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	OP3.2	[Qua92a]		-	219	2.1	11%	47%
SET105	OrdPrEl3		Special member 3 of an ordered pair					
−6		[Qua92a]		-	162	2.1	4%	48%
−7	OP3.3	[Qua92a]		-	220	2.1	11%	46%
SET108	1st2ndOrdPr		1st and 2nd make the ordered pair					
−6		[Qua92a, Qua92b]		-	161	2.1	4%	47%
−7	OP6.1	[Qua92a, Qua92b]		-	224	2.1	12%	46%
SET109	1stOrdPr1		1st is the ordered pair, first condition					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	OP6.2	[Qua92a]		-	224	2.1	12%	47%
SET110	2ndOrdPr1		2nd is the ordered pair, first condition					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	OP6.3	[Qua92a]		-	224	2.1	12%	47%
SET111	1stOrdPr2		1st is the ordered pair, second condition					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	OP6.4	[Qua92a]		-	224	2.1	12%	47%
SET112	2ndOrdPr2		2nd is the ordered pair, second condition					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	OP6.5	[Qua92a]		-	224	2.1	12%	47%
SET113	1stUnq1		1st is unique if x is not an ordered pair of sets, part 1					
−6		[Qua92a]		-	163	2.1	4%	48%
−7	OP8.1	[Qua92a]		-	233	2.1	13%	47%
SET114	2ndUnq1		2nd is unique if x is not an ordered pair of sets, part 1					
−6		[Qua92a]		-	163	2.1	4%	48%
−7	OP8.2	[Qua92a]		-	233	2.1	13%	47%
SET115	1stUnq2		1st is unique if x is not an ordered pair of sets, part 2					
−6		[Qua92a]		-	163	2.1	4%	49%
−7	OP8.3	[Qua92a]		-	233	2.1	13%	48%
SET116	2ndUnq2		2nd is unique if x is not an ordered pair of sets, part 2					
−6		[Qua92a]		-	163	2.1	4%	49%
−7	OP8.4	[Qua92a]		-	233	2.1	13%	48%
SET117	OrdPrSetCor1		Corollary 1 to every ordered pair being a set					
−6		[Qua92a]		-	161	2.1	4%	48%
−7	OP9.1	[Qua92a]		-	237	2.1	15%	48%
SET118	OrdPrSetCor2		Corollary 2 to every ordered pair being a set					
−6		[Qua92a]		-	161	2.1	4%	47%
−7	OP9.2	[Qua92a]		-	237	2.1	15%	48%
SET119	OrdPrCpntsEqCor1		Corollary 1 to components of equal ordered pairs being equal					
−6	OP10 cor.	[Qua92a]		-	161	2.1	4%	48%
−7	OP10 cor.1	[Qua92a]		-	239	2.1	15%	48%
SET120	OrdPrCpntsEqCor2		Corollary 2 to components of equal ordered pairs being equal					
−6	OP10 cor.	[Qua92a]		-	161	2.1	4%	48%
−7	OP10 cor.2	[Qua92a]		-	239	2.1	15%	48%
SET121	OrdPrCpntsEqCor3		Corollary 3 to components of equal ordered pairs being equal					
−6	OP11	[Qua92a]		-	161	2.1	4%	48%
−7	OP11 cor.1	[Qua92a]		-	241	2.1	15%	48%
SET122	OrdPrCpntsEqCor4		Corollary 4 to components of equal ordered pairs being equal					
−6	OP11 cor.	[Qua92a]		-	161	2.1	4%	48%
−7	OP11 cor.2	[Qua92a]		-	241	2.1	15%	48%
SET123	SetBAltDef1		Alternative definition of set builder, part 1					
−6	SB2.1	[Qua92a]		-	165	2.1	4%	48%
SET124	SetBAltDef2		Alternative definition of set builder, part 2					
−6	SB2.2	[Qua92a]		-	164	2.1	4%	48%
SET125	SetBAltDef3		Alternative definition of set builder, part 3					
−6	SB2.3	[Qua92a]		-	164	2.1	4%	48%
SET126	SetB_Sgtn		Relation to singleton					
−6	SB3	[Qua92a]		-	163	2.1	4%	49%
SET127	SetB_UOrdPr		Relation to unordered pair					
−6	SB4	[Qua92a]		-	163	2.1	4%	49%
SET128	SetB3		Building a triple					
−6	SB5.1	[Qua92a]		-	163	2.1	4%	49%
SET129	SetB3El		Membership in a built unordered triple					
−6	SB5.2	[Qua92a]		-	166	2.1	4%	49%
SET130	SetB3El1		Membership in unordered triple, part 1					
−6	SB5.3	[Qua92a]		-	164	2.1	4%	48%
SET131	SetB3El2		Membership in unordered triple, part 2					
−6	SB5.4	[Qua92a]		-	164	2.1	4%	48%
SET132	SetB3El3		Membership in unordered triple, part 3					
−6	SB5.5	[Qua92a]		-	164	2.1	4%	48%
SET133	SetB3Cor1		Corollary 1 to membership in unordered triple					
−6	SB5.6	[Qua92a]		-	166	2.1	4%	48%
SET134	SetB3Cor2		Corollary 2 to membership in unordered triple					
−6	SB5.7	[Qua92a]		-	164	2.1	4%	49%
SET135	SetB3Cor3		Corollary 3 to membership in unordered triple					
−6	SB5.8	[Qua92a]		-	164	2.1	4%	49%
SET136	SetB3Cor4		Corollary 4 to membership in unordered triple					
−6	SB5.9	[Qua92a]		-	164	2.1	4%	49%
SET137	SetB3Fix1		Kludge 1 to instantiate variables in unordered triples					
−6	SB5.10	[Qua92a]		-	166	2.1	4%	48%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SET138	−6	SetB3Fix2	SB5.11	[Qua92a]	Kludge 2 to instantiate variables in unordered triples	-	166	2.1	4%	48%
SET139	−6	SetB3Rdcn1	SB6.1	[Qua92a]	Triple reduction 1	-	163	2.1	4%	49%
SET140	−6	SetB3Rdcn2	SB6.2	[Qua92a]	Triple reduction 2	-	163	2.1	4%	49%
SET141	−6	SetB3Rdcn3	SB6.3	[Qua92a]	Triple reduction 3	-	163	2.1	4%	49%
SET142	−6	SetBOrd	SB7	[Qua92a]	Lexical ordering in unordered triples is irrelevant	-	163	2.1	4%	49%
SET143	−6	IntscAssc	I1	[Qua92a]	Associativity of intersection	-	188	2.1	4%	47%
SET144	−6	IntscComm1	I2	[Qua92a]	Commutativity of intersection	-	188	2.1	4%	47%
SET145	−6	IntscComm2	I3	[Qua92a]	Commutativity outside intersection	-	188	2.1	4%	47%
SET146	−6	IntscNull	I4	[Qua92a]	Intersection with null class	-	188	2.1	4%	47%
SET147	−6	IntscId	I5	[Qua92a]	Universal class is identity for intersection	-	188	2.1	4%	47%
SET148	−6	IntscIdem	I6	[Qua92a]	Idempotency of intersection	-	188	2.1	4%	47%
SET149	−6	IntscIdemCor	I6 cor.	[Qua92a]	Corollary to idempotency of intersection	-	188	2.1	4%	47%
SET150	−6	CpmtIvln	C1	[Qua92a]	Complement is an involution	-	188	2.1	4%	47%
SET151	−6	CpmtNull	C2.1	[Qua92a]	Complement of null class is universal class	-	188	2.1	4%	47%
SET152	−6	CpmtUniv	C2.2	[Qua92a]	Complement of universal class is null class	-	188	2.1	4%	47%
SET153	−6	IntscCpmt	C3.1	[Qua92a]	Intersection with complement is null class	-	188	2.1	4%	47%
SET154	−6	UnionCpmt	C3.2	[Qua92a]	Union with complement is universal class	-	188	2.1	4%	47%
SET155	−6	DeMorgan1	C4.1	[Qua92a]	De Morgans law 1	-	188	2.1	4%	47%
SET156	−6	DeMorgan2	C4.2	[Qua92a]	De Morgans law 2	-	188	2.1	4%	47%
SET157	−6	CpmtUnq	C5	[Qua92a]	Complement is unique	-	190	2.0	4%	47%
SET158	−6	CpmtAxCor	C6	[Qua92a]	Corollary to complement axiom	-	190	2.0	4%	46%
SET159	−6	UnionAssc	U1	[Qua92a]	Associativity of union	-	188	2.1	4%	47%
SET160	−6	UnionComm1	U2	[Qua92a]	Commutativity of union	-	188	2.1	4%	47%
SET161	−6	UnionComm2	U3	[Qua92a]	Commutativity outside union	-	188	2.1	4%	47%
SET162	−6	UnionId	U4	[Qua92a]	Null class is identity for union	-	188	2.1	4%	47%
SET163	−6	UnionUniv	U5	[Qua92a]	Union with universal class	-	188	2.1	4%	47%
SET164	−6	UnionIdem	U6	[Qua92a]	Idempotency of union	-	188	2.1	4%	47%
SET165	−6	UnionIdemCor	U6 cor.	[Qua92a]	Corollary to idempotency of union	-	188	2.1	4%	47%
SET166	−6	UnionEl1	U7.1	[Qua92a]	Members of union 1	-	190	2.0	4%	46%
SET167	−6	UnionEl2	U7.2	[Qua92a]	Members of union 2	-	189	2.1	4%	46%
SET168	−6	UnionEl3	U7.3	[Qua92a]	Members of union 3	-	189	2.1	4%	46%
SET169	−6	IntscUnion1	D1.1	[Qua92a]	Distribution of intersection over union 1	-	188	2.1	4%	47%
SET170	−6	IntscUnion2	D1.2	[Qua92a]	Distribution of intersection over union 2	-	188	2.1	4%	47%
SET171	−6	UnionIntsc1	D2.1	[Qua92a]	Distribution of union over intersection 1	-	188	2.1	4%	47%
SET172	−6	UnionIntsc2	D2.2	[Qua92a]	Distribution of union over intersection 2	-	188	2.1	4%	47%
SET173	−6	IntscAbsb	D3	[Qua92a]	Absorbtion for intersection	-	188	2.1	4%	47%
SET174	−6	IntscAbsbCor	D3 cor.	[Qua92a]	Corollary to absorbtion for intersection	-	188	2.1	4%	47%
SET175	−6	UnionAbsb	D4	[Qua92a]	Absorbtion for union	-	188	2.1	4%	47%
SET176	−6	UnionAbsbCor	D4 cor.	[Qua92a]	Corollary to absorbtion for union	-	188	2.1	4%	47%
SET177	−6	DistEqn1	D5	[Qua92a]	Distribution property 1	-	188	2.1	4%	47%
SET178	−6	DistEqn1Cor1	D5 cor.	[Qua92a]	Corollary 1 to distribution property 1	-	188	2.1	4%	47%
SET179	−6	DistEqn1Cor2	D5 cor.	[Qua92a]	Corollary 2 to distribution property 1	-	188	2.1	4%	47%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SET180	−6	DistEqn2	D6	[Qua92a]	Distribution property 2	-	188	2.1	4%	47%
SET181	−6	DistEqn2Cor	D6 cor.	[Qua92a]	Corollary to distribution property 2	-	188	2.1	4%	47%
SET182	−6	DistEqn3	D7	[Qua92a]	Distribution property 3	-	188	2.1	4%	47%
SET183	−6	SubCEqn1	SU1	[Qua92a]	Subclass property 1	-	189	2.1	4%	46%
SET184	−6	SubCEqn2	SU2	[Qua92a]	Subclass property 2	-	189	2.1	4%	46%
SET185	−6	SubCEqn3	SU3	[Qua92a]	Subclass property 3	-	189	2.1	4%	46%
SET186	−6	SubCEqn4	SU4	[Qua92a]	Subclass property 4	-	189	2.1	4%	46%
SET187	−6	SubCEqn5	SU5	[Qua92a]	Subclass property 5	-	189	2.1	4%	46%
SET188	−6	SubCEqn6	SU6	[Qua92a]	Subclass property 6	-	189	2.1	4%	46%
SET189	−6	SubCEqn6Cor	SU6 cor.	[Qua92a]	Corollary to subclass property 6	-	190	2.0	4%	47%
SET190	−6	SubCEqn7	SU7	[Qua92a]	Subclass property 7	-	189	2.1	4%	46%
SET191	−6	SubCEqn8	SU8	[Qua92a]	Subclass property 8	-	189	2.1	4%	46%
SET192	−6	SubCEqn9	SU9	[Qua92a]	Subclass property 9	-	189	2.1	4%	46%
SET193	−6	SubCEqn10	SU10	[Qua92a]	Subclass property 10	-	189	2.1	4%	46%
SET194	−6	LattUpBnd1	LA1.1	[Qua92a]	Lattice upper bound 1	-	188	2.1	4%	46%
SET195	−6	LattUpBnd2	LA1.2	[Qua92a]	Lattice upper bound 2	-	188	2.1	4%	46%
SET196	−6	LattLowBnd1	LA1.3	[Qua92a]	Lattice lower bound 1	-	188	2.1	4%	46%
SET197	−6	LattLowBnd2	LA1.4	[Qua92a]	Lattice lower bound 2	-	188	2.1	4%	46%
SET198	−6	MinUpBnd	LA2.1	[Qua92a]	Least upper bound	-	190	2.0	4%	46%
SET199	−6	MaxLowBnd	LA2.2	[Qua92a]	Greatest lower bound	-	190	2.0	4%	46%
SET200	−6	UnionMono	LA3.1	[Qua92a]	Union is monotonic	-	190	2.0	4%	46%
SET201	−6	IntscMono	LA3.2	[Qua92a]	Intersection is monotonic	-	190	2.0	4%	46%
SET202	−6	XProdEqn1	CP1	[Qua92a]	Cross product property 1	-	188	2.1	4%	46%
SET203	−6	XProdEqn1Cor	CP1 cor.	[Qua92a]	Corollary to cross product product property 1	-	190	2.0	4%	46%
SET204	−6	XProdEqn2	CP2	[Qua92a]	Cross product property 2	-	189	2.1	4%	46%
SET205	−6	XProdNull1	CP3.1	[Qua92a]	Cross product with null class 1	-	188	2.1	4%	47%
SET206	−6	XProdNull2	CP3.2	[Qua92a]	Cross product with null class 2	-	188	2.1	4%	47%
SET207	−6	XProdEqn3	CP4	[Qua92a]	Cross product property 3	-	188	2.1	4%	46%
SET208	−6	XProdMono1	CP5.1	[Qua92a]	Cross product is monotonic 1	-	189	2.1	4%	46%
SET209	−6	XProdMono2	CP5.2	[Qua92a]	Cross product is monotonic 2	-	189	2.1	4%	46%
SET210	−6	XProdMonoCor1	CP5 cor.1	[Qua92a]	Corollary 1 to cross product product monotonicity	-	188	2.1	4%	46%
SET211	−6	XProdMonoCor2	CP5 cor.2	[Qua92a]	Corollary 2 to cross product product monotonicity	-	188	2.1	4%	46%
SET212	−6	XProdMonoCor3	CP5 cor.3	[Qua92a]	Corollary 3 to cross product product monotonicity	-	188	2.1	4%	46%
SET213	−6	XProdMonoCor4	CP5 cor.4	[Qua92a]	Corollary 4 to cross product product monotonicity	-	188	2.1	4%	46%
SET214	−6	XProdMonoCor5	CP5 cor.5	[Qua92a]	Corollary 5 to cross product product monotonicity	-	188	2.1	4%	46%
SET215	−6	XProdMonoCor6	CP5 cor.6	[Qua92a]	Corollary 6 to cross product product monotonicity	-	188	2.1	4%	46%
SET216	−6	XProdMonoCor7	CP5 cor.7	[Qua92a]	Corollary 7 to cross product product monotonicity	-	188	2.1	4%	46%
SET217	−6	XProdMonoCor8	CP5 cor.8	[Qua92a]	Corollary 8 to cross product product monotonicity	-	188	2.1	4%	46%
SET218	−6	XProdUnion1	CP6.1	[Qua92a]	Cross product distributes over union 1	-	188	2.1	4%	47%
SET219	−6	XProdUnion2	CP6.2	[Qua92a]	Cross product distributes over union 2	-	188	2.1	4%	47%
SET220	−6	XProdIntsc1	CP7.1	[Qua92a]	Cross product distributes over intersection 1	-	188	2.1	4%	47%
SET221	−6	XProdIntsc2	CP7.2	[Qua92a]	Cross product distributes over intersection 2	-	188	2.1	4%	47%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SET222	−6	XProdEqn4	CP8	[Qua92a]	Cross product property 4	-	188	2.1	4%	46%
SET223	−6	XProdEqn5	CP8	[Qua92a]	Cross product property 5	-	188	2.1	4%	46%
SET224	−6	XProd2Dist	CP9	[Qua92a]	Cross product double distribution for intersection	-	188	2.1	4%	47%
SET225	−6	InvSqrXProd	CP10	[Qua92a]	Inverse of cross product squared	-	188	2.1	4%	47%
SET226	−6	XProdLCanc1	CP11.1	[Qua92a]	Cross product left cancellation 1	-	190	2.0	4%	47%
SET227	−6	XProdLCanc2	CP11.2	[Qua92a]	Cross product left cancellation 2	-	190	2.0	4%	47%
SET228	−6	XProdRCanc1	CP12.1	[Qua92a]	Cross product right cancellation 1	-	190	2.0	4%	47%
SET229	−6	XProdRCanc2	CP12.2	[Qua92a]	Cross product right cancellation 2	-	190	2.0	4%	47%
SET230	−6	XProdCancCor	CP13	[Qua92a]	Corollary to cross product cancellation	-	189	2.1	4%	47%
SET231	−6	XProdEqn6	CP14.1	[Qua92a]	Cross product property 6	-	189	2.1	4%	46%
SET232	−6	XProdEqn7	CP14.2	[Qua92a]	Cross product property 7	-	189	2.1	4%	46%
SET233	−6	XProdEqn8	CP14.3	[Qua92a]	Cross product property 8	-	189	2.1	4%	46%
SET234	−6	XProdEqn9	CP14.4	[Qua92a]	Cross product property 9	-	189	2.1	4%	46%
SET235	−6	XProdEqn10	CP15.1	[Qua92a]	Cross product property 10	-	190	2.0	4%	46%
SET236	−6	XProdEqn11	CP15.2	[Qua92a]	Cross product property 11	-	190	2.0	4%	46%
SET237	−6	RstnAltDef1	RS0	[Qua92a]	Restriction alternate definition 1	-	188	2.1	4%	46%
SET238	−6	RstnAltDef1Cor	RS0 cor.	[Qua92a]	Corollary to restriction alternate definition 1	-	189	2.1	4%	46%
SET239	−6	RstnAltDef2	RS1	[Qua92a]	Restriction alternate definition 2	-	189	2.1	4%	46%
SET240	−6	RstnAltDef3	RS2	[Qua92a]	Restriction alternate definition 3	-	189	2.1	4%	46%
SET241	−6	RstnAltDef4	RS3	[Qua92a]	Restriction alternate definition 4	-	189	2.1	4%	46%
SET242	−6	RstnAltDef5	RS4	[Qua92a]	Restriction alternate definition 5	-	190	2.0	4%	46%
SET243	−6	RstnEqn1	RS5	[Qua92a]	Restriction property 1	-	188	2.1	4%	47%
SET244	−6	RstnUnivCl	RS6.1	[Qua92a]	Restriction with universal class	-	188	2.1	4%	47%
SET245	−6	RstnNullCl1	RS6.2	[Qua92a]	Restriction with null class 1	-	188	2.1	4%	47%
SET246	−6	RstnNullCl2	RS6.3	[Qua92a]	Restriction with null class 2	-	188	2.1	4%	47%
SET247	−6	RstnNullCl3	RS6.4	[Qua92a]	Restriction with null class 3	-	188	2.1	4%	47%
SET248	−6	RstnIntsc	RS7	[Qua92a]	Restriction preserves intersections	-	188	2.1	4%	47%
SET249	−6	RstnEqn2	RS8	[Qua92a]	Restriction property 2	-	188	2.1	4%	47%
SET250	−6	RstnEqn2Cor	RS8 cor.	[Qua92a]	Corollary to restriction property 2	-	188	2.1	4%	47%
SET251	−6	RstdElRel1	RS9.1	[Qua92a]	Restriction of element relation, part 1	-	189	2.1	4%	46%
SET252	−6	RstnEqn3	RS10.1	[Qua92a]	Restriction property 3	-	188	2.1	4%	46%
SET253	−6	RstnEqn4	RS10.2	[Qua92a]	Restriction property 4	-	188	2.1	4%	46%
SET254	−6	RstnMono1	RS11.1	[Qua92a]	Monotonicity of restriction 1	-	189	2.1	4%	46%
SET255	−6	RstnMono2	RS11.2	[Qua92a]	Monotonicity of restriction 2	-	189	2.1	4%	46%
SET256	−6	RstnMono3	RS11.3	[Qua92a]	Monotonicity of restriction 3	-	189	2.1	4%	46%
SET257	−6	RstnEqn5	RS12	[Qua92a]	Restriction property 5	-	188	2.1	4%	47%
SET258	−6	DomAltDef1	DO1.1	[Qua92a]	Domain alternate definition 1	-	189	2.1	4%	46%
SET259	−6	DomAltDef2	DO1.2	[Qua92a]	Domain alternate definition 2	-	189	2.1	4%	46%
SET260	−6	DomAltDef3	DO1.3	[Qua92a]	Domain alternate definition 3	-	190	2.0	4%	46%
SET261	−6	DomOfNullCl	DO2.1	[Qua92a]	Domain of null class is the null class	-	188	2.1	4%	47%
SET262	−6	DomOfUnivCl	DO2.2	[Qua92a]	Domain of universal class is the universal class	-	188	2.1	4%	47%
SET263	−6	DomUnion	DO3	[Qua92a]	Domain preserves union	-	188	2.1	4%	47%

Syntactic name V#	Semantic name Other names	References	Description	V	Cl	Av	nH	Eq
SET264 −6	DomMono1 DO3 cor.1	[Qua92a]	Domain is monotonic 1	-	189	2.1	4%	46%
SET265 −6	DomMono2 DO3 cor.2	[Qua92a]	Domain is monotonic 2	-	188	2.1	4%	46%
SET266 −6	DomMono3 DO3 cor.3	[Qua92a]	Domain is monotonic 3	-	188	2.1	4%	46%
SET267 −6	DomMono4 DO3 cor.4	[Qua92a]	Domain is monotonic 4	-	188	2.1	4%	46%
SET268 −6	DomEqn1 DO4	[Qua92a]	Domain property 1	-	188	2.1	4%	46%
SET269 −6	DomPrs DO5	[Qua92a]	Domain only considers ordered pairs	-	188	2.1	4%	47%
SET270 −6	DomEqn2 DO6	[Qua92a]	Domain property 2	-	189	2.1	4%	47%
SET271 −6	DomEqn2Cor DO6 cor.	[Qua92a]	Corollary to domain property 2	-	188	2.1	4%	47%
SET272 −6	DomEqn3 DO7	[Qua92a]	Domain property 3	-	188	2.1	4%	47%
SET273 −6	DomEqn3Cor DO7 cor.	[Qua92a]	Corollary to domain property 3	-	188	2.1	4%	47%
SET274 −6	DomEqn4 DO8	[Qua92a]	Domain property 4	-	188	2.1	4%	47%
SET275 −6	DomEqn4Cor1 DO8 cor.1	[Qua92a]	Corollary 1 to domain property 4	-	188	2.1	4%	46%
SET276 −6	DomEqn4Cor2 DO8 cor.2	[Qua92a]	Corollary 2 to domain property 4	-	188	2.1	4%	46%
SET277 −6	DomEqn4Cor3 DO8 cor.3	[Qua92a]	Corollary 3 to domain property 4	-	188	2.1	4%	46%
SET278 −6	DomEqn4Cor4 DO8 cor.4	[Qua92a]	Corollary 4 to domain property 4	-	188	2.1	4%	46%
SET279 −6	DomEqn5 DO9	[Qua92a]	Domain property 5	-	190	2.0	4%	46%
SET280 −6	DomEqn6 DO10	[Qua92a]	Domain property 6	-	190	2.0	4%	47%
SET281 −6	DomRelFunc DO12	[Qua92a]	Domain relation is a function	-	188	2.1	4%	46%
SET282 −6	DomOfDomRel DO13	[Qua92a]	Domain of domain relation	-	188	2.1	4%	47%
SET283 −6	ApplyDomRel DO14	[Qua92a]	Apply domain relation	-	189	2.1	4%	46%
SET284 −6	ImgOfDomRel DO15	[Qua92a]	Image of domain relation	-	188	2.1	4%	47%
SET285 −6	DomEqn7 DO16	[Qua92a]	Domain property 7	-	189	2.1	4%	46%
SET286 −6	DomEqn7Cor DO16 cor.	[Qua92a]	Corollary to domain property 7	-	189	2.1	4%	46%
SET287 −6	DomEqn8 DO17	[Qua92a]	Domain property 8	-	189	2.1	4%	46%
SET288 −6	DomEqn9 DO18	[Qua92a]	Domain property 9	-	190	2.0	4%	46%
SET289 −6	GodelAx1 IN1	[Qua92a]	Proof of Goedel's axiom B6, part 1	-	188	2.1	4%	46%
SET290 −6	GodelAx2 IN2	[Qua92a]	Proof of Goedel's axiom B6, part 2	-	189	2.1	4%	46%
SET291 −6	GodelAx3 IN3	[Qua92a]	Proof of Goedel's axiom B6, part 3	-	190	2.0	4%	46%
SET292 −6	InvNullCl IN4.1	[Qua92a]	Inverse of null class is the null class	-	188	2.1	4%	47%
SET293 −6	InvUnivCl IN4.2	[Qua92a]	Inverse of universal class is the universal class	-	188	2.1	4%	47%
SET294 −6	InvUnion IN5.1	[Qua92a]	Inverse distributes over union	-	188	2.1	4%	47%
SET295 −6	InvIntsc IN5.2	[Qua92a]	Inverse distributes over intersection	-	188	2.1	4%	47%
SET296 −6	DomOfInv IN6.1	[Qua92a, Ale95]	Domain of inverse	-	188	2.1	4%	47%
SET297 −6	RngOfInv IN6.2	[Qua92a]	Range of inverse	-	188	2.1	4%	47%
SET298 −6	InvOfCpmt IN7	[Qua92a]	Inverse of complement	-	188	2.1	4%	47%
SET299 −6	InvOfProd IN8	[Qua92a]	Inverse of product	-	188	2.1	4%	47%
SET300 −6	InvOfInv IN9	[Qua92a]	Inverse of inverse	-	188	2.1	4%	47%
SET301 −6	IncRstn IN10	[Qua92a]	Inverse commutes with restriction	-	188	2.1	4%	47%
SET302 −6	RngAltDef1 RA1.1	[Qua92a]	Range alternate definition 1	-	189	2.1	4%	46%
SET303 −6	RngAltDef2 RA1.2	[Qua92a]	Range alternate definition 2	-	189	2.1	4%	46%
SET304 −6	RngAltDef3 RA1.3	[Qua92a]	Range alternate definition 3	-	190	2.0	4%	46%
SET305 −6	RngOfNullCl RA2.1	[Qua92a]	Range of null class is the null class	-	188	2.1	4%	47%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SET306	−6	RngOfUnivCl	RA2.2	[Qua92a]	Range of universal class is the universal class	-	188	2.1	4%	47%
SET307	−6	RngUnion	RA3	[Qua92a]	Range preserves union	-	188	2.1	4%	47%
SET308	−6	RngMono1	RA3 cor.1	[Qua92a]	Monotonicity of range 1	-	189	2.1	4%	46%
SET309	−6	RngMono2	RA3 cor.2	[Qua92a]	Monotonicity of range 2	-	188	2.1	4%	46%
SET310	−6	RngMono3	RA3 cor.3	[Qua92a]	Monotonicity of range 3	-	188	2.1	4%	46%
SET311	−6	RngEqn1	RA4	[Qua92a]	Range property 1	-	188	2.1	4%	46%
SET312	−6	RngOrdPrs	RA5	[Qua92a]	Range only considers ordered pairs	-	188	2.1	4%	47%
SET313	−6	RngEqn2	RA6	[Qua92a]	Range property 2	-	189	2.1	4%	47%
SET314	−6	RngEqn3	RA7	[Qua92a]	Range property 3	-	188	2.1	4%	47%
SET315	−6	RngEqn3Cor	RA7 cor.	[Qua92a]	Corollary to range property 3	-	188	2.1	4%	47%
SET316	−6	RngEqn4	RA8	[Qua92a]	Range property 4	-	188	2.1	4%	47%
SET317	−6	RngEqn4Cor1	RA8 cor.1	[Qua92a]	Corollary 1 to range property 4	-	188	2.1	4%	46%
SET318	−6	RngEqn4Cor2	RA8 cor.2	[Qua92a]	Corollary 2 to range property 4	-	188	2.1	4%	46%
SET319	−6	RngEqn4Cor3	RA8 cor.3	[Qua92a]	Corollary 3 to range property 4	-	188	2.1	4%	46%
SET320	−6	RngEqn4Cor4	RA8 cor.4	[Qua92a]	Corollary 4 to range property 4	-	188	2.1	4%	46%
SET321	−6	RngEqn5	RA9.1	[Qua92a]	Range property 5	-	189	2.1	4%	46%
SET322	−6	RngEqn6	RA9.2	[Qua92a]	Range property 6	-	189	2.1	4%	46%
SET323	−6	RngEqn7	RA10	[Qua92a]	Range property 7	-	190	2.0	4%	47%
SET324	−6	ImgAltDef1	IM3	[Qua92a]	Image alternate definition 1	-	189	2.1	4%	46%
SET325	−6	ImgAltDef2	IM4	[Qua92a]	Image alternate definition 2	-	189	2.1	4%	46%
SET326	−6	ImgAltDef2Cor	IM4 cor.	[Qua92a]	Corollary to image alternate definition 2	-	189	2.1	4%	46%
SET327	−6	ImgAltDef3	IM1	[Qua92a]	Image alternate definition 3	-	189	2.1	4%	46%
SET328	−6	ImgAltDef3Cor	IM1 cor.	[Qua92a]	Corollary to image alternate definition 3	-	190	2.0	4%	46%
SET329	−6	ImgAltDef4	IM2	[Qua92a]	Image alternate definition 4	-	191	2.0	4%	46%
SET330	−6	ImgAltDef4Cor	IM2 cor.	[Qua92a]	Corollary to image alternate definition 4	-	190	2.0	4%	46%
SET331	−6	RngImgDom	IM5	[Qua92a]	Range is image of the domain	-	188	2.1	4%	47%
SET332	−6	RngImgDomCor	IM5 cor.	[Qua92a]	Corollary to range is image of domain	-	188	2.1	4%	47%
SET333	−6	ImgMono1	IM6.1	[Qua92a]	Monotonicity of image 1	-	189	2.1	4%	46%
SET334	−6	ImgMono2	IM6.2	[Qua92a]	Monotonicity of image 2	-	189	2.1	4%	46%
SET335	−6	ImgEqn1	IM7	[Qua92a]	Image property 1	-	189	2.1	4%	47%
SET336	−6	ImgEqn1Cor1	IM7 cor.1	[Qua92a]	Corollary 1 image property 1	-	188	2.1	4%	47%
SET337	−6	ImgEqn1Cor2	IM7 cor.2	[Qua92a]	Corollary 2 image property 1	-	188	2.1	4%	47%
SET338	−6	ImgEqn1Cor3	IM7 cor.3	[Qua92a]	Corollary 3 image property 1	-	189	2.1	4%	46%
SET339	−6	SubCAltDef1	IM8	[Qua92a]	Subclass alternate definition 1	-	189	2.1	4%	46%
SET340	−6	SubCAltDef2	IM9	[Qua92a]	Subclass alternate definition 2	-	190	2.0	4%	46%
SET341	−6	ImgUnivCl	IM10	[Qua92a]	Image under universal class	-	189	2.1	4%	47%
SET342	−6	ImgOfUnion	IM11	[Qua92a]	Image of union	-	188	2.1	4%	46%
SET343	−6	ImgOfIntsc	IM12	[Qua92a]	Image of intersection	-	188	2.1	4%	47%
SET344	−6	SumClAltDef1	SC1.1	[Qua92a]	Sum class alternate definition 1	-	189	2.1	4%	46%
SET345	−6	SumClAltDef2	SC1.2	[Qua92a]	Sum class alternate definition 2	-	189	2.1	4%	46%
SET346	−6	SumClAltDef3	SC2	[Qua92a]	Sum class alternate definition 3	-	190	2.0	4%	46%
SET347	−6	SumClOfNullCl	SC3.1	[Qua92a]	Sum class of null class is null class	-	188	2.1	4%	47%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SET348	−6	SumClOfUnivCl	SC3.2	[Qua92a]	Sum class of universal class is universal class	-	188	2.1	4%	47%
SET349	−6	SumClOfSgtnNull1	SC3.3	[Qua92a]	Sum class of singleton null is null class 1	-	188	2.1	4%	47%
SET350	−6	SumClOfSgtnNull2	SC3.4	[Qua92a]	Sum class of singleton null is null class 2	-	190	2.0	4%	47%
SET351	−6	SumClSgtn	SC4	[Qua92a]	Sum of singleton	-	189	2.1	4%	46%
SET352	−6	SumClPr	SC5	[Qua92a]	Sum of pair	-	189	2.1	4%	46%
SET353	−6	SumClPrCor	SC5 cor.	[Qua92a]	Corollary to sum of pair	-	189	2.1	4%	46%
SET354	−6	SumClOrdPr	SC6	[Qua92a]	Sum of ordered pair	-	189	2.1	4%	46%
SET355	−6	SubCUnion	SC7	[Qua92a]	An element of a class is a subclass of union	-	189	2.1	4%	46%
SET356	−6	SubCUnionCor	SC7 cor.	[Qua92a]	Corollary to subclass of union	-	188	2.1	4%	46%
SET357	−6	SumClAltDef4	SC8	[Qua92a]	Sum class alternate definition 4	-	188	2.1	4%	47%
SET358	−6	SumClUnion	SC9	[Qua92a]	Sum distributes over union	-	188	2.1	4%	47%
SET359	−6	SumClEqn1	SC10	[Qua92a]	Sum class property 1	-	188	2.1	4%	46%
SET360	−6	DomSumClSqr	SC11.1	[Qua92a]	Domain is sum squared	-	188	2.1	4%	46%
SET361	−6	RngSumClSqr	SC11.2	[Qua92a]	Range is sum squared	-	188	2.1	4%	46%
SET362	−6	SumClMono	SC12	[Qua92a]	Monotonicity of sum	-	189	2.1	4%	46%
SET363	−6	PwrClAltDef1	PC1	[Qua92a]	Power class alternative definition 1	-	189	2.1	4%	46%
SET364	−6	PwrClAltDef2	PC2	[Qua92a]	Power class alternative definition 2	-	190	2.0	4%	46%
SET365	−6	PwrClMono	PC3	[Qua92a]	Monotonicity of power	-	189	2.1	4%	46%
SET366	−6	NullClElPwrCl	PC4.1	[Qua92a]	Null class in power class	-	188	2.1	4%	46%
SET367	−6	PwrClNotNull	PC4.2	[Qua92a]	Power class not in null class	-	188	2.1	4%	47%
SET368	−6	PwrClOfUnivCl	PC4.3	[Qua92a]	Power class of universal class is universal class	-	188	2.1	4%	47%
SET369	−6	PwrClOfSet	PC5	[Qua92a]	Power class of set	-	189	2.1	4%	46%
SET370	−6	PwrClEqn1	PC6	[Qua92a]	Power class property 1	-	188	2.1	4%	46%
SET371	−6	PwrClEqn2	PC7	[Qua92a]	Power class property 2	-	188	2.1	4%	46%
SET372	−6	PwrClEqn3	PC8	[Qua92a]	Power class property 3	-	188	2.1	4%	47%
SET373	−6	PwrClEqn4	PC9	[Qua92a]	Power class property 4	-	188	2.1	4%	47%
SET374	−6	PwrClClsdUnion	PC10	[Qua92a]	Power class is closed under union	-	190	2.0	4%	46%
SET375	−6	PwrClClsdIntsc	PC11	[Qua92a]	Power class is closed under intersection	-	190	2.0	4%	46%
SET376	−6	PwrClSetB	PC12	[Qua92a]	Power class set builder	-	190	2.0	4%	46%
SET377	−6	PwrClSetBCor1	PC12 cor.1	[Qua92a]	Corollary 1 to power class set builder	-	189	2.1	4%	46%
SET378	−6	PwrClSetBCor2	PC12 cor.2	[Qua92a]	Corollary 2 to power class set builder	-	188	2.1	4%	46%
SET379	−6	PwrClSetBCor3	PC12 cor.3	[Qua92a]	Corollary 3 to power class set builder	-	189	2.1	4%	46%
SET380	−6	RelEqn1	RL1	[Qua92a]	Relation property 1	-	188	2.1	4%	46%
SET381	−6	RelEqn2	RL2	[Qua92a]	Relation property 2	-	189	2.1	4%	46%
SET382	−6	RelEqn2Cor1	RL2 cor.2	[Qua92a]	Corollary 1 to relation property 2	-	189	2.1	4%	46%
SET383	−6	RelEqn2Cor2	RL2 cor.2	[Qua92a]	Corollary 2 to relation property 2	-	188	2.1	4%	46%
SET384	−6	RelEqn3Cor1	RL3 cor.1	[Qua92a]	Corollary 1 to relation property 3	-	188	2.1	4%	47%
SET385	−6	RelEqn3Cor2	RL3 cor.2	[Qua92a]	Corollary 2 to relation property 3	-	188	2.1	4%	47%
SET386	−6	RelEqn4	RL4	[Qua92a]	Relation property 4	-	189	2.1	4%	46%
SET387	−6	CmpsnAltDef1	CO1.1	[Qua92a]	Composition alternate definition 1	-	189	2.1	4%	46%
SET388	−6	CmpsnAltDef2	CO1.2	[Qua92a]	Composition alternate definition 2	-	189	2.1	4%	46%
SET389	−6	CmpsnAltDef3	CO1.3	[Qua92a]	Composition alternate definition 3	-	189	2.1	4%	46%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SET390	−6	CmpsnAltDef4	CO1.4	[Qua92a]	Composition alternate definition 4	-	189	2.1	4%	46%
SET391	−6	CmpsnEqn1	CO2	[Qua92a]	Composition property 1	-	192	2.0	4%	46%
SET392	−6	CmpsnRId	CO3.1	[Qua92a]	Right identity for composition	-	188	2.1	4%	47%
SET393	−6	CmpsnLId	CO3.2	[Qua92a]	Left identity for composition	-	188	2.1	4%	47%
SET394	−6	CmpsnEqn2	CO4	[Qua92a]	Composition property 2	-	188	2.1	4%	46%
SET395	−6	CmpsnImg	CO5	[Qua92a]	Composition relates to image	-	188	2.1	4%	47%
SET396	−6	DomOfCmpsn1	CO6.1	[Qua92a]	Domain of composition 1	-	188	2.1	4%	46%
SET397	−6	RngOfCmpsn	CO6.2	[Qua92a]	Range of composition	-	188	2.1	4%	46%
SET398	−6	CmpsnAssc	CO7	[Qua92a]	Associativity of composition	-	188	2.1	4%	47%
SET399	−6	LCmpsnNullCl	CO8.1	[Qua92a]	Left compose with null class	-	188	2.1	4%	47%
SET400	−6	RCmpsnNullCl	CO8.2	[Qua92a]	Right compose with null class	-	188	2.1	4%	47%
SET401	−6	LCmpsnUnicCl	CO8.3	[Qua92a]	Left compose with universal class	-	188	2.1	4%	47%
SET402	−6	RCmpsnUnicCl	CO8.4	[Qua92a]	Right compose with universal class	-	188	2.1	4%	47%
SET403	−6	DomOfCmpsn2	CO10	[Qua92a]	Domain of composition 2	-	189	2.1	4%	46%
SET404	−6	CmpsnMono1	CO11.1	[Qua92a]	Monotonicity of composition 1	-	189	2.1	4%	46%
SET405	−6	CmpsnMono2	CO11.2	[Qua92a]	Monotonicity of composition 2	-	189	2.1	4%	46%
SET406	−6	CmpsnMonoCor1	CO11 cor.1	[Qua92a]	Corollary 1 monotonicity of composition	-	189	2.1	4%	46%
SET407	−6	CmpsnMonoCor2	CO11 cor.2	[Qua92a]	Corollary 2 monotonicity of composition	-	189	2.1	4%	46%
SET408	−6	InvCmpsn	CO12	[Qua92a]	Inverse of composition	-	188	2.1	4%	47%
SET409	−6	CmpsnElRel1	CO13.1	[Qua92a]	Composition of element relation 1	-	189	2.1	4%	46%
SET410	−6	CmpsnElRel2	CO13.2	[Qua92a]	Composition of element relation 2	-	190	2.0	4%	46%
SET411	−6	CmpsnSgtnEl1	CO15	[Qua92a]	Compose condition for singleton membership 1	-	189	2.1	4%	46%
SET412	−6	CmpsnSgtnEl2	CO16	[Qua92a]	Compose condition for singleton membership 2	-	189	2.1	4%	46%
SET413	−6	CmpsnSgtnEl3	CO17	[Qua92a]	Compose condition for singleton membership 3	-	190	2.0	4%	46%
SET414	−6	CmpsnUnion	CO18	[Qua92a]	Composition distributes over union	-	188	2.1	4%	47%
SET415	−6	CmpsnSgtnFunc1	CO19.1	[Qua92a]	Composition with singleton function 1	-	189	2.1	4%	46%
SET416	−6	CmpsnSgtnFunc2	CO19.2	[Qua92a]	Composition with singleton function 2	-	189	2.1	4%	46%
SET417	−6	CmpsnEqn1	CO21	[Qua92a]	Composition property 1	-	188	2.1	4%	46%
SET418	−6	CmpsnEqn2	CO22	[Qua92a]	Composition property 2	-	188	2.1	4%	46%
SET419	−6	CmpsnEqn3	CO23	[Qua92a]	Composition property 3	-	189	2.1	4%	46%
SET420	−6	CmpsnEqn4	CO24	[Qua92a]	Composition property 4	-	189	2.1	4%	46%
SET421	−6	CmpsClFunc	CO26	[Qua92a]	Compose class is a function	-	188	2.1	4%	46%
SET422	−6	CmpsClApply	CO27	[Qua92a]	Compose class and apply	-	189	2.1	4%	46%
SET423	−6	SumCmpsCl	CO28	[Qua92a]	Sum compose class	-	188	2.1	4%	47%
SET424	−6	CmpsClCmpsn	CO29	[Qua92a]	Compose class and composition function are related	-	189	2.1	4%	46%
SET425	−6	SVClAltDef1	SV1	[Qua92a]	Single valued class alternate definition 1	-	193	2.0	4%	46%
SET426	−6	SVClAltDef2	SV3.1	[Qua92a]	Single valued class alternate definition 2	-	189	2.1	4%	46%
SET427	−6	SVClAltDef3	SV3.2	[Qua92a]	Single valued class alternate definition 3	-	189	2.1	4%	46%
SET428	−6	SVClAltDef4	SV3.3	[Qua92a]	Single valued class alternate definition 4	-	189	2.1	4%	46%
SET429	−6	SubClSVCl	SV4	[Qua92a]	A subclass of a single-valued class is single-valued	-	189	2.1	4%	46%
SET430	−6	SVClImg	SV5	[Qua92a]	In a single-valued class, each image is a singleton	-	191	2.0	4%	47%
SET431	−6	CmpsnSVCls	SV6	[Qua92a]	The composition of single-valued classes is single-valued	-	190	2.0	4%	46%

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SET432	−6	FuncAltDef1	FU1	[Qua92a]	Function alternate definition 1	-	191	2.0	4%	46%
SET433	−6	FuncAltDef2	FU3.1	[Qua92a]	Function alternate definition 2	-	190	2.0	4%	46%
SET434	−6	FuncAltDef3	FU3.2	[Qua92a]	Function alternate definition 3	-	190	2.0	4%	46%
SET435	−6	FuncAltDef4	FU3.3	[Qua92a]	Function alternate definition 4	-	190	2.0	4%	46%
SET436	−6	SubClOfFunc1	FU4.1	[Qua92a]	Subclass of function is a function, part 1	-	189	2.1	4%	46%
SET437	−6	SubClOfFunc2	FU4.2	[Qua92a]	Subclass of function is a function, part 2	-	189	2.1	4%	46%
SET438	−6	FuncImg	FU5	[Qua92a]	In a function, the image of each domain element is a singleton	-	191	2.0	4%	47%
SET439	−6	NullClFunc	FU7	[Qua92a]	Null class is a function	-	188	2.1	4%	46%
SET440	−6	RstnFuncs	FU1, FU8	[Qua92a]	The restriction of function is function	-	189	2.1	4%	46%
SET441	−6	IntscFuncs	FU2, FU9	[Qua92a]	The intersection of functions is a function	-	190	2.0	4%	46%
SET442	−6	RstnFunc	FU4, FU10	[Qua92a]	Restriction of function	-	189	2.1	4%	46%
SET443	−6	DiffFuncs	FU11	[Qua92a]	Difference of functions is a function	-	190	2.0	4%	46%
SET444	−6	FuncEqn1	FU12	[Qua92a]	Function property 1	-	191	2.0	4%	46%
SET445	−6	FuncEqn2	FU12 cor.	[Qua92a]	Corollary to function property 1	-	190	2.0	4%	46%
SET446	−6	FuncEqn2Cor	FU13	[Qua92a]	Function property 2	-	189	2.1	4%	46%
SET447	−6	FuncEqn3	FU14	[Qua92a]	Function property 3	-	190	2.0	4%	46%
SET448	−6	FuncEqn4	FU15	[Qua92a]	Function property 4	-	191	2.0	4%	46%
SET449	−6	FuncSubS1	FU16.1	[Qua92a]	Condition 1 for one function to be a subset of another	-	193	2.0	4%	47%
SET450	−6	FuncSubS2	FU16.2	[Qua92a]	Condition 2 for one function to be a subset of another	-	193	2.0	4%	47%
SET451	−6	SubSRelAltDef1	SR1	[Qua92a]	Subset relation alternate definition 1	-	188	2.1	4%	46%
SET452	−6	SubSRelAltDef2	SR2	[Qua92a]	Subset relation alternate definition 2	-	189	2.1	4%	46%
SET453	−6	SubSRelAltDef3	SR3	[Qua92a]	Subset relation alternate definition 3	-	190	2.0	4%	46%
SET454	−6	IdAltDef1	ID1	[Qua92a]	Identity alternate definition 1	-	188	2.1	4%	46%
SET455	−6	IdAltDef2	ID2	[Qua92a]	Identity alternate definition 2	-	189	2.1	4%	46%
SET456	−6	IdAltDef3	ID3	[Qua92a]	Identity alternate definition 3	-	190	2.0	4%	46%
SET457	−6	IdFunc	ID4	[Qua92a]	Identity is a function	-	188	2.1	4%	46%
SET458	−6	IdFuncCor	ID4 cor.	[Qua92a]	Corollary to identity is a function	-	188	2.1	4%	46%
SET459	−6	IdDom	ID5.1	[Qua92a]	Domain of identity is the universal class	-	188	2.1	4%	47%
SET460	−6	IdRng	ID5.2	[Qua92a]	Range of identity	-	188	2.1	4%	47%
SET461	−6	RstdIdDom	ID5.3	[Qua92a]	Domain of restricted identity	-	188	2.1	4%	47%
SET462	−6	RstdIdRng	ID5.4	[Qua92a]	Range of restricted identity	-	188	2.1	4%	47%
SET463	−6	IdDomRngCor	ID5 cor.	[Qua92a]	Corollary to domain and range of identity	-	188	2.1	4%	47%
SET464	−6	ClImgId	ID6	[Qua92a]	Class image under identity	-	188	2.1	4%	47%
SET465	−6	Id1to1	ID7	[Qua92a]	Identity is one-to-one	-	188	2.1	4%	46%
SET466	−6	InvId	ID8	[Qua92a]	Inverse of identity is identity	-	188	2.1	4%	47%
SET467	−6	Set1El1	ID9.1	[Qua92a]	Sets with at most one member 1	-	190	2.0	4%	47%
SET468	−6	Set1El2	ID9.2	[Qua92a]	Sets with at most one member 2	-	189	2.1	4%	46%
SET469	−6	Set1El3	ID9.3	[Qua92a]	Sets with at most one member 3	-	190	2.1	4%	47%
SET470	−6	Set1ElCor	ID9 cor.	[Qua92a]	Corollary to sets with one member	-	191	2.0	4%	47%
SET471	−6	SetNEl1	ID10.1	[Qua92a]	Sets with more than one member 1	-	190	2.0	4%	46%
SET472	−6	SetNEl2	ID10.2	[Qua92a]	Sets with more than one member 2	-	190	2.0	4%	46%
SET473	−6	RstdDomLem1	ID11.1	[Qua92a]	Lemma 1 to restricted domain	-	189	2.1	4%	47%

Syntactic name V#	Semantic name Other names	References	Description	V	Cl	Av	nH	Eq
SET474 −6	RstdDomLem2 ID11.2	[Qua92a]	Lemma 2 to restricted domain	-	190	2.0	4%	46%
SET475 −6	RstdDom ID11.3	[Qua92a]	Restricted domain	-	191	2.0	4%	47%
SET476 −6	IntescCl ID11.4, ID12	[Qua92a]	Intersection subclass	-	188	2.1	4%	46%
SET477 −6	AxOfSubs1 RP1.1	[Qua92a]	Axiom of subsets 1	-	190	2.0	4%	46%
SET478 −6	AxOfSubs2 RP1.2	[Qua92a]	Axiom of subsets 2	-	189	2.1	4%	46%
SET479 −6	RplmtEqn1 RP2.1	[Qua92a]	Replacement property 1	-	189	2.1	4%	46%
SET480 −6	RplmtEqn2 RP2.2	[Qua92a]	Replacement property 2	-	189	2.1	4%	46%
SET481 −6	RplmtEqn3 RP3	[Qua92a]	Replacement property 3	-	189	2.1	4%	46%
SET482 −6	RplmtEqn4 RP4	[Qua92a]	Replacement property 4	-	190	2.0	4%	46%
SET483 −6	RplmtEqn5 RP5	[Qua92a]	Replacement property 5	-	189	2.1	4%	46%
SET484 −6	RplmtEqn6 RP6	[Qua92a]	Replacement property 6	-	190	2.0	4%	46%
SET485 −6	RplmtEqn7 RP7	[Qua92a]	Replacement property 7	-	190	2.0	4%	46%
SET486 −6	RplmtEqn8 RP8	[Qua92a]	Replacement property 8	-	189	2.1	4%	46%
SET487 −6	RplmtEqn9 RP9	[Qua92a]	Replacement property 9	-	189	2.1	4%	46%
SET488 −6	RplmtEqn10 RP10	[Qua92a]	Replacement property 10	-	189	2.1	4%	46%
SET489 −6	RplmtEqn11 RP11.1	[Qua92a]	Replacement property 11	-	190	2.0	4%	46%
SET490 −6	RplmtEqn12 RP11.2	[Qua92a]	Replacement property 12	-	190	2.0	4%	46%
SET491 −6	DiagnLem1 DI1.1	[Qua92a]	Diagonalization lemma 1	-	189	2.1	4%	46%
SET492 −6	DiagnLem2 DI1.2	[Qua92a]	Diagonalization lemma 2	-	189	2.1	4%	46%
SET493 −6	DiagnCor DI1 cor.	[Qua92a]	Diagonalization corollary	-	190	2.0	4%	46%
SET494 −6	DiagnAltDef1 DI2	[Qua92a]	Diagonalization alternate definition 1	-	188	2.1	4%	47%
SET495 −6	DiagnAltDef2 DI3	[Qua92a]	Diagonalization alternate definition 2	-	189	2.1	4%	46%
SET496 −6	DiagnAltDef3 DI4	[Qua92a]	Diagonalization alternate definition 3	-	190	2.0	4%	46%
SET497 −6	RussellCl1 DI5	[Qua92a]	Special case of the Russell class, without the regularity axiom	-	189	2.1	4%	46%
SET498 −6	RussellCl2 DI6	[Qua92a]	Special case of the Russell class, without the regularity axiom	-	190	2.0	4%	46%
SET499 −6	RussellClNotSet DI7	[Qua92a]	The Russell class not a set	-	188	2.1	4%	46%
SET500 −6	DiagnEqn1 DI8	[Qua92a]	Diagonalization property 1	-	188	2.1	4%	47%
SET501 −6	DiagnEqn2 DI9.1	[Qua92a]	Diagonalization property 2	-	188	2.1	4%	47%
SET502 −6	DiagnEqn3 DI9.2	[Qua92a]	Diagonalization property 3	-	188	2.1	4%	47%
SET503 −6	UnivClNotSet SP6	[Qua92a]	The universal class not set	-	188	2.1	4%	46%
SET504 −6	UnivClNotSetCor1 SP6 cor.1	[Qua92a]	Corollary 1 to universal class not set	-	188	2.1	4%	46%
SET505 −6	UnivClNotSetCor2 SP6 cor.2	[Qua92a]	Corollary 2 to universal class not set	-	188	2.1	4%	46%
SET506 −6	UnivClNotNullCl SP7.1	[Qua92a]	Universal class not null class	-	188	2.1	4%	47%
SET507 −6	UnivClNotNullSubCl SP7.2	[Qua92a]	Universal class not subclass of null class	-	188	2.1	4%	46%
SET508 −6	SgtnUOrdPrAxCor1 SP8.1	[Qua92a]	Corollary 1 to singleton in unordered pair axiom	-	188	2.1	4%	47%
SET509 −6	SgtnUOrdPrAxCor2 SP8.2	[Qua92a]	Corollary 2 to singleton in unordered pair axiom	-	188	2.1	4%	47%
SET510 −6	SgtnNullClCor SP9	[Qua92a]	Corollary to singleton is null class	-	188	2.1	4%	47%
SET511 −6	OrdPrElCor1 SP10.1	[Qua92a]	Corollary 1 to special members of ordered pairs	-	188	2.1	4%	47%
SET512 −6	OrdPrElCor2 SP10.2	[Qua92a]	Corollary 2 to special members of ordered pairs	-	188	2.1	4%	47%
SET513 −6	OrdPrElCor3 SP10.3	[Qua92a]	Corollary 3 to special members of ordered pairs	-	188	2.1	4%	47%
SET514 −6	OrdPrClNotSet SP11	[Qua92a]	Class of ordered pairs is not a set	-	188	2.1	4%	46%
SET515 −6	ClNotClEl RE1	[Qua92a]	No class belongs to itself	-	188	2.1	4%	46%

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
SET516 −6	ClNotClElCor RE2	Corollary to no class belongs to itself [Qua92a]	-	188	2.1	4%	47%
SET517 −6	XElXNotSgtn RE3	If member of X is X then X is not a singleton of a set [Qua92a]	-	190	2.1	4%	47%
SET518 −6	No2Cycle RE4	There are no cycles of length 2 [Qua92a]	-	189	2.1	4%	46%
SET519 −6	No2CycleCor1 RE5.1	Corollary 1 to no cycles of length 2 [Qua92a]	-	188	2.1	4%	47%
SET520 −6	No2CycleCor2 RE5.2	Corollary 2 to no cycles of length 2 [Qua92a]	-	188	2.1	4%	47%
SET521 −6	OrdPrCmpts1 RE6.1	Ordered pair determines components 1 [Qua92a]	-	189	2.1	4%	46%
SET522 −6	OrdPrCmpts2 RE6.2	Ordered pair determines components 2 [Qua92a]	-	189	2.1	4%	46%
SET523 −6	ElCpmtNotSet RE7	Element and complement can't both be sets [Qua92a]	-	189	2.1	4%	46%
SET524 −6	NotOrdPr1 RE8.1	Equivalent condition 1 for x not to be an ordered pair [Qua92a]	-	189	2.1	4%	47%
SET525 −6	NotOrdPr2 RE8.2	Equivalent condition 2 for x not to be an ordered pair [Qua92a]	-	189	2.1	4%	47%
SET526 −6	OrdPrCmptSet1 RE9.1	Ordered pair components are sets 1 [Qua92a]	-	189	2.1	4%	46%
SET527 −6	OrdPrCmptSet2 RE9.2	Ordered pair components are sets 2 [Qua92a]	-	189	2.1	4%	46%
SET528 −6	OrdPrCmptSetCor1 RE9 cor.	Corollary 1 to ordered pair components are sets [Qua92a]	-	189	2.1	4%	46%
SET529 −6	OrdPrCmptSetCor2 RE10.1	Corollary 2 to ordered pair components are sets [Qua92a]	-	189	2.1	4%	46%
SET530 −6	OrdPrCmptSetCor3 RE10.2	Corollary 3 to ordered pair components are sets [Qua92a]	-	189	2.1	4%	46%
SET531 −6	AppnEqn1 AP1.1	Application property 1 [Qua92a]	-	191	2.0	4%	47%
SET532 −6	AppnEqn2 AP1.2	Application property 2 [Qua92a]	-	190	2.0	4%	46%
SET533 −6	RngClAppn1 AP2	The range of Z is the class of applications of Z to Z's domain 1 [Qua92a]	-	190	2.0	4%	46%
SET534 −6	RngClAppn2 AP3	The range of Z is the class of applications of Z to Z's domain 2 [Qua92a]	-	190	2.0	4%	46%
SET535 −6	AppnEqn3 AP4	Application property 3 [Qua92a]	-	189	2.1	4%	46%
SET536 −6	AppnEqn3Cor1 AP4 cor.1	Corollary 1 to application property 3 [Qua92a]	-	188	2.1	4%	46%
SET537 −6	AppnEqn3Cor2 AP4 cor.2	Corollary 2 to application property 3 [Qua92a]	-	190	2.0	4%	46%
SET538 −6	AppnEqn4 AP5	Application property 4 [Qua92a]	-	188	2.1	4%	47%
SET539 −6	AppnEqn5 AP6.1	Application property 5 [Qua92a]	-	189	2.1	4%	46%
SET540 −6	AppnEqn6 AP6.2	Application property 6 [Qua92a]	-	190	2.0	4%	46%
SET541 −6	AppnEqn7 AP7, AP12	Application property 7 [Qua92a]	-	189	2.1	4%	46%
SET542 −6	AppnEqn9Cor AP9 cor.	Corollary to application property 9 [Qua92a]	-	190	2.0	4%	46%
SET543 −6	AppnEqn10Cor AP10 cor.	Corollary to application property 10 [Qua92a]	-	191	2.0	4%	46%
SET544 −6	AppnEqn11Cor AP11 cor.	Corollary to application property 11 [Qua92a]	-	190	2.0	4%	46%
SET545 −6	AppnEqn13 AP14.1, AP13.1	Application special case 1 [Qua92a]	-	189	2.1	4%	46%
SET546 −6	AppnEqn14 AP14.2, AP13.2	Application special case 2 [Qua92a]	-	189	2.1	4%	46%
SET547 −6	AppnEqn15 AP14.3, AP13.3	Application special case 3 [Qua92a]	-	188	2.1	4%	47%
SET548 −6	AppnEqn16 AP14	Application property 16 [Qua92a]	-	190	2.0	4%	46%
SET549 −6	AppnEqn17 AP16	Application property 17 [Qua92a]	-	188	2.1	4%	46%
SET550 −6	AppnEqn18 AP17	Application property 18 [Qua92a]	-	188	2.1	4%	46%
SET551 −6	AppnEqn19 AP18	Application property 19 [Qua92a]	-	190	2.0	4%	46%
SET552 −6	AppnEqn20 AP19	Application property 20 [Qua92a]	-	190	2.0	4%	46%
SET553 −6	CantorAltDef1 CA1	Cantor class alternate definition 1 [Qua92a]	-	188	2.1	4%	46%
SET554 −6	CantorAltDef2 CA2	Cantor class alternate definition 2 [Qua92a]	-	189	2.1	4%	46%
SET555 −6	CantorAltDef3 CA3	Cantor class alternate definition 3 [Qua92a]	-	190	2.0	4%	46%
SET556 −6	CantorEqn1 CA2	Cantor class property 1 [Qua92a]	-	189	2.1	4%	46%
SET557 −6	CantorThm CA4	Cantor's theorem [Qua92a]	-	190	2.0	4%	46%

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
SET558		CmpblFuncAltDef1	Compatible functions alternate definition 1					
	−6	CF1	[Qua92a]	-	190	2.0	4%	46%
SET559		CmpblFuncAltDef2	Compatible functions alternate definition 2					
	−6	CF2	[Qua92a]	-	190	2.0	4%	46%
SET560		CmpblFuncAltDef3	Compatible functions alternate definition 3					
	−6	CF3	[Qua92a]	-	191	2.0	4%	46%
SET561		CmpblFuncEqn1	Compatible function property 1					
	−6	CF4	[Qua92a]	-	191	2.0	4%	46%
SET562		CmpblFuncEqn2	Compatible function property 2					
	−6	CF5	[Qua92a]	-	190	2.0	4%	46%
SET563		CmpblFuncEqn3	Compatible function property 3					
	−6	CF6	[Qua92a]	-	190	2.0	4%	46%
SET564		CmpblFuncEqn3Cor1	Corollary 1 to compatible function property 3					
	−6	CF6 cor.1	[Qua92a]	-	190	2.0	4%	46%
SET565		CmpblFuncEqn3Cor2	Corollary 2 to compatible function property 3					
	−6	CF6 cor.2	[Qua92a]	-	190	2.0	4%	46%
SET566		CmpblFuncEqn4	Compatible function property 4					
	−6	CF7	[Qua92a]	-	190	2.0	4%	46%
SET567		CmpblFunc1	Compatible function special case					
	−6	CF8	[Qua92a]	-	188	2.1	4%	46%

Domain SYN (340 abstract problems, 350 problems)

Syntactic name	V#	Semantic name / Other names	Description / References	V	Cl	Av	nH	Eq
SYN001		Allways	All signed combinations of some propositions.					
	−1.005	ls5 (Size 2), Pelletier 2, 6, 7, 8, 11 (Size 1), Pelletier 9, 14 (Size 2), Pelletier 12 (Size 3)	[NS72, LS74, WM76, Pel86]	-	32	5.0	81%	–
SYN002		OddEven	Odd and Even Problem					
	−1.007:008	ederX-Y.lop (Size X:Y)	[SA92]	-	2	2.0	50%	–
SYN003		Implies1	Implications that form a contradiction					
	−1.006	Problem 5.2	[Pla82]	-	24	2.3	–	–
SYN004		Implies2	Implications that form a contradiction					
	−1.007	Problem 5.3	[Pla82]	-	15	2.7	–	–
SYN005		Or1	Disjunctions that form a contradiction					
	−1.010	Problem 5.4	[Pla82]	-	11	1.8	–	–
SYN006		Splits	A problem to demonstrate controlling splits					
	−1	Problem 5.8	[Pla82]	-	7	1.7	28%	–
SYN007		FPell71	Pelletier Problem 71					
	−1.002	Pelletier 71	[Pel86, Urq87]	-	8	3.0	62%	–
SYN008		Relev1	A problem to demonstrate the usefulness of relevancy testing					
	−1	Figure 3	[WL89]	-	6	2.2	50%	–
SYN009		Relev2	A problem to demonstrate the usefulness of relevancy testing					
	−1	Figure 8	[WL89]	-	7	1.7	14%	–
SYN010		Letz	Example for Proposition 5.2 in [Letz, et al., 1994]					
	−1.005:005	Example 5.1	[LMG94]	-	27	4.9	–	–
SYN011		CRdcn	A problem to demonstrate C-reduction					
	−1	Problem for C Reduction	[Sho76]	-	8	2.1	25%	–
SYN012		ModelElim	A problem to demonstrate Model Elimination					
	−1	Example	[Lov68]	-	7	2.4	28%	–
SYN013		Quant1	A problem in quantification theory					
	−1	ExQ1, EXQ1, wos31, exq1.ver1.in, exq1.ver2.in, wang1.in	[Wan65, Wosb, MOW76, WM76]	-	23	2.8	47%	61%
SYN014		Quant2	A problem in quantification theory					
	−1	ExQ2, EXQ2, exq2.ver1.in, exq2.ver2.in	[Wan65, MOW76]	-	24	3.0	58%	62%
	−2	Problem 32, wos32	[Wosb, Wan65, WM76]	-	26	2.7	50%	–
SYN015		Quant3	A problem in quantification theory					
	−1	ExQ3, EXQ3, exq3.ver1.in, exq3.ver2.in	[Wan65, MOW76]	-	23	3.0	56%	60%
	−2	Problem 33, wos33	[Wosb, Wan65, WM76]	-	26	2.7	50%	–
SYN028		EW1	EW1					
	−1	EW1, EW1	[MRS72, WM76]	-	6	2.0	16%	–
SYN029		EW2	EW2					
	−1	EW2, EW2	[MRS72, WM76]	-	5	2.0	20%	–
SYN030		EW3	EW3					
	−1	EW3, EW3	[MRS72, WM76]	-	9	2.4	11%	–
SYN031		MQW	MQW					
	−1	MQW, MQW	[MRS72, WM76]	-	5	2.0	40%	–
SYN032		Ances	Ances					
	−1	ANCES2	[RRY+72]	-	7	2.4	42%	–
SYN033		DM	DM					
	−1	DM, DM	[MRS72, WM76]	-	4	1.8	–	–
SYN034		QW	QW					
	−1	QW, QW	[MRS72, WM76]	-	3	2.3	66%	–
SYN035		ROB1	ROB1					
	−1	ROB1, ROB1	[MRS72, WM76]	-	3	2.7	–	–
SYN036		PAndrews	Andrews Challenge Problem					
	−1	Pelletier 34, andrews.in	[Cha79, Pel86, Pel88]	-	128	8.0	99%	–
	−2		[Cha79, Pel86, And86, Pel88]	-	128	8.0	99%	–
	−3	Problem 9	[Cha79, Pel86, AZ89]	-	36	2.9	30%	–
	−4	Theorem A	[Cha79, Pel86, AZ89, Qua90]	-	32	5.3	78%	–
SYN037		PAndrews2	Andrews Challenge Problem Variant					
	−1	Problem 1	[Cha79, Pel86, AZ89]	-	36	2.9	30%	–
	−2	Theorem P	[Cha79, Pel86, AZ89, Qua90]	-	22	3.5	59%	–
SYN038		SFleisig4	Syntactic formula					
	−1	Example 4, EX4-T?, ex4.lop, FEX4T1, FEX4T2	[Fri63, FLSY74, WM76]	-	7	2.4	28%	–
SYN039		VLifsch	A challenge to resolution programs					
	−1	lifsch.in	[Lif89]	-	27	3.0	40%	–

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
SYN040	FPell01	Pelletier Problem 1					
–1	Pelletier 1	[NSS63, Pel86]	-	4	1.5	–	–
SYN041	FPell03	Pelletier Problem 3, 16					
–1	Pelletier 3, Pelletier 16	[SRM73, Pel86]	-	4	1.0	–	–
SYN044	FPell10	Pelletier Problem 10					
–1	Pelletier 10	[Pel86]	-	6	2.2	33%	–
SYN045	FPell13	Pelletier Problem 13					
–1	Pelletier 13	[Pel86]	-	4	1.8	50%	–
SYN046	FPell15	Pelletier Problem 15					
–1	Pelletier 15	[Pel86, Pel88]	-	3	1.3	–	–
SYN047	FPell17	Pelletier Problem 17					
–1	Pelletier 17	[BBN72, Pel82, Pel86]	-	5	2.0	20%	–
SYN048	FPell18	Pelletier Problem 18					
–1	Pelletier 18	[Pel86]	-	2	1.0	–	–
SYN049	FPell19	Pelletier Problem 19					
–1	Pelletier 19	[Pel86]	-	3	1.3	–	–
SYN050	FPell20	Pelletier Problem 20					
–1	Pelletier 20	[Pel86]	-	5	1.8	–	–
SYN051	FPell21	Pelletier Problem 21					
–1	Pelletier 21	[Pel86]	-	4	2.0	25%	–
SYN052	FPell22	Pelletier Problem 22					
–1	Pelletier 22	[Pel86]	-	5	2.0	20%	–
SYN053	FPell23	Pelletier Problem 23					
–1	Pelletier 23	[Pel86]	-	5	2.4	60%	–
SYN054	FPell24	Pelletier Problem 24					
–1	Pelletier 24	[KM64, Pel86]	-	6	2.2	33%	–
SYN055	FPell25	Pelletier Problem 25					
–1	Pelletier 25	[KM64, Pel86]	-	7	2.3	28%	–
SYN056	FPell26	Pelletier Problem 26					
–1	Pelletier 26	[KM64, Pel86]	-	13	2.8	30%	–
SYN057	FPell27	Pelletier Problem 27					
–1	Pelletier 27	[KM64, Pel86]	-	7	1.9	–	–
SYN058	FPell28	Pelletier Problem 28					
–1	Pelletier 28	[KM64, Pel86, Pel88]	-	9	1.8	–	–
SYN059	FPell29	Pelletier Problem 29					
–1	Pelletier 29	[KM64, Pel86]	-	32	3.8	68%	–
SYN060	FPell30	Pelletier Problem 30					
–1	Pelletier 30	[KM64, Pel86]	-	7	1.9	57%	–
SYN061	FPell31	Pelletier Problem 31					
–1	Pelletier 31	[KM64, Pel86]	-	6	1.7	16%	–
SYN062	FPell32	Pelletier Problem 32					
–1	Pelletier 32	[KM64, Pel86]	-	7	2.0	–	–
SYN063	FPell33	Pelletier Problem 33					
–1	Pelletier 33	[KM64, Pel86]	-	7	3.1	42%	–
–2		[KM64, Pel86]	-	3	1.3	–	–
SYN064	FPell35	Pelletier Problem 35					
–1	Pelletier 35, p35.in	[KM64, Pel86]	-	2	1.0	–	–
SYN065	FPell36	Pelletier Problem 36					
–1	Pelletier 36, p36.in	[Pel86]	-	7	2.1	–	–
SYN066	FPell37	Pelletier Problem 37					
–1	Pelletier 37, p37.in	[Pel86]	-	6	1.7	16%	–
SYN067	FPell38	Pelletier Problem 38					
–1	Pelletier 38, p38a.in, p38b.in	[Pel86]	-	84	6.0	82%	–
–2		[Pel86]	-	55	5.3	80%	–
–3		[Pel86]	-	46	5.6	86%	–
SYN068	FPell44	Pelletier Problem 44					
–1	Pelletier 44, p44.in	[KM64, Pel86]	-	7	1.9	–	–
SYN069	FPell45	Pelletier Problem 45					
–1	Pelletier 45, p45.in	[KM64, Pel86]	-	9	3.0	22%	–
SYN070	FPell46	Pelletier Problem 46					
–1	Pelletier 46, p46.in	[KM64, Pel86]	-	9	2.9	44%	–
SYN071	FPell48	Pelletier Problem 48					
–1	Pelletier 48	[Pel86, Rud93]	-	7	1.7	28%	100%
SYN072	FPell49	Pelletier Problem 49					
–1	Pelletier 49	[Pel86]	-	9	1.7	11%	66%
SYN073	FPell50	Pelletier Problem 50					
–1	Pelletier 50	[Pel86]	-	8	2.1	12%	58%
SYN074	FPell51	Pelletier Problem 51					
–1	Pelletier 51	[Pel86]	-	20	2.8	25%	65%
SYN075	FPell52	Pelletier Problem 52					
–1	Pelletier 52	[Pel86]	-	19	2.7	21%	64%
SYN076	FPell53	Pelletier Problem 53					
–1	Pelletier 53	[Pel86]	-	53	4.4	60%	71%
SYN077	FPell54	Pelletier Problem 54					
–1	Pelletier 54	[Mon55, Pel86, Pel88]	-	18	2.4	16%	51%
SYN078	FPell56	Pelletier Problem 56					
–1	Pelletier 56	[Pel86, Pel88]	-	17	2.7	35%	34%
SYN079	FPell57	Pelletier Problem 57					
–1	Pelletier 57	[Pel86]	-	4	1.5	–	–
SYN080	FPell58	Pelletier Problem 58					
–1	Pelletier 58	[Pel86]	-	7	1.7	–	100%
SYN081	FPell59	Pelletier Problem 59					
–1	Pelletier 59	[Pel86]	-	3	2.0	33%	–
SYN082	FPell60	Pelletier Problem 60					
–1	Pelletier 60	[Pel86, Pel88]	-	8	3.1	50%	–

Syntactic name	Semantic name	Description					
V#	Other names	References	V	Cl	Av	nH	Eq
SYN083	FPell61	Pelletier Problem 61					
−1	Pelletier 61	[Pel86]	-	7	1.7	–	100%
SYN084	FPell62	Pelletier Problem 62					
−1	Pelletier 62	[Pel86, Pel88, Pel95]	-	13	3.8	61%	–
−2	Pelletier 62	[Pel86, Pel88, Häh94, Pel95]	-	7	2.7	28%	–
SYN085	DAPs1	Plaisted problem s(1,10)					
−1.010	S1n	[Pla94]	-	12	1.8	–	–
SYN086	DAPs2	Plaisted problem s(2,3)					
−1.003	S2n	[Pla94]	-	19	2.6	–	–
SYN087	DAPs3	Plaisted problem s(3,3)					
−1.003	S3n	[Pla94]	-	21	2.8	–	–
SYN088	DAPs4	Plaisted problem s(4,10)					
−1.010	S4n	[Pla94]	-	22	1.5	–	–
SYN089	DAPt2	Plaisted problem t(2,2)					
−1.002	T2n	[Pla94]	-	13	1.9	–	–
SYN090	DAPt3	Plaisted problem t(3,8)					
−1.008	T3n	[Pla94]	-	65	2.8	–	–
SYN091	DAPsyms2	Plaisted problem sym(s(2,3))					
−1.003	Sym(S2n)	[Pla94]	-	38	2.6	31%	–
SYN092	DAPsyms3	Plaisted problem sym(s(3,3))					
−1.003	Sym(S3n)	[Pla94]	-	42	2.8	40%	–
SYN093	DAPut2	Plaisted problem u(t(2,2))					
−1.002	U(T2n)	[Pla94]	-	26	2.4	46%	–
SYN094	DAPut3	Plaisted problem u(t(3,5))					
−1.005	U(T3n)	[Pla94]	-	82	2.8	48%	–
SYN095	DAPmt2	Plaisted problem m(t(2,2))					
−1.002	M(T2n)	[Pla94]	-	13	1.9	–	–
SYN096	DAPmt3	Plaisted problem m(t(3,8))					
−1.008	M(T3n)	[Pla94]	-	65	2.8	–	–
SYN097	DAPsymut2	Plaisted problem sym(u(t(2,2)))					
−1.002	Sym(U(T2n))	[Pla94]	-	52	2.4	30%	–
SYN098	DAPsymut3	Plaisted problem sym(u(t(3,2)))					
−1.002	Sym(U(T3n))	[Pla94]	-	68	2.6	36%	–
SYN099	DAPsymmt2	Plaisted problem sym(m(t(2,3)))					
−1.003	Sym(M(T2n))	[Pla94]	-	50	2.2	24%	–
SYN100	DAPsymmt3	Plaisted problem sym(m(t(3,5)))					
−1.005	Sym(M(T3n))	[Pla94]	-	82	2.7	40%	–
SYN101	DAPnt2	Plaisted problem n(t(2,2),2)					
−1.002:002	N(T2n))	[Pla94]	-	17	2.2	–	–
SYN102	DAPnt3	Plaisted problem n(t(3,7),7)					
−1.007:007	N(T3n))	[Pla94]	-	71	2.8	–	–
SYN103	RPT63_QU_1	RPT63 synthetic problem 1 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN104	RPT63_QU_2	RPT63 synthetic problem 2 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN105	RPT63_QU_3	RPT63 synthetic problem 3 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN106	RPT63_QU_4	RPT63 synthetic problem 4 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN107	RPT63_QU_5	RPT63 synthetic problem 5 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN108	RPT63_QU_6	RPT63 synthetic problem 6 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN109	RPT63_QU_7	RPT63 synthetic problem 7 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN110	RPT63_QU_8	RPT63 synthetic problem 8 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN111	RPT63_QU_9	RPT63 synthetic problem 9 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN112	RPT63_QU_10	RPT63 synthetic problem 10 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN113	RPT63_QU_11	RPT63 synthetic problem 11 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN114	RPT63_QU_12	RPT63 synthetic problem 12 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN115	RPT63_QU_13	RPT63 synthetic problem 13 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN116	RPT63_QU_14	RPT63 synthetic problem 14 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN117	RPT63_QU_15	RPT63 synthetic problem 15 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN118	RPT63_QU_16	RPT63 synthetic problem 16 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN119	RPT63_QU_17	RPT63 synthetic problem 17 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN120	RPT63_QU_18	RPT63 synthetic problem 18 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN121	RPT63_QU_19	RPT63 synthetic problem 19 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN122	RPT63_QU_20	RPT63 synthetic problem 20 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN123	RPT63_QU_21	RPT63 synthetic problem 21 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–
SYN124	RPT63_QU_22	RPT63 synthetic problem 22 (quasi-uniform distribution)					
−1		[SE94]	-	369	2.9	–	–

Syntactic name V#	Semantic name Other names	References	Description	V	Cl	Av	nH	Eq
SYN125 −1	RPT63_QU_23	[SE94]	RPT63 synthetic problem 23 (quasi-uniform distribution)	-	369	2.9	–	–
SYN126 −1	RPT63_QU_24	[SE94]	RPT63 synthetic problem 24 (quasi-uniform distribution)	-	369	2.9	–	–
SYN127 −1	RPT63_QU_25	[SE94]	RPT63 synthetic problem 25 (quasi-uniform distribution)	-	369	2.9	–	–
SYN128 −1	RPT63_QU_26	[SE94]	RPT63 synthetic problem 26 (quasi-uniform distribution)	-	369	2.9	–	–
SYN129 −1	RPT63_QU_27	[SE94]	RPT63 synthetic problem 27 (quasi-uniform distribution)	-	369	2.9	–	–
SYN130 −1	RPT63_QU_28	[SE94]	RPT63 synthetic problem 28 (quasi-uniform distribution)	-	369	2.9	–	–
SYN131 −1	RPT63_QU_29	[SE94]	RPT63 synthetic problem 29 (quasi-uniform distribution)	-	369	2.9	–	–
SYN132 −1	RPT63_QU_30	[SE94]	RPT63 synthetic problem 30 (quasi-uniform distribution)	-	369	2.9	–	–
SYN133 −1	RPT63_QU_31	[SE94]	RPT63 synthetic problem 31 (quasi-uniform distribution)	-	369	2.9	–	–
SYN134 −1	RPT63_QU_32	[SE94]	RPT63 synthetic problem 32 (quasi-uniform distribution)	-	369	2.9	–	–
SYN135 −1	RPT63_QU_33	[SE94]	RPT63 synthetic problem 33 (quasi-uniform distribution)	-	369	2.9	–	–
SYN136 −1	RPT63_QU_34	[SE94]	RPT63 synthetic problem 34 (quasi-uniform distribution)	-	369	2.9	–	–
SYN137 −1	RPT63_QU_35	[SE94]	RPT63 synthetic problem 35 (quasi-uniform distribution)	-	369	2.9	–	–
SYN138 −1	RPT63_QU_36	[SE94]	RPT63 synthetic problem 36 (quasi-uniform distribution)	-	369	2.9	–	–
SYN139 −1	RPT63_QU_37	[SE94]	RPT63 synthetic problem 37 (quasi-uniform distribution)	-	369	2.9	–	–
SYN140 −1	RPT63_QU_38	[SE94]	RPT63 synthetic problem 38 (quasi-uniform distribution)	-	369	2.9	–	–
SYN141 −1	RPT63_QU_39	[SE94]	RPT63 synthetic problem 39 (quasi-uniform distribution)	-	369	2.9	–	–
SYN142 −1	RPT63_QU_40	[SE94]	RPT63 synthetic problem 40 (quasi-uniform distribution)	-	369	2.9	–	–
SYN143 −1	RPT63_QU_41	[SE94]	RPT63 synthetic problem 41 (quasi-uniform distribution)	-	369	2.9	–	–
SYN144 −1	RPT63_QU_42	[SE94]	RPT63 synthetic problem 42 (quasi-uniform distribution)	-	369	2.9	–	–
SYN145 −1	RPT63_QU_43	[SE94]	RPT63 synthetic problem 43 (quasi-uniform distribution)	-	369	2.9	–	–
SYN146 −1	RPT63_QU_44	[SE94]	RPT63 synthetic problem 44 (quasi-uniform distribution)	-	369	2.9	–	–
SYN147 −1	RPT63_QU_45	[SE94]	RPT63 synthetic problem 45 (quasi-uniform distribution)	-	369	2.9	–	–
SYN148 −1	RPT63_QU_46	[SE94]	RPT63 synthetic problem 46 (quasi-uniform distribution)	-	369	2.9	–	–
SYN149 −1	RPT63_QU_47	[SE94]	RPT63 synthetic problem 47 (quasi-uniform distribution)	-	369	2.9	–	–
SYN150 −1	RPT63_QU_48	[SE94]	RPT63 synthetic problem 48 (quasi-uniform distribution)	-	369	2.9	–	–
SYN151 −1	RPT63_QU_49	[SE94]	RPT63 synthetic problem 49 (quasi-uniform distribution)	-	369	2.9	–	–
SYN152 −1	RPT63_QU_50	[SE94]	RPT63 synthetic problem 50 (quasi-uniform distribution)	-	369	2.9	–	–
SYN153 −1	RPT63_QU_51	[SE94]	RPT63 synthetic problem 51 (quasi-uniform distribution)	-	369	2.9	–	–
SYN154 −1	RPT63_QU_52	[SE94]	RPT63 synthetic problem 52 (quasi-uniform distribution)	-	369	2.9	–	–
SYN155 −1	RPT63_QU_53	[SE94]	RPT63 synthetic problem 53 (quasi-uniform distribution)	-	369	2.9	–	–
SYN156 −1	RPT63_QU_54	[SE94]	RPT63 synthetic problem 54 (quasi-uniform distribution)	-	369	2.9	–	–
SYN157 −1	RPT63_QU_55	[SE94]	RPT63 synthetic problem 55 (quasi-uniform distribution)	-	369	2.9	–	–
SYN158 −1	RPT63_QU_56	[SE94]	RPT63 synthetic problem 56 (quasi-uniform distribution)	-	369	2.9	–	–
SYN159 −1	RPT63_QU_57	[SE94]	RPT63 synthetic problem 57 (quasi-uniform distribution)	-	369	2.9	–	–
SYN160 −1	RPT63_QU_58	[SE94]	RPT63 synthetic problem 58 (quasi-uniform distribution)	-	369	2.9	–	–
SYN161 −1	RPT63_QU_59	[SE94]	RPT63 synthetic problem 59 (quasi-uniform distribution)	-	369	2.9	–	–
SYN162 −1	RPT63_QU_60	[SE94]	RPT63 synthetic problem 60 (quasi-uniform distribution)	-	369	2.9	–	–
SYN163 −1	RPT63_QU_61	[SE94]	RPT63 synthetic problem 61 (quasi-uniform distribution)	-	369	2.9	–	–
SYN164 −1	RPT63_QU_62	[SE94]	RPT63 synthetic problem 62 (quasi-uniform distribution)	-	369	2.9	–	–
SYN165 −1	RPT63_QU_63	[SE94]	RPT63 synthetic problem 63 (quasi-uniform distribution)	-	369	2.9	–	–
SYN166 −1	RPT63_QU_64	[SE94]	RPT63 synthetic problem 64 (quasi-uniform distribution)	-	369	2.9	–	–

Syntactic name	V#	Semantic name / Other names	References	Description	V	Cl	Av	nH	Eq
SYN167	−1	RPT63_QU_65	[SE94]	RPT63 synthetic problem 65 (quasi-uniform distribution)	-	369	2.9	–	–
SYN168	−1	RPT63_QU_66	[SE94]	RPT63 synthetic problem 66 (quasi-uniform distribution)	-	369	2.9	–	–
SYN169	−1	RPT63_QU_67	[SE94]	RPT63 synthetic problem 67 (quasi-uniform distribution)	-	369	2.9	–	–
SYN170	−1	RPT63_QU_68	[SE94]	RPT63 synthetic problem 68 (quasi-uniform distribution)	-	369	2.9	–	–
SYN171	−1	RPT63_QU_69	[SE94]	RPT63 synthetic problem 69 (quasi-uniform distribution)	-	369	2.9	–	–
SYN172	−1	RPT63_QU_70	[SE94]	RPT63 synthetic problem 70 (quasi-uniform distribution)	-	369	2.9	–	–
SYN173	−1	RPT63_QU_71	[SE94]	RPT63 synthetic problem 71 (quasi-uniform distribution)	-	369	2.9	–	–
SYN174	−1	RPT63_QU_72	[SE94]	RPT63 synthetic problem 72 (quasi-uniform distribution)	-	369	2.9	–	–
SYN175	−1	RPT63_QU_73	[SE94]	RPT63 synthetic problem 73 (quasi-uniform distribution)	-	369	2.9	–	–
SYN176	−1	RPT63_QU_74	[SE94]	RPT63 synthetic problem 74 (quasi-uniform distribution)	-	369	2.9	–	–
SYN177	−1	RPT63_QU_75	[SE94]	RPT63 synthetic problem 75 (quasi-uniform distribution)	-	369	2.9	–	–
SYN178	−1	RPT63_QU_76	[SE94]	RPT63 synthetic problem 76 (quasi-uniform distribution)	-	369	2.9	–	–
SYN179	−1	RPT63_QU_77	[SE94]	RPT63 synthetic problem 77 (quasi-uniform distribution)	-	369	2.9	–	–
SYN180	−1	RPT63_QU_78	[SE94]	RPT63 synthetic problem 78 (quasi-uniform distribution)	-	369	2.9	–	–
SYN181	−1	RPT63_QU_79	[SE94]	RPT63 synthetic problem 79 (quasi-uniform distribution)	-	369	2.9	–	–
SYN182	−1	RPT63_QU_80	[SE94]	RPT63 synthetic problem 80 (quasi-uniform distribution)	-	369	2.9	–	–
SYN183	−1	RPT63_QU_81	[SE94]	RPT63 synthetic problem 81 (quasi-uniform distribution)	-	369	2.9	–	–
SYN184	−1	RPT63_QU_82	[SE94]	RPT63 synthetic problem 82 (quasi-uniform distribution)	-	369	2.9	–	–
SYN185	−1	RPT63_QU_83	[SE94]	RPT63 synthetic problem 83 (quasi-uniform distribution)	-	369	2.9	–	–
SYN186	−1	RPT63_QU_84	[SE94]	RPT63 synthetic problem 84 (quasi-uniform distribution)	-	369	2.9	–	–
SYN187	−1	RPT63_QU_85	[SE94]	RPT63 synthetic problem 85 (quasi-uniform distribution)	-	369	2.9	–	–
SYN188	−1	RPT63_QU_86	[SE94]	RPT63 synthetic problem 86 (quasi-uniform distribution)	-	369	2.9	–	–
SYN189	−1	RPT63_QU_87	[SE94]	RPT63 synthetic problem 87 (quasi-uniform distribution)	-	369	2.9	–	–
SYN190	−1	RPT63_QU_88	[SE94]	RPT63 synthetic problem 88 (quasi-uniform distribution)	-	369	2.9	–	–
SYN191	−1	RPT63_QU_89	[SE94]	RPT63 synthetic problem 89 (quasi-uniform distribution)	-	369	2.9	–	–
SYN192	−1	RPT63_QU_90	[SE94]	RPT63 synthetic problem 90 (quasi-uniform distribution)	-	369	2.9	–	–
SYN193	−1	RPT63_QU_91	[SE94]	RPT63 synthetic problem 91 (quasi-uniform distribution)	-	369	2.9	–	–
SYN194	−1	RPT63_QU_92	[SE94]	RPT63 synthetic problem 92 (quasi-uniform distribution)	-	369	2.9	–	–
SYN195	−1	RPT63_QU_93	[SE94]	RPT63 synthetic problem 93 (quasi-uniform distribution)	-	369	2.9	–	–
SYN196	−1	RPT63_QU_94	[SE94]	RPT63 synthetic problem 94 (quasi-uniform distribution)	-	369	2.9	–	–
SYN197	−1	RPT63_QU_95	[SE94]	RPT63 synthetic problem 95 (quasi-uniform distribution)	-	369	2.9	–	–
SYN198	−1	RPT63_QU_96	[SE94]	RPT63 synthetic problem 96 (quasi-uniform distribution)	-	369	2.9	–	–
SYN199	−1	RPT63_QU_97	[SE94]	RPT63 synthetic problem 97 (quasi-uniform distribution)	-	369	2.9	–	–
SYN200	−1	RPT63_QU_98	[SE94]	RPT63 synthetic problem 98 (quasi-uniform distribution)	-	369	2.9	–	–
SYN201	−1	RPT63_QU_99	[SE94]	RPT63 synthetic problem 99 (quasi-uniform distribution)	-	369	2.9	–	–
SYN202	−1	RPT63_QU_100	[SE94]	RPT63 synthetic problem 100 (quasi-uniform distribution)	-	369	2.9	–	–
SYN203	−1	RPT63_QU_101	[SE94]	RPT63 synthetic problem 101 (quasi-uniform distribution)	-	369	2.9	–	–
SYN204	−1	RPT63_QU_102	[SE94]	RPT63 synthetic problem 102 (quasi-uniform distribution)	-	369	2.9	–	–
SYN205	−1	RPT63_QU_103	[SE94]	RPT63 synthetic problem 103 (quasi-uniform distribution)	-	369	2.9	–	–
SYN206	−1	RPT63_QU_104	[SE94]	RPT63 synthetic problem 104 (quasi-uniform distribution)	-	369	2.9	–	–
SYN207	−1	RPT63_QU_105	[SE94]	RPT63 synthetic problem 105 (quasi-uniform distribution)	-	369	2.9	–	–
SYN208	−1	RPT63_QU_106	[SE94]	RPT63 synthetic problem 106 (quasi-uniform distribution)	-	369	2.9	–	–

Syntactic name	V#	Semantic name	Other names	References	Description	V	Cl	Av	nH	Eq
SYN209	−1	RPT63_QU_107		[SE94]	RPT63 synthetic problem 107 (quasi-uniform distribution)	-	369	2.9	–	–
SYN210	−1	RPT63_QU_108		[SE94]	RPT63 synthetic problem 108 (quasi-uniform distribution)	-	369	2.9	–	–
SYN211	−1	RPT63_QU_109		[SE94]	RPT63 synthetic problem 109 (quasi-uniform distribution)	-	369	2.9	–	–
SYN212	−1	RPT63_QU_110		[SE94]	RPT63 synthetic problem 110 (quasi-uniform distribution)	-	369	2.9	–	–
SYN213	−1	RPT63_QU_111		[SE94]	RPT63 synthetic problem 111 (quasi-uniform distribution)	-	369	2.9	–	–
SYN214	−1	RPT63_QU_112		[SE94]	RPT63 synthetic problem 112 (quasi-uniform distribution)	-	369	2.9	–	–
SYN215	−1	RPT63_QU_113		[SE94]	RPT63 synthetic problem 113 (quasi-uniform distribution)	-	369	2.9	–	–
SYN216	−1	RPT63_SK_1		[SE94]	RPT63 synthetic problem 1 (skewed distribution)	-	369	2.9	–	–
SYN217	−1	RPT63_SK_2		[SE94]	RPT63 synthetic problem 2 (skewed distribution)	-	369	2.9	–	–
SYN218	−1	RPT63_SK_3		[SE94]	RPT63 synthetic problem 3 (skewed distribution)	-	369	2.9	–	–
SYN219	−1	RPT63_SK_4		[SE94]	RPT63 synthetic problem 4 (skewed distribution)	-	369	2.9	–	–
SYN220	−1	RPT63_SK_5		[SE94]	RPT63 synthetic problem 5 (skewed distribution)	-	369	2.9	–	–
SYN221	−1	RPT63_SK_6		[SE94]	RPT63 synthetic problem 6 (skewed distribution)	-	369	2.9	–	–
SYN222	−1	RPT63_SK_7		[SE94]	RPT63 synthetic problem 7 (skewed distribution)	-	369	2.9	–	–
SYN223	−1	RPT63_SK_8		[SE94]	RPT63 synthetic problem 8 (skewed distribution)	-	369	2.9	–	–
SYN224	−1	RPT63_SK_9		[SE94]	RPT63 synthetic problem 9 (skewed distribution)	-	369	2.9	–	–
SYN225	−1	RPT63_SK_10		[SE94]	RPT63 synthetic problem 10 (skewed distribution)	-	369	2.9	–	–
SYN226	−1	RPT63_SK_11		[SE94]	RPT63 synthetic problem 11 (skewed distribution)	-	369	2.9	–	–
SYN227	−1	RPT63_SK_12		[SE94]	RPT63 synthetic problem 12 (skewed distribution)	-	369	2.9	–	–
SYN228	−1	RPT63_SK_13		[SE94]	RPT63 synthetic problem 13 (skewed distribution)	-	369	2.9	–	–
SYN229	−1	RPT63_SK_14		[SE94]	RPT63 synthetic problem 14 (skewed distribution)	-	369	2.9	–	–
SYN230	−1	RPT63_SK_15		[SE94]	RPT63 synthetic problem 15 (skewed distribution)	-	369	2.9	–	–
SYN231	−1	RPT63_SK_16		[SE94]	RPT63 synthetic problem 16 (skewed distribution)	-	369	2.9	–	–
SYN232	−1	RPT63_SK_17		[SE94]	RPT63 synthetic problem 17 (skewed distribution)	-	369	2.9	–	–
SYN233	−1	RPT63_SK_18		[SE94]	RPT63 synthetic problem 18 (skewed distribution)	-	369	2.9	–	–
SYN234	−1	RPT63_SK_19		[SE94]	RPT63 synthetic problem 19 (skewed distribution)	-	369	2.9	–	–
SYN235	−1	RPT63_SK_20		[SE94]	RPT63 synthetic problem 20 (skewed distribution)	-	369	2.9	–	–
SYN236	−1	RPT63_SK_21		[SE94]	RPT63 synthetic problem 21 (skewed distribution)	-	369	2.9	–	–
SYN237	−1	RPT63_SK_22		[SE94]	RPT63 synthetic problem 22 (skewed distribution)	-	369	2.9	–	–
SYN238	−1	RPT63_SK_23		[SE94]	RPT63 synthetic problem 23 (skewed distribution)	-	369	2.9	–	–
SYN239	−1	RPT63_SK_24		[SE94]	RPT63 synthetic problem 24 (skewed distribution)	-	369	2.9	–	–
SYN240	−1	RPT63_SK_25		[SE94]	RPT63 synthetic problem 25 (skewed distribution)	-	369	2.9	–	–
SYN241	−1	RPT63_SK_26		[SE94]	RPT63 synthetic problem 26 (skewed distribution)	-	369	2.9	–	–
SYN242	−1	RPT63_SK_27		[SE94]	RPT63 synthetic problem 27 (skewed distribution)	-	369	2.9	–	–
SYN243	−1	RPT63_SK_28		[SE94]	RPT63 synthetic problem 28 (skewed distribution)	-	369	2.9	–	–
SYN244	−1	RPT63_SK_29		[SE94]	RPT63 synthetic problem 29 (skewed distribution)	-	369	2.9	–	–
SYN245	−1	RPT63_SK_30		[SE94]	RPT63 synthetic problem 30 (skewed distribution)	-	369	2.9	–	–
SYN246	−1	RPT63_SK_31		[SE94]	RPT63 synthetic problem 31 (skewed distribution)	-	369	2.9	–	–
SYN247	−1	RPT63_SK_32		[SE94]	RPT63 synthetic problem 32 (skewed distribution)	-	369	2.9	–	–
SYN248	−1	RPT63_SK_33		[SE94]	RPT63 synthetic problem 33 (skewed distribution)	-	369	2.9	–	–
SYN249	−1	RPT63_SK_34		[SE94]	RPT63 synthetic problem 34 (skewed distribution)	-	369	2.9	–	–
SYN250	−1	RPT63_SK_35		[SE94]	RPT63 synthetic problem 35 (skewed distribution)	-	369	2.9	–	–

Syntactic name V#	Semantic name Other names	References	Description	V	Cl	Av	nH	Eq
SYN251 −1	RPT63_SK_36	[SE94]	RPT63 synthetic problem 36 (skewed distribution)	-	369	2.9	–	–
SYN252 −1	RPT63_SK_37	[SE94]	RPT63 synthetic problem 37 (skewed distribution)	-	369	2.9	–	–
SYN253 −1	RPT63_SK_38	[SE94]	RPT63 synthetic problem 38 (skewed distribution)	-	369	2.9	–	–
SYN254 −1	RPT63_SK_39	[SE94]	RPT63 synthetic problem 39 (skewed distribution)	-	369	2.9	–	–
SYN255 −1	RPT63_SK_40	[SE94]	RPT63 synthetic problem 40 (skewed distribution)	-	369	2.9	–	–
SYN256 −1	RPT63_SK_41	[SE94]	RPT63 synthetic problem 41 (skewed distribution)	-	369	2.9	–	–
SYN257 −1	RPT63_SK_42	[SE94]	RPT63 synthetic problem 42 (skewed distribution)	-	369	2.9	–	–
SYN258 −1	RPT63_SK_43	[SE94]	RPT63 synthetic problem 43 (skewed distribution)	-	369	2.9	–	–
SYN259 −1	RPT63_SK_44	[SE94]	RPT63 synthetic problem 44 (skewed distribution)	-	369	2.9	–	–
SYN260 −1	RPT63_SK_45	[SE94]	RPT63 synthetic problem 45 (skewed distribution)	-	369	2.9	–	–
SYN261 −1	RPT63_SK_46	[SE94]	RPT63 synthetic problem 46 (skewed distribution)	-	369	2.9	–	–
SYN262 −1	RPT63_SK_47	[SE94]	RPT63 synthetic problem 47 (skewed distribution)	-	369	2.9	–	–
SYN263 −1	RPT63_SK_48	[SE94]	RPT63 synthetic problem 48 (skewed distribution)	-	369	2.9	–	–
SYN264 −1	RPT63_SK_49	[SE94]	RPT63 synthetic problem 49 (skewed distribution)	-	369	2.9	–	–
SYN265 −1	RPT63_SK_50	[SE94]	RPT63 synthetic problem 50 (skewed distribution)	-	369	2.9	–	–
SYN266 −1	RPT63_SK_51	[SE94]	RPT63 synthetic problem 51 (skewed distribution)	-	369	2.9	–	–
SYN267 −1	RPT63_SK_52	[SE94]	RPT63 synthetic problem 52 (skewed distribution)	-	369	2.9	–	–
SYN268 −1	RPT63_SK_53	[SE94]	RPT63 synthetic problem 53 (skewed distribution)	-	369	2.9	–	–
SYN269 −1	RPT63_SK_54	[SE94]	RPT63 synthetic problem 54 (skewed distribution)	-	369	2.9	–	–
SYN270 −1	RPT63_SK_55	[SE94]	RPT63 synthetic problem 55 (skewed distribution)	-	369	2.9	–	–
SYN271 −1	RPT63_SK_56	[SE94]	RPT63 synthetic problem 56 (skewed distribution)	-	369	2.9	–	–
SYN272 −1	RPT63_SK_57	[SE94]	RPT63 synthetic problem 57 (skewed distribution)	-	369	2.9	–	–
SYN273 −1	RPT63_SK_58	[SE94]	RPT63 synthetic problem 58 (skewed distribution)	-	369	2.9	–	–
SYN274 −1	RPT63_SK_59	[SE94]	RPT63 synthetic problem 59 (skewed distribution)	-	369	2.9	–	–
SYN275 −1	RPT63_SK_60	[SE94]	RPT63 synthetic problem 60 (skewed distribution)	-	369	2.9	–	–
SYN276 −1	RPT63_SK_61	[SE94]	RPT63 synthetic problem 61 (skewed distribution)	-	369	2.9	–	–
SYN277 −1	RPT63_SK_62	[SE94]	RPT63 synthetic problem 62 (skewed distribution)	-	369	2.9	–	–
SYN278 −1	RPT63_SK_63	[SE94]	RPT63 synthetic problem 63 (skewed distribution)	-	369	2.9	–	–
SYN279 −1	RPT63_SK_64	[SE94]	RPT63 synthetic problem 64 (skewed distribution)	-	369	2.9	–	–
SYN280 −1	RPT63_SK_65	[SE94]	RPT63 synthetic problem 65 (skewed distribution)	-	369	2.9	–	–
SYN281 −1	RPT63_SK_66	[SE94]	RPT63 synthetic problem 66 (skewed distribution)	-	369	2.9	–	–
SYN282 −1	RPT63_SK_67	[SE94]	RPT63 synthetic problem 67 (skewed distribution)	-	369	2.9	–	–
SYN283 −1	RPT63_SK_68	[SE94]	RPT63 synthetic problem 68 (skewed distribution)	-	369	2.9	–	–
SYN284 −1	RPT63_SK_69	[SE94]	RPT63 synthetic problem 69 (skewed distribution)	-	369	2.9	–	–
SYN285 −1	RPT63_SK_70	[SE94]	RPT63 synthetic problem 70 (skewed distribution)	-	369	2.9	–	–
SYN286 −1	RPT63_SK_71	[SE94]	RPT63 synthetic problem 71 (skewed distribution)	-	369	2.9	–	–
SYN287 −1	RPT63_SK_72	[SE94]	RPT63 synthetic problem 72 (skewed distribution)	-	369	2.9	–	–
SYN288 −1	RPT63_SK_73	[SE94]	RPT63 synthetic problem 73 (skewed distribution)	-	369	2.9	–	–
SYN289 −1	RPT63_SK_74	[SE94]	RPT63 synthetic problem 74 (skewed distribution)	-	369	2.9	–	–
SYN290 −1	RPT63_SK_75	[SE94]	RPT63 synthetic problem 75 (skewed distribution)	-	369	2.9	–	–
SYN291 −1	RPT63_SK_76	[SE94]	RPT63 synthetic problem 76 (skewed distribution)	-	369	2.9	–	–
SYN292 −1	RPT63_SK_77	[SE94]	RPT63 synthetic problem 77 (skewed distribution)	-	369	2.9	–	–

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
SYN293 −1	RPT63_SK_78	RPT63 synthetic problem 78 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN294 −1	RPT63_SK_79	RPT63 synthetic problem 79 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN295 −1	RPT63_SK_80	RPT63 synthetic problem 80 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN296 −1	RPT63_SK_81	RPT63 synthetic problem 81 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN297 −1	RPT63_SK_82	RPT63 synthetic problem 82 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN298 −1	RPT63_SK_83	RPT63 synthetic problem 83 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN299 −1	RPT63_SK_84	RPT63 synthetic problem 84 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN300 −1	RPT63_SK_85	RPT63 synthetic problem 85 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN301 −1	RPT63_SK_86	RPT63 synthetic problem 86 (skewed distribution) [SE94]	-	369	2.9	–	–
SYN302 −1.003	DAPa An	Plaisted problem a(3) [Pla94]	-	72	3.0	–	–
SYN303 −1	Decide1 Example 1	Problem for testing satisfiability [BCP94]	-	5	1.6	–	–
SYN304 −1	Decide2 Example 2, EXAMPLE 7.8	Problem for testing satisfiability [BCP94, FLTZ93]	-	8	1.3	12%	–
SYN305 −1	Decide3 Example 3	Problem for testing satisfiability [BCP94]	-	9	1.7	–	100%
SYN306 −1	Decide4 EXAMPLE 3.2.2	Problem for testing satisfiability [FLTZ93]	-	6	1.7	16%	–
SYN307 −1	Decide5 EXAMPLE 3.2.3	Problem for testing satisfiability [FLTZ93]	-	4	2.0	25%	–
SYN308 −1	Decide6 EXAMPLE 4.11	Problem for testing satisfiability [FLTZ93]	-	4	2.3	75%	–
SYN309 −1	Decide7 EXAMPLE 7.1	Problem for testing satisfiability [FLTZ93]	-	6	1.8	50%	–
SYN310 −1	Decide8 H1	Problem for testing satisfiability [FLTZ93]	-	6	1.7	–	–
SYN311 −1	Decide9 H2	Problem for testing satisfiability [FLTZ93]	-	6	1.7	–	–
SYN312 −1	Decide10 H3	Problem for testing satisfiability [FLTZ93]	-	8	1.8	12%	–
SYN313 −1.001:002	Decide11	Problem for testing satisfiability [Fer94]	-	2	2.5	50%	–
SYN314 −1.002:001	Decide12	Problem for testing satisfiability [Fer94]	-	2	2.5	50%	–
SYN315 −1	Church46_2_1 Ch2N1	Church problem 46.2 (1) [Chu56, FLTZ93, Tam94]	-	4	2.0	25%	–
SYN316 −1	Church46_2_2 Ch2N2	Church problem 46.2 (2) [Chu56, FLTZ93, Tam94]	-	2	2.0	50%	–
SYN317 −1	Church46_2_3 Ch2N3	Church problem 46.2 (3) [Chu56, FLTZ93, Tam94]	-	3	2.0	33%	–
SYN318 −1	Church46_2_4 Ch2N4	Church problem 46.2 (4) [Chu56, FLTZ93, Tam94]	-	4	1.5	–	–
SYN319 −1	Church46_2_5 Ch2N5	Church problem 46.2 (5) [Chu56, FLTZ93, Tam94]	-	7	1.9	14%	–
SYN320 −1	Church46_3_1 Ch3N1	Church problem 46.3 (1) [Chu56, FLTZ93, Tam94]	-	3	1.3	33%	–
SYN321 −1	Church46_3_2 Ch3N2	Church problem 46.3 (2) [Chu56, FLTZ93, Tam94]	-	4	2.0	25%	–
SYN322 −1	Church46_4_1 Ch4N1	Church problem 46.4 (1) [Chu56, FLTZ93, Tam94]	-	2	2.0	–	–
SYN323 −1	Church46_4_2 Ch4N2	Church problem 46.4 (2) [Chu56, FLTZ93, Tam94]	-	4	2.0	25%	–
SYN324 −1	Church46_9_1 Ch9N1	Church problem 46.9 (1) [Chu56, FLTZ93, Tam94]	-	4	2.0	25%	–
SYN325 −1	Church46_9_2 Ch9N2	Church problem 46.9 (2) [Chu56, FLTZ93, Tam94]	-	5	1.8	40%	–
SYN326 −1	Church46_12_1 Ch12N1	Church problem 46.12 (1) [Chu56, FLTZ93, Tam94]	-	7	1.7	42%	–
SYN327 −1	Church46_12_2 Ch12N2	Church problem 46.12 (2) [Chu56, FLTZ93, Tam94]	-	6	2.3	33%	–
SYN328 −1	Church46_12_3 Ch12N3	Church problem 46.12 (3) [Chu56, FLTZ93, Tam94]	-	11	2.5	36%	–
SYN329 −1	Church46_14_1 Ch14N1	Church problem 46.14 (1) [Chu56, FLTZ93, Tam94]	-	4	1.0	–	–
SYN330 −1	Church46_14_2 Ch14N2	Church problem 46.14 (2) [Chu56, FLTZ93, Tam94]	-	8	2.0	12%	–
SYN331 −1	Church46_14_3 Ch14N3	Church problem 46.14 (3) [Chu56, FLTZ93, Tam94]	-	7	1.4	14%	–
SYN332 −1	Church46_14_4 Ch14N4	Church problem 46.14 (4) [Chu56, FLTZ93, Tam94]	-	14	2.4	42%	–
SYN333 −1	Church46_14_5 Ch14N5	Church problem 46.14 (5) [Chu56, FLTZ93, Tam94]	-	3	2.7	–	–
SYN334 −1	Church46_14_6 Ch14N6	Church problem 46.14 (6) [Chu56, FLTZ93, Tam94]	-	7	2.4	28%	–

Syntactic name / V#	Semantic name / Other names	References	Description	V	Cl	Av	nH	Eq
SYN335	Church46_14_7		Church problem 46.14 (7)					
–1	Ch14N7	[Chu56, FLTZ93, Tam94]		-	12	2.2	33%	–
SYN336	Church46_15_1		Church problem 46.15 (1)					
–1	Ch15N1	[Chu56, FLTZ93, Tam94]		-	5	1.0	–	–
SYN337	Church46_15_2		Church problem 46.15 (2)					
–1	Ch15N2	[Chu56, FLTZ93, Tam94]		-	5	1.0	–	–
SYN338	Church46_15_3		Church problem 46.15 (3)					
–1	Ch15N3	[Chu56, FLTZ93, Tam94]		-	3	1.0	–	–
SYN339	Church46_15_4		Church problem 46.15 (4)					
–1	Ch15N4	[Chu56, FLTZ93, Tam94]		-	2	1.0	–	–
SYN340	Church46_15_5		Church problem 46.15 (5)					
–1	Ch15N5	[Chu56, FLTZ93, Tam94]		-	2	1.0	–	–
SYN341	Church46_15_6		Church problem 46.15 (6)					
–1	Ch15N6	[Chu56, FLTZ93, Tam94]		-	2	1.0	–	–
SYN342	Church46_15_7		Church problem 46.15 (7)					
–1	Ch15N7	[Chu56, FLTZ93, Tam94]		-	2	1.0	–	–
SYN343	Church46_16_2		Church problem 46.16 (2)					
–1	Ch16N2	[Chu56, FLTZ93, Tam94]		-	3	2.0	33%	–
SYN344	Church46_16_3		Church problem 46.16 (3)					
–1	Ch16N3	[Chu56, FLTZ93, Tam94]		-	5	2.0	40%	–
SYN345	Church46_16_4		Church problem 46.16 (4)					
–1	Ch16N4	[Chu56, FLTZ93, Tam94]		-	8	3.0	50%	–
SYN346	Church46_17_2		Church problem 46.17 (2)					
–1	Ch17N2	[Chu56, FLTZ93, Tam94]		-	4	1.5	–	–
SYN347	Church46_17_3		Church problem 46.17 (3)					
–1	Ch17N3	[Chu56, FLTZ93, Tam94]		-	6	2.7	50%	–
SYN348	Church46_17_4		Church problem 46.17 (4)					
–1	Ch17N4	[Chu56, FLTZ93, Tam94]		-	16	6.0	93%	–
SYN349	Church46_17_5		Church problem 46.17 (5)					
–1	Ch17N5	[Chu56, FLTZ93, Tam94]		-	10	3.6	70%	–
SYN350	Church46_18_2		Church problem 46.18 (2)					
–1	Ch18N2	[Chu56, FLTZ93, Tam94]		-	6	2.7	33%	–
SYN351	Church46_18_3		Church problem 46.18 (3)					
–1	Ch18N3	[Chu56, FLTZ93, Tam94]		-	7	2.0	42%	–
SYN352	Church46_18_4		Church problem 46.18 (4)					
–1	Ch18N4	[Chu56, FLTZ93, Tam94]		-	7	2.6	57%	–
SYN353	Church46_18_5		Church problem 46.18 (5)					
–1	Ch18N5	[Chu56, FLTZ93, Tam94]		-	17	2.8	47%	–
SYN354	Church46_20_1		Church problem 46.20 (1)					
–1	Ch20N1	[Chu56, FLTZ93, Tam94]		-	7	2.4	14%	–

Domain TOP (19 abstract problems, 24 problems)

Syntactic name / V#	Semantic name / Other names	References	Description	V	Cl	Av	nH	Eq
TOP001	BasisTplgLem1		Topology generated by a basis forms a topological space, part 1					
–1	Lemma 1a	[WM89]		-	111	3.0	20%	–
–2	Lemma 1a	[WM89]		-	13	2.1	7%	–
TOP002	BasisTplgLem2		Topology generated by a basis forms a topological space, part 2					
–1	Lemma 1b	[WM89]		-	111	3.0	20%	–
–2	Lemma 1b	[WM89]		-	3	1.3	33%	–
TOP003	BasisTplgLem3		Topology generated by a basis forms a topological space, part 3					
–1	Lemma 1c	[WM89]		-	111	3.0	20%	–
–2	Lemma 1c	[WM89]		-	11	2.0	9%	–
TOP004	BasisTplgLem4		Topology generated by a basis forms a topological space, part 4					
–1	Lemma 1d	[WM89]		-	113	3.0	20%	–
–2	Lemma 1d	[WM89]		-	21	2.8	4%	–
TOP005	BasisTplgLem5		Topology generated by a basis forms a topological space, part 5					
–1	Lemma 1e	[WM89]		-	112	3.0	20%	–
–2	Lemma 1e	[WM89]		-	12	2.5	16%	–
TOP006	BasisTplg		Topology generated by a basis forms a topological space					
–1	Problem 1	[WM89]		-	111	3.0	20%	–
TOP007	TplgEqn1		Property 1 of topological spaces					
–1	Problem 2	[WM89]		-	114	3.0	20%	–
TOP008	SubSpTplg		The subspace topology gives rise to a topological space					
–1	Problem 3	[WM89]		-	112	3.0	20%	–
TOP009	OpenTrans		If Y is open in X, and A is open in Y, then A is open in X					
–1	Problem 4	[WM89]		-	112	3.0	20%	–
TOP010	FinerSubSp		A finer topology induces a finer subspace topology					
–1	Problem 5	[WM89]		-	112	3.0	20%	–
TOP011	TopBasisAltDef		An alternative definition of top_of_basis					
–1	Problem 6	[WM89]		-	112	3.1	22%	–
TOP012	UnionIntscClsd		Intersections and finite unions of closed sets are closed					
–1	Problem 7	[WM89]		-	119	3.2	22%	–
TOP013	IntrSubSClsr		Properties of interior and closure					
–1	Problem 8	[WM89]		-	112	3.0	20%	–
TOP014	OpenIntrClsdClsr		Properties of open & interior and closed & closure					
–1	Problem 9	[WM89]		-	115	3.1	22%	–
TOP015	IntrBndy		The interior and the boundary of a set are disjoint					
–1	Problem 10	[WM89]		-	112	3.0	20%	–
TOP016	UnionIntrBndy		The union of the interior and the boundary is the closure					
–1	Problem 11	[WM89]		-	112	3.0	20%	–
TOP017	BndyEmpty		If the boundary of A is empty, A is both open and closed					
–1	Problem 12	[WM89]		-	114	3.0	21%	–
TOP018	LmtPtConnSet		Propoerty of limits points and connected sets					
–1	Problem 13	[WM89]		-	112	3.0	20%	–

Syntactic name V#	Semantic name Other names	Description References	V	Cl	Av	nH	Eq
TOP019 –1	ClsrConn Problem 14	The closure of a connected set is connected [WM89]	-	111	3.0	20%	–

9 Appendix

9.1 Abbreviation List

Acc : Account
Aff : Affect
AId : Additive Identity
ASym : Anti-symmetric
Abn : Abelian
Abs : Absolute
Absb : Absorption
Add : Addition/Additive
Alt : Alternative
Apply : Apply
Appn : Application
Assc : Associative
Assr : Associator
Ax : Axiom
B3Alg : Ternary Boolean Algebra
Base : Base step
Bnd : Bound
Bndy : Boundary
Bool : Boolean
Btwn : Betweenness
Canc : Cancellation
Circ : Circular
Cl : Class
Clsd : Closed
Clsr : Closure
Cmbtr : Combinator
Cmpbl : Compatible
Cmplt : Complete
Cmx : Complex
Cmps : Compose
Cmpsn : Composition
Cmpt : Component
Cmtr : Commutator
Comm : Commute
Cod : Codomain
Coll : Collinearity
Comm : Commutative
Cond : Condition
Cong : Congruent
Conj : Conjugate
Conn : Connected
Conn : Connectivity
Cons : Construction
Cont : Continuous
Cor : Corollary
Cpmt : Complement
Crit : Critical
Cube : Cubed
Dbl : Double
Dth : Death
Dec : Decrease
Def : Defined
Def : Definition
Dep : Depends on
Diagn : Diagonalization
Diff : Difference
Dsbg : Disbanding rate
Dist : Distributive
Div : Division operator
Dom : Domain
EP : Efficient producers
El : Element
Elim : Elimination
Embdg : Embedding
Empty : Empty
Env : Environment
Eq : Equality
Eq : Equals
Eqid : Equidistance
Eqn : Equation
Est : Estimate
Ex : Exists
Ext : Lengthen
Extn : Extension
Fact : Factor
FM : First movers
Flex : Flexible
Func : Function
Fxd : Fixed
Gen : General
Geq : Greater than or equal to
Gt : Greater than
Grp : Group
Gth : Growth
Hi : High
IN : Index N
Id : Identity
Idem : Idempotent
Img : Image
Inc : Increase
Indp : Independent
Indisc : Indiscernibles
Indn : Induction step
Indv : Inductive
Iia : Inertia
Inf : Infinite
Inr : Inner
Insr : Insertion
Intchg : Interchange
Intmed : Intermediate
Intr : Interior
Intsc : Intersection
Inv : Inverse
Invar : Invariant
Irr : Irrational
Irrefl : Irreflexive
Is El : Element
Isos : Isosceles
Ivln : Involution
L : Left
Lrg : Large
Latt : Lattice
LOG : Lattice Ordered Group
Law : Law
Leq : Less than or equal to
Lin : Linearised
Lmt : Limit
Ln : Line
Log : Logic
Low : Lower
Lt : Less than
Lub : Least Upper Bound
M : Middle
MId : Multiplicative Id
Max : Maximum
Memb : Member (of)
Min : Minimum
Minus : Subtraction operator
Mono : Monotonic
Mult M : Multiplication/M'tive
Neg : Negative
Nrml : Normal
Null : Null (segment)
ON : Order N
Obj : Object
Op : Operation
Opp : Opposite
Ord : Ordered
Ordl : Ordinal
Org : Organisation
Orth : Orthogonal(ity)
Out : Outer
Pln : Plane
Plus : Addition operator
Pop : Population
Pos : Positive
Ppr : Proper
Ppty : Property
Pr(s) : Pair(s)
Pred : Predecessor
Prm : Prime
Prod : Product
Prop : Propositional
Pt(s) : Point(s)
PwrCl : Power Class
Quant : Quantification
Quot : Quotient
R : Right
Rdcn : Reduction
Recr : Recursion
Refl : Reflexive
Reflc : Reflection
Rel : Relation
Reli : Reliable
Repr : Reproduce
Rsce : Resource
Rng : Range
Rob : Robbins

Rplmt	: Replacement
Rstd	: Restricted
Rstn	: Restriction
Rev	: Reverse
SV	: Single Valued
Sat	: Satisfiable
Sect	: Section
Seg	: Segment
Sel	: Selection
SemiG	: Semigroups
Set	: Set
SetB	: Set Builder
Sgtn	: Singleton
Sim	: Similar
Sz	: Size
Sm	: Small (set)
Soln	: Solution
Sqr	: Square(d)
Stb	: Stable
StSp	: State Space
Strong	: Strong
Struc	: Structure
SubCl	: Sub(class)
SubG	: Subgroups
SubS	: Sub(Set)
SubSp	: Sub(space)
Subs	: Substitution
Succ	: Successor
SupS	: Super(Set)
Symm	: Symmetric
Symn	: Symmetrization
Thm	: Theorem
Tm	: Time
Times	: Multiplication operator
Tplg	: Topology
Trans	: Transitive
Tri	: Triangle
Trnsf	: Transfinite
Un	: UnXXX
Union	: Union
Univ	: Universal
Unq	: Unique
Up	: Upper
Val	: Value
Wk	: Weak
XProd	: Cross product
Xm	: Xmorphism

9.2 Reverse Name Index

bird4.ver1.in	[ANL]	: COL052-1.p
bird4.ver2.in	[ANL]	: COL052-2.p
bird5.ver1.in	[ANL]	: COL053-1.p
bird6.ver1.in	[ANL]	: COL054-1.p
bird7.ver1.in	[ANL]	: COL055-1.p
bird8.ver1.in	[ANL]	: COL056-1.p
Bisecting Diagonal Theorem	[Wos88]	: GEO073-1.p
BL1	[MOW76]	: ANA003-2.p
BL2	[MOW76]	: ANA004-2.p
BL3	[MOW76]	: ANA005-1.p
Bledsoe-P1	[LM92]	: ANA003-4.p
bool.in	[OTT]	: BOO008-3.p
Boolean Rings	[Wos88]	: RNG008-1.p
Boolean Rings	[Wos88]	: RNG008-7.p
bool_ass.in	[OTT]	: BOO008-3.p
Boxes-of-fruit	[Wos88]	: PUZ012-1.p
Boxes-of-fruit	[WOLB92]	: PUZ012-1.p
boxes.ver1.in	[ANL]	: PUZ012-1.p
boys.ver1.in	[ANL]	: PUZ013-1.p
BURSTALL	[RRY+72]	: COM002-1.p
BURSTALL	[WM76]	: COM002-1.p
C0-37	[MW92]	: LCL025-1.p
C0-38	[MW92]	: LCL026-1.p
C0-39	[MW92]	: LCL027-1.p
C0-40	[MW92]	: LCL028-1.p
C0-41	[MW92]	: LCL029-1.p
C0-42	[MW92]	: LCL030-1.p
C0-43	[MW92]	: LCL031-1.p
C0-44	[MW92]	: LCL032-1.p
C0-45	[MW92]	: LCL033-1.p
C0-46	[MW92]	: LCL034-1.p
C0-47	[MW92]	: LCL035-1.p
C0-48	[MW92]	: LCL036-1.p
C0-49	[MW92]	: LCL037-1.p
C1	[Kun92]	: GRP049-1.p
C1	[MOW76]	: CAT001-1.p
C1	[Qua92a]	: SET150-6.p
C1	[WM88a]	: COL001-1.p
C1.1	[WM88a]	: COL002-1.p
C2	[MOW76]	: CAT002-1.p
C2	[WM88a]	: COL003-1.p
C2.1	[Qua89b]	: GEO064-3.p
C2.1	[Qua92a]	: SET151-6.p
C2.2	[Qua89b]	: GEO065-3.p
C2.2	[Qua92a]	: SET152-6.p
C2.3	[Qua89b]	: GEO066-3.p
C3	[Kun92]	: GRP051-1.p
C3	[MOW76]	: CAT003-1.p
C3	[Qua89b]	: GEO067-3.p
C3.1	[Qua92a]	: SET153-6.p
C3.2	[Qua92a]	: SET154-6.p
C4	[Kun92]	: GRP052-1.p
C4	[MOW76]	: CAT004-1.p
C4	[Qua89b]	: GEO068-3.p
C4	[WM88a]	: COL004-1.p
C4.1	[Qua92a]	: SET155-6.p
C4.2	[Qua92a]	: SET156-6.p
C5	[Kun92]	: GRP053-1.p
C5	[MOW76]	: CAT005-1.p
C5	[Qua89b]	: GEO069-3.p
C5	[Qua92a]	: SET157-6.p
C5	[WM88a]	: COL005-1.p
C6	[Kun92]	: GRP054-1.p
C6	[MOW76]	: CAT006-1.p
C6	[Qua92d]	: SET158-6.p
C6	[WM88a]	: COL006-1.p
C7	[Kun92]	: GRP055-1.p
C7	[MOW76]	: CAT007-1.p
C8	[Kun92]	: GRP056-1.p
C8	[MOW76]	: CAT008-1.p
c15	[Ste87]	: RNG012-6.p
c16	[Ste87]	: RNG013-6.p
c17	[Ste87]	: RNG014-6.p
c18	[Ste87]	: RNG015-6.p
c19	[Ste87]	: RNG016-6.p
c20	[Ste87]	: RNG017-6.p
c21	[Ste87]	: RNG018-6.p
c24	[Ste87]	: RNG019-6.p
c25	[Ste87]	: RNG020-6.p
c26	[Ste87]	: RNG021-6.p
CA1	[Qua92a]	: SET553-6.p
CA2	[Qua92a]	: SET554-6.p
CA2	[Qua92d]	: SET556-6.p
CA3	[Qua92a]	: SET555-6.p
CA4	[Qua92a]	: SET557-6.p
CADE-11 Competition 1	[Ove90]	: GRP001-1.p
CADE-11 Competition 2	[Ove90]	: GRP002-1.p
CADE-11 Competition 3	[Ove90]	: RNG008-6.p
CADE-11 Competition 4	[Ove90]	: LCL024-1.p
CADE-11 Competition 5	[Ove90]	: LCL038-1.p
CADE-11 Competition 6	[Ove90]	: LCL111-1.p
CADE-11 Competition 7	[Ove90]	: LCL114-1.p
CADE-11 Competition Eq-1	[Ove90]	: GRP002-3.p
CADE-11 Competition Eq-10	[Ove90]	: RNG011-5.p
CADE-11 Competition Eq-2	[Ove90]	: ROB005-1.p
CADE-11 Competition Eq-3	[Ove90]	: BOO002-1.p
CADE-11 Competition Eq-4	[Ove90]	: GRP014-1.p
CADE-11 Competition Eq-5	[Ove90]	: LCL109-2.p
CADE-11 Competition Eq-6	[Ove90]	: COL049-1.p
CADE-11 Competition Eq-7	[Ove90]	: RNG009-5.p
CADE-11 Competition Eq-8	[Ove90]	: COL003-1.p
CADE-11 Competition Eq-9	[Ove90]	: RNG010-5.p
CD-12	[LM92]	: LCL051-1.p
CD-13	[LM92]	: LCL052-1.p
CD-90	[LM92]	: LCL097-1.p
CF1	[Qua92a]	: SET558-6.p
CF2	[Qua92a]	: SET559-6.p
CF3	[Qua92a]	: SET560-6.p
CF4	[Qua92a]	: SET561-6.p
CF5	[Qua92a]	: SET562-6.p
CF6	[Qua92a]	: SET563-6.p
CF6 cor.1	[Qua92a]	: SET564-6.p
CF6 cor.2	[Qua92a]	: SET565-6.p
CF7	[Qua92a]	: SET566-6.p
CF8	[Qua92d]	: SET567-6.p
ch	[Ste87]	: RNG033-6.p
Ch2N1	[Tam94]	: SYN315-1.p
Ch2N2	[Tam94]	: SYN316-1.p
Ch2N3	[Tam94]	: SYN317-1.p
Ch2N4	[Tam94]	: SYN318-1.p
Ch2N5	[Tam94]	: SYN319-1.p
Ch3N1	[Tam94]	: SYN320-1.p
Ch3N2	[Tam94]	: SYN321-1.p
Ch4N1	[Tam94]	: SYN322-1.p
Ch4N2	[Tam94]	: SYN323-1.p
Ch9N1	[Tam94]	: SYN324-1.p
Ch9N2	[Tam94]	: SYN325-1.p
Ch12N1	[Tam94]	: SYN326-1.p
Ch12N2	[Tam94]	: SYN327-1.p
Ch12N3	[Tam94]	: SYN328-1.p
Ch14N1	[Tam94]	: SYN329-1.p
Ch14N2	[Tam94]	: SYN330-1.p
Ch14N3	[Tam94]	: SYN331-1.p
Ch14N4	[Tam94]	: SYN332-1.p
Ch14N5	[Tam94]	: SYN333-1.p
Ch14N6	[Tam94]	: SYN334-1.p
Ch14N7	[Tam94]	: SYN335-1.p
Ch15N1	[Tam94]	: SYN336-1.p
Ch15N2	[Tam94]	: SYN337-1.p
Ch15N3	[Tam94]	: SYN338-1.p
Ch15N4	[Tam94]	: SYN339-1.p
Ch15N5	[Tam94]	: SYN340-1.p
Ch15N6	[Tam94]	: SYN341-1.p
Ch15N7	[Tam94]	: SYN342-1.p
Ch16N2	[Tam94]	: SYN343-1.p
Ch16N3	[Tam94]	: SYN344-1.p
Ch16N4	[Tam94]	: SYN345-1.p
Ch17N2	[Tam94]	: SYN346-1.p
Ch17N3	[Tam94]	: SYN347-1.p
Ch17N4	[Tam94]	: SYN348-1.p
Ch17N5	[Tam94]	: SYN349-1.p
Ch18N2	[Tam94]	: SYN350-1.p
Ch18N3	[Tam94]	: SYN351-1.p
Ch18N4	[Tam94]	: SYN352-1.p
Ch18N5	[Tam94]	: SYN353-1.p
Ch20N1	[Tam94]	: SYN354-1.p
Chang-Lee-1	[Cha70]	: GRP028-1.p
Chang-Lee-2	[Cha70]	: GRP001-5.p
Chang-Lee-3	[Cha70]	: GRP003-1.p
Chang-Lee-4	[Cha70]	: GRP004-1.p
Chang-Lee-5	[Cha70]	: GRP005-1.p
Chang-Lee-6	[Cha70]	: GRP006-1.p
Chang-Lee-7	[Cha70]	: NUM014-1.p
Chang-Lee-8	[Cha70]	: NUM015-1.p
Chang-Lee-9	[Cha70]	: NUM016-2.p
Chang-Lee-10a	[Cha70]	: NUM001-1.p
Chang-Lee-10b	[Cha70]	: NUM002-1.p
Chang-Lee-10c	[Cha70]	: NUM003-1.p
Chang-Lee-10d	[Cha70]	: NUM004-1.p
chekndom.ver1.in	[ANL]	: PUZ015-1.p
chekndom.ver2.in	[ANL]	: PUZ016-1.p
CL1	[LW92]	: COL049-1.p
CL2	[LW92]	: COL003-1.p
CL3	[LW92]	: COL044-1.p
CL4	[LW92]	: COL043-1.p
CL5	[LW92]	: COL057-1.p
CL-1	[WWM+90]	: COL060-1.p
CL-2	[WWM+90]	: COL061-1.p
CL-3	[WWM+90]	: COL062-1.p
CL-4	[WWM+90]	: COL063-1.p
CL-5	[WWM+90]	: COL064-1.p
CL-6	[WWM+90]	: COL065-1.p
CL-7	[WWM+90]	: COL066-1.p

design_or.ver1.clauses	[ANL]	: CID001-1.p
DI1.1	[Qua92a]	: SET491-6.p
DI1.2	[Qua92a]	: SET492-6.p
DI1 cor.	[Qua92d]	: SET493-6.p
DI2	[Qua92a]	: SET494-6.p
DI3	[Qua92a]	: SET495-6.p
DI4	[Qua92a]	: SET496-6.p
DI5	[Qua92a]	: SET497-6.p
DI6	[Qua92a]	: SET498-6.p
DI7	[Qua92a]	: SET499-6.p
DI8	[Qua92a]	: SET500-6.p
DI9.1	[Qua92a]	: SET501-6.p
DI9.2	[Qua92a]	: SET502-6.p
distrnu	[Sch95]	: GRP164-1.p
distrun	[Sch95]	: GRP164-2.p
DM	[MRS72]	: SYN033-1.p
DM	[WM76]	: SYN033-1.p
DO1.1	[Qua92a]	: SET258-6.p
DO1.2	[Qua92a]	: SET259-6.p
DO1.3	[Qua92a]	: SET260-6.p
DO2.1	[Qua92a]	: SET261-6.p
DO2.2	[Qua92a]	: SET262-6.p
DO3	[Qua92a]	: SET263-6.p
DO3 cor.1	[Qua92a]	: SET264-6.p
DO3 cor.2	[Qua92a]	: SET265-6.p
DO3 cor.3	[Qua92a]	: SET266-6.p
DO3 cor.4	[Qua92d]	: SET267-6.p
DO4	[Qua92a]	: SET268-6.p
DO5	[Qua92a]	: SET269-6.p
DO6	[Qua92a]	: SET270-6.p
DO6 cor.	[Qua92a]	: SET271-6.p
DO7	[Qua92a]	: SET272-6.p
DO7 cor.	[Qua92a]	: SET273-6.p
DO8	[Qua92a]	: SET274-6.p
DO8 cor.1	[Qua92a]	: SET275-6.p
DO8 cor.2	[Qua92a]	: SET276-6.p
DO8 cor.3	[Qua92a]	: SET277-6.p
DO8 cor.4	[Qua92a]	: SET278-6.p
DO9	[Qua92d]	: SET279-6.p
DO10	[Qua92d]	: SET280-6.p
DO12	[Qua92d]	: SET281-6.p
DO13	[Qua92d]	: SET282-6.p
DO14	[Qua92d]	: SET283-6.p
DO15	[Qua92d]	: SET284-6.p
DO16	[Qua92d]	: SET285-6.p
DO16 cor.	[Qua92d]	: SET286-6.p
DO17	[Qua92d]	: SET287-6.p
DO18	[Qua92d]	: SET288-6.p
E1	[MOW76]	: PRV002-1.p
E1	[Qua89b]	: GEO035-3.p
E2	[MOW76]	: PRV003-1.p
E2	[Qua89b]	: GEO036-3.p
E3	[MOW76]	: PRV004-1.p
E3	[Qua89b]	: GEO037-3.p
E4	[MOW76]	: PRV005-1.p
E5	[MOW76]	: PRV006-1.p
E6	[MOW76]	: PRV007-1.p
E7	[MOW76]	: PRV008-1.p
EC-1	[WWM+90]	: LCL166-1.p
EC-2	[WWM+90]	: LCL167-1.p
EC-69	[MW92]	: LCL006-1.p
EC-70	[MW92]	: LCL007-1.p
EC-71	[MW92]	: LCL008-1.p
EC-72	[MW92]	: LCL009-1.p
EC-73	[MW92]	: LCL010-1.p
EC-74	[MW92]	: LCL011-1.p
EC-75	[MW92]	: LCL012-1.p
EC-76	[MW92]	: LCL013-1.p
EC-77	[MW92]	: LCL014-1.p
EC-78	[MW92]	: LCL015-1.p
EC-79	[MW92]	: LCL016-1.p
EC-80	[MW92]	: LCL017-1.p
EC-81	[MW92]	: LCL018-1.p
EC-82	[MW92]	: LCL019-1.p
EC-83	[MW92]	: LCL020-1.p
EC-84	[MW92]	: LCL021-1.p
ec.in part 1	[OTT]	: LCL022-1.p
ec.in part 2	[OTT]	: LCL023-1.p
ec_yq.in	[OTT]	: LCL010-1.p
ederX-Y.lop (Size X:Y)	[TUM]	: SYN002-1.g
EQ1	[Qua92a]	: SET055-7.p
EQ2.1	[Qua92a]	: SET056-7.p
EQ2.2	[Qua92a]	: SET057-7.p
EQ2.3	[Qua92a]	: SET058-7.p
EQ2.4	[Qua92a]	: SET059-7.p
EST-S1	[WB87]	: SET012-1.p
EST-S2	[WB87]	: SET013-1.p
EST-S3	[WB87]	: SET015-1.p
EST-S4	[WB87]	: SET014-2.p
Established lemma	[MOW76]	: BOO007-1.p
Established lemma	[MOW76]	: BOO016-1.p
Established lemma	[MOW76]	: BOO017-1.p
Established lemma	[MOW76]	: GRP022-2.p
Established lemma	[MOW76]	: GRP023-2.p
Established lemma	[MOW76]	: RNG002-1.p
Established lemma	[MOW76]	: RNG003-1.p
EW1	[MRS72]	: SYN028-1.p
EW1	[WM76]	: SYN028-1.p
EW2	[MRS72]	: SYN029-1.p
EW2	[WM76]	: SYN029-1.p
EW3	[MRS72]	: SYN030-1.p
EW3	[WM76]	: SYN030-1.p
EX1	[SPR]	: GRP028-1.p
EX2	[SPR]	: GRP001-5.p
EX3	[SPR]	: GRP003-1.p
EX4	[SPR]	: GRP004-1.p
EX4-T?	[WM76]	: SYN038-1.p
ex4.lop	[SET]	: SYN038-1.p
EX5	[SPR]	: GRP005-1.p
EX5-T?	[WM76]	: ALG002-1.p
ex5.lop	[SET]	: ALG002-1.p
EX6	[SPR]	: GRP006-1.p
EX6-T?	[WM76]	: RNG001-3.p
ex6.lop	[SET]	: RNG001-3.p
Example	[Lov68]	: SYN012-1.p
Example 1	[BCP94]	: SYN303-1.p
Example 1	[Lov69]	: GRP001-5.p
Example 1	[Luc68]	: GRP028-3.p
Example 2	[BCP94]	: SYN304-1.p
Example 2	[FLSY74]	: NUM014-1.p
Example 2	[Lov69]	: NUM015-1.p
Example 2	[Luc68]	: GRP003-1.p
Example 3	[BCP94]	: SYN305-1.p
Example 3	[FLSY74]	: NUM015-1.p
Example 3	[Luc68]	: GRP004-1.p
EXAMPLE 3.2.2	[FLTZ93]	: SYN306-1.p
EXAMPLE 3.2.3	[FLTZ93]	: SYN307-1.p
Example 4	[BCP94]	: BOO019-1.p
Example 4	[FLSY74]	: SYN038-1.p
Example 4	[Luc68]	: GRP001-5.p
EXAMPLE 4.11	[FLTZ93]	: SYN308-1.p
Example 5	[FLSY74]	: ALG002-1.p
Example 5	[Luc68]	: GRP005-1.p
Example 5.1	[LMG94]	: SYN010-1.g
Example 6	[Luc68]	: NUM014-1.p
Example 6a	[FLSY74]	: RNG001-3.p
Example 7	[Luc68]	: NUM015-1.p
EXAMPLE 7.1	[FLTZ93]	: SYN309-1.p
Example 8a	[Luc68]	: NUM016-2.p
Example 8b	[Luc68]	: NUM016-1.p
EXQ1	[MOW76]	: SYN013-1.p
ExQ1	[Wan65]	: SYN013-1.p
exq1.ver1.in	[ANL]	: SYN013-1.p
exq1.ver2.in	[ANL]	: SYN013-1.p
EXQ2	[MOW76]	: SYN014-1.p
ExQ2	[Wan65]	: SYN014-1.p
exq2.ver1.in	[ANL]	: SYN014-1.p
exq2.ver2.in	[ANL]	: SYN014-1.p
EXQ3	[MOW76]	: SYN015-1.p
ExQ3	[Wan65]	: SYN015-1.p
exq3.ver1.in	[ANL]	: SYN015-1.p
exq3.ver2.in	[ANL]	: SYN015-1.p
fac2.lop (Size 2)	[SET]	: NUM283-1.g
fac3.lop (Size 3)	[SET]	: NUM283-1.g
fac4.lop (Size 4)	[SET]	: NUM283-1.g
fac5.lop (Size 5)	[SET]	: NUM283-1.g
fac6.lop (Size 7)	[SET]	: NUM283-1.g
fac7.lop (Size 7)	[SET]	: NUM283-1.g
FEX4T1	[SPR]	: SYN038-1.p
FEX4T2	[SPR]	: SYN038-1.p
FEX5	[SPR]	: ALG002-1.p
FEX6T1	[SPR]	: RNG001-3.p
FEX6T2	[SPR]	: RNG001-3.p
fib3.lop (Size 3)	[SET]	: NUM284-1.g
fib4.lop (Size 4)	[SET]	: NUM284-1.g
fib5.lop (Size 5)	[SET]	: NUM284-1.g
fib6.lop (Size 6)	[SET]	: NUM284-1.g
fib9.lop (Size 9)	[SET]	: NUM284-1.g
Figure 3	[WL89]	: SYN008-1.p
Figure 8	[WL89]	: SYN009-1.p
Five Point Theorem	[Wos88]	: GEO008-1.p
FU1	[Qua92a]	: SET440-6.p
FU1	[Qua92d]	: SET432-6.p
FU2	[Qua92a]	: SET441-6.p
FU3.1	[Qua92d]	: SET433-6.p
FU3.2	[Qua92d]	: SET434-6.p
FU3.3	[Qua92d]	: SET435-6.p
FU4	[Qua92a]	: SET442-6.p
FU4.1	[Qua92d]	: SET436-6.p
FU4.2	[Qua92d]	: SET437-6.p
FU5	[Qua92d]	: SET438-6.p
FU6	[Qua92a]	: SET034-6.p
FU7	[Qua92d]	: SET439-6.p
FU8	[Qua92d]	: SET440-6.p

FU9	[Qua92d]	: SET441-6.p
FU10	[Qua92d]	: SET442-6.p
FU11	[Qua92d]	: SET443-6.p
FU12	[Qua92d]	: SET444-6.p
FU12 cor.	[Qua92d]	: SET445-6.p
FU13	[Qua92d]	: SET446-6.p
FU14	[Qua92d]	: SET447-6.p
FU15	[Qua92d]	: SET448-6.p
FU16.1	[Qua92d]	: SET449-6.p
FU16.2	[Qua92d]	: SET450-6.p
G1	[MOW76]	: GRP001-1.p
G2	[MOW76]	: GRP017-1.p
G3	[MOW76]	: GRP030-1.p
G4	[MOW76]	: GRP031-1.p
G5	[MOW76]	: GRP029-1.p
G5	[MOW76]	: GRP029-2.p
G6	[MOW76]	: GRP002-1.p
G7	[MOW76]	: GRP039-4.p
G8	[ANL]	: GRP025-2.p
G8	[MOW76]	: GRP025-1.p
G9	[ANL]	: GRP026-2.p
G9	[MOW76]	: GRP026-1.p
G11A	[Ben92]	: GEO077-4.p
G15	[Ben92]	: GEO076-4.p
G16	[Ben92]	: GEO078-5.p
GCD	[WB87]	: NUM005-1.p
gcd	[Wan85]	: NUM005-1.p
GEOMETRY THEOREM	[Sla67]	: GEO079-1.p
GP1	[MOW76]	: GRP001-2.p
GP2	[MOW76]	: GRP039-7.p
GROUP1	[RRY+72]	: GRP028-1.p
GROUP1	[WM76]	: GRP028-1.p
GROUP2	[RRY+72]	: GRP001-5.p
GROUP2	[WM76]	: GRP001-5.p
Groups of Order 4	[Wos88]	: GRP113-1.p
groups.exp3.in part 1	[OTT]	: GRP115-1.p
groups.exp3.in part 2	[OTT]	: GRP116-1.p
groups.exp3.in part 3	[OTT]	: GRP117-1.p
groups.exp3.in part 4	[OTT]	: GRP118-1.p
groups.exp4.in part 1	[OTT]	: GRP119-1.p
groups.exp4.in part 2	[OTT]	: GRP120-1.p
groups.exp4.in part 3	[OTT]	: GRP121-1.p
groups.exp4.in part 4	[OTT]	: GRP122-1.p
GT1	[LW92]	: GRP001-2.p
GT2	[LW92]	: GRP112-1.p
GT3	[LW92]	: GRP002-4.p
GT4	[LW92]	: GRP058-1.p
GT5	[LW92]	: GRP085-1.p
GT6	[LW92]	: GRP084-1.p
H1	[FLTZ93]	: SYN310-1.p
H1	[MOW76]	: HEN001-1.p
H1	[Pfe88]	: LCL084-1.p
H2	[FLTZ93]	: SYN311-1.p
H2	[MOW76]	: HEN002-2.p
H3	[FLTZ93]	: SYN312-1.p
H3	[MOW76]	: HEN003-2.p
H4	[MOW76]	: HEN004-2.p
H5	[MOW76]	: HEN005-2.p
H6	[MOW76]	: HEN006-2.p
H7	[MOW76]	: HEN007-2.p
H8	[MOW76]	: HEN008-2.p
H9	[MOW76]	: HEN009-2.p
H10	[MOW76]	: HEN010-2.p
H11	[MOW76]	: HEN011-2.p
HASPARTS-T1	[RRY+72]	: MSC003-1.p
HASPARTS-T1	[WM76]	: MSC003-1.p
HASPARTS-T2	[RRY+72]	: MSC004-1.p
HASPARTS-T2	[WM76]	: MSC004-1.p
HO1	[Quaife, 1992a]	: ALG001-3.p
HO1	[Quaife, 1992b]	: ALG001-3.p
Hoares FIND	[Ble77]	: PRV009-1.p
houses.ver1.in	[ANL]	: PUZ017-1.p
How to Win a Bride	[Ohl85]	: PUZ021-1.p
hp1.ver1.in	[ANL]	: HEN001-1.p
hp1.ver2.in	[ANL]	: HEN001-3.p
hp1.ver3.in	[ANL]	: HEN001-5.p
hp2.ver1.in	[ANL]	: HEN002-1.p
hp2.ver2.in	[ANL]	: HEN002-3.p
hp2.ver3.in	[ANL]	: HEN002-5.p
HP3	[ANL]	: HEN003-3.p
hp3.ver1.in	[ANL]	: HEN003-2.p
hp3.ver2.in	[ANL]	: HEN003-4.p
hp3.ver3.in	[ANL]	: HEN003-5.p
HP4	[ANL]	: HEN004-3.p
hp4.ver1.in	[ANL]	: HEN004-2.p
hp4.ver2.in	[ANL]	: HEN004-6.p
hp4.ver3.in	[ANL]	: HEN004-5.p
HP5	[ANL]	: HEN005-3.p
hp5.ver1.in	[ANL]	: HEN005-1.p
hp5.ver2.in	[ANL]	: HEN005-6.p
hp5.ver3.in	[ANL]	: HEN005-5.p
HP6	[ANL]	: HEN006-3.p
hp6.ver1.in	[ANL]	: HEN006-7.p
hp6.ver2.in	[ANL]	: HEN006-6.p
hp6.ver3.in	[ANL]	: HEN006-5.p
HP7	[ANL]	: HEN007-3.p
hp7.ver1.in	[ANL]	: HEN007-6.p
hp7.ver2.in	[ANL]	: HEN007-4.p
hp7.ver3.in	[ANL]	: HEN007-5.p
HP8	[ANL]	: HEN008-3.p
hp8.ver1.in	[ANL]	: HEN008-1.p
hp8.ver2.in	[ANL]	: HEN008-6.p
hp8.ver3.in	[ANL]	: HEN008-5.p
HP9	[ANL]	: HEN009-3.p
hp9.ver1.in	[ANL]	: HEN009-2.p
hp9.ver2.in	[ANL]	: HEN009-6.p
hp9.ver3.in	[ANL]	: HEN009-5.p
HP10	[ANL]	: HEN010-3.p
hp10.ver1.in	[ANL]	: HEN010-7.p
hp10.ver2.in	[ANL]	: HEN010-6.p
hp10.ver3.in	[ANL]	: HEN010-5.p
HP11	[ANL]	: HEN011-3.p
hp11.ver1.in	[ANL]	: HEN011-2.p
hp11.ver2.in	[ANL]	: HEN011-4.p
hp11.ver3.in	[ANL]	: HEN011-5.p
I1	[Pfe88]	: LCL081-1.p
I1	[Qua92a]	: SET143-6.p
I2	[Qua89b]	: GEO061-3.p
I2	[Qua92a]	: SET144-6.p
I3	[Qua89b]	: GEO062-3.p
I3	[Qua92a]	: SET145-6.p
I4	[Qua89b]	: GEO063-3.p
I4	[Qua92a]	: SET146-6.p
I5	[Qua92a]	: SET147-6.p
I6	[Qua92a]	: SET148-6.p
I6 cor.	[Qua92a]	: SET149-6.p
IC-1.1	[WWM+90]	: LCL082-1.p
IC-1.2	[WWM+90]	: LCL083-1.p
IC-1.3	[WWM+90]	: LCL084-1.p
IC-63	[MW92]	: LCL080-1.p
IC-64	[MW92]	: LCL081-1.p
IC-65	[MW92]	: LCL082-1.p
IC-66	[MW92]	: LCL083-1.p
IC-67	[MW92]	: LCL084-1.p
IC-68	[MW92]	: LCL085-1.p
ID1	[Qua92a]	: SET454-6.p
ID2	[Qua92a]	: SET455-6.p
ID3	[Qua92a]	: SET456-6.p
ID4	[Qua92a]	: SET457-6.p
ID4 cor.	[Qua92a]	: SET458-6.p
ID5.1	[Qua92a]	: SET459-6.p
ID5.2	[Qua92a]	: SET460-6.p
ID5.3	[Qua92a]	: SET461-6.p
ID5.4	[Qua92a]	: SET462-6.p
ID5 cor.	[Qua92a]	: SET463-6.p
ID6	[Qua92a]	: SET464-6.p
ID7	[Qua92a]	: SET465-6.p
ID8	[Qua92a]	: SET466-6.p
ID9.1	[Qua92a]	: SET467-6.p
ID9.2	[Qua92a]	: SET468-6.p
ID9.3	[Qua92a]	: SET469-6.p
ID9 cor.	[Qua92d]	: SET470-6.p
ID10.1	[Qua92a]	: SET471-6.p
ID10.2	[Qua92a]	: SET472-6.p
ID11.1	[Qua92d]	: SET473-6.p
ID11.2	[Qua92d]	: SET474-6.p
ID11.3	[Qua92d]	: SET475-6.p
ID11.4	[Qua92a]	: SET476-6.p
ID12	[Qua92d]	: SET476-6.p
ident1.ver1.in	[ANL]	: GRP030-1.p
ident2.ver1.in	[ANL]	: GRP029-1.p
Identity established	[MOW76]	: GRP018-1.p
Identity established	[MOW76]	: GRP019-1.p
Identity established	[MOW76]	: GRP020-1.p
Identity established	[MOW76]	: GRP021-1.p
Identity established	[MOW76]	: GRP022-1.p
Identity established	[MOW76]	: GRP023-1.p
IH1	[Pfe88]	: LCL084-2.p
IM1	[Qua92a]	: SET327-6.p
IM1 cor.	[Qua92d]	: SET328-6.p
IM2	[Qua92a]	: SET329-6.p
IM2 cor.	[Qua92d]	: SET330-6.p
IM3	[Qua92a]	: SET324-6.p
IM4	[Qua92a]	: SET325-6.p
IM4 cor.	[Qua92a]	: SET326-6.p
IM5	[Qua92a]	: SET331-6.p
IM5 cor.	[Qua92a]	: SET332-6.p
IM6.1	[Qua92a]	: SET333-6.p
IM6.2	[Qua92a]	: SET334-6.p
IM7	[Qua92a]	: SET335-6.p
IM7 cor.1	[Qua92a]	: SET336-6.p
IM7 cor.2	[Qua92d]	: SET337-6.p
IM7 cor.3	[Qua92a]	: SET338-6.p
IM8	[Qua92a]	: SET339-6.p

IM9	[Qua92a]	: SET340-6.p
IM10	[Qua92a]	: SET341-6.p
IM11	[Qua92d]	: SET342-6.p
IM12	[Qua92d]	: SET343-6.p
Imp-4	[LM92]	: LCL084-1.p
IMV	[WB87]	: ANA002-3.p
IN1	[Qua92a]	: SET289-6.p
IN2	[Qua92a]	: SET290-6.p
IN3	[Qua92a]	: SET291-6.p
IN4.1	[Qua92a]	: SET292-6.p
IN4.2	[Qua92a]	: SET293-6.p
IN5.1	[Qua92a]	: SET294-6.p
IN5.2	[Qua92a]	: SET295-6.p
IN6.1	[Qua92a]	: SET296-6.p
IN6.2	[Qua92a]	: SET297-6.p
IN7	[Qua92a]	: SET298-6.p
IN8	[Qua92a]	: SET299-6.p
IN9	[Qua92a]	: SET300-6.p
IN10	[Qua92a]	: SET301-6.p
index.ver1.in	[ANL]	: GRP039-4.p
index.ver2.in	[ANL]	: GRP039-5.p
intchg_val.ver1.clauses	[ANL]	: CIV001-1.p
interchange.ver1.clauses	[ANL]	: CID002-1.p
interns.ver1.in	[ANL]	: PUZ018-1.p
inters.ver1.in	[ANL]	: SET013-2.p
inters.ver2.in	[ANL]	: SET013-4.p
invers1.ver1.in	[ANL]	: GRP017-1.p
invers2.ver1.t	[ANL]	: GRP031-1.p
IP1	[Pfe88]	: LCL083-2.p
IPH1	[Pfe88]	: LCL084-3.p
IR1	[Qua92d]	: NUM039-1.p
IR2	[Qua92d]	: NUM040-1.p
IR3.1	[Qua92d]	: NUM041-1.p
IR3.2	[Qua92d]	: NUM042-1.p
IR4	[Qua92d]	: NUM043-1.p
IR5	[Qua92d]	: NUM044-1.p
IR6	[Qua92d]	: NUM045-1.p
ivt.lop	[SET]	: ANA002-4.p
jobs	[LP92]	: PUZ010-1.p
jobs.ver1.in	[ANL]	: PUZ019-1.p
KL-ONE-example	[FLTZ93]	: MSC009-1.p
knightknave.in	[ANL]	: PUZ020-1.p
L1a	[McC88]	: LAT001-1.p
L1b	[McC88]	: LAT002-1.p
L2	[McC88]	: LAT003-1.p
L3	[McC88]	: LAT004-1.p
LA1.1	[Qua92a]	: SET194-6.p
LA1.2	[Qua92a]	: SET195-6.p
LA1.3	[Qua92a]	: SET196-6.p
LA1.4	[Qua92a]	: SET197-6.p
LA2.1	[Qua92a]	: SET198-6.p
LA2.2	[Qua92a]	: SET199-6.p
LA3.1	[Qua92a]	: SET200-6.p
LA3.2	[Qua92a]	: SET201-6.p
lat1a	[Sch95]	: GRP165-1.p
lat1b	[Sch95]	: GRP165-2.p
lat2a	[Sch95]	: GRP166-1.p
lat2b	[Sch95]	: GRP166-2.p
lat3a	[Sch95]	: GRP166-3.p
lat3b	[Sch95]	: GRP166-4.p
lat4	[Sch95]	: GRP167-2.p
Lattice structure theorem 1	[Bon91]	: LCL142-1.p
Lattice structure theorem 10	[Bon91]	: LCL150-1.p
Lattice structure theorem 11	[Bon91]	: LCL151-1.p
Lattice structure theorem 12	[Bon91]	: LCL152-1.p
Lattice structure theorem 2	[Bon91]	: LCL143-1.p
Lattice structure theorem 3	[Bon91]	: LCL144-1.p
Lattice structure theorem 4	[Bon91]	: LCL145-1.p
Lattice structure theorem 5	[Bon91]	: LCL146-1.p
Lattice structure theorem 6	[Bon91]	: LCL147-1.p
Lattice structure theorem 7	[Bon91]	: LCL148-1.p
Lattice structure theorem 8	[Bon91]	: LCL109-4.p
Lattice structure theorem 8	[Bon91]	: LCL109-5.p
Lattice structure theorem 8	[Bon91]	: LCL109-6.p
Lattice structure theorem 9	[Bon91]	: LCL149-1.p
LCM	[WB87]	: NUM007-1.p
lcm	[Wan85]	: NUM007-1.p
Lemma for Axiom Independence	[Wos88]	: BOO002-2.p
Lemma proved	[OMW76]	: BOO003-1.p
Lemma proved	[OMW76]	: BOO004-1.p
Lemma proved	[OMW76]	: BOO005-1.p
Lemma proved	[OMW76]	: BOO006-1.p
Lemma proved	[OMW76]	: BOO009-1.p
Lemma proved	[OMW76]	: BOO010-1.p
Lemma proved	[OMW76]	: GRP018-1.p
Lemma proved	[OMW76]	: GRP019-1.p
Lemma proved	[OMW76]	: GRP020-1.p
Lemma proved	[OMW76]	: GRP021-1.p
Lemma proved	[OMW76]	: GRP022-1.p
Lemma proved	[OMW76]	: GRP023-1.p
Lemma proved	[OMW76]	: RNG002-1.p
Lemma proved	[OMW76]	: RNG003-1.p
Lemma 1	[Bon91]	: LCL132-1.p
Lemma 1	[BLM+86]	: SET016-3.p
Lemma 1a	[WM89]	: TOP001-1.p
Lemma 1a	[WM89]	: TOP001-2.p
Lemma 1b	[WM89]	: TOP002-1.p
Lemma 1b	[WM89]	: TOP002-2.p
Lemma 1c	[WM89]	: TOP003-1.p
Lemma 1c	[WM89]	: TOP003-2.p
Lemma 1d	[WM89]	: TOP004-1.p
Lemma 1d	[WM89]	: TOP004-2.p
Lemma 1e	[WM89]	: TOP005-1.p
Lemma 1e	[WM89]	: TOP005-2.p
Lemma 2	[Bon91]	: LCL133-1.p
Lemma 2	[BLM+86]	: SET017-3.p
Lemma 2	[BLM+86]	: SET017-4.p
Lemma 2.1	[Win90]	: ROB002-1.p
Lemma 2.2	[Win90]	: ROB003-1.p
Lemma 2.3	[Win90]	: ROB004-1.p
Lemma 2.4	[Win90]	: ROB005-1.p
Lemma 3	[Bon91]	: LCL134-1.p
Lemma 3	[BLM+86]	: SET018-3.p
Lemma 3	[BLM+86]	: SET018-4.p
Lemma 3.1	[Win90]	: ROB008-1.p
Lemma 3.2	[Win90]	: ROB009-1.p
Lemma 3.3	[Win90]	: ROB010-1.p
Lemma 3.4	[Win90]	: ROB011-1.p
Lemma 3.4	[Win90]	: ROB012-1.p
Lemma 3.4	[Win90]	: ROB012-2.p
Lemma 3.5	[Win90]	: ROB013-1.p
Lemma 3.6	[Win90]	: ROB014-1.p
Lemma 3.6	[Win90]	: ROB014-2.p
Lemma 3.6	[Win90]	: ROB015-1.p
Lemma 3.6	[Win90]	: ROB015-2.p
Lemma 3.8	[Win90]	: ROB017-1.p
Lemma 4	[Bon91]	: LCL135-1.p
Lemma 4	[BLM+86]	: SET019-3.p
Lemma 4	[BLM+86]	: SET019-4.p
Lemma 5	[Bon91]	: LCL136-1.p
Lemma 5	[BLM+86]	: SET020-3.p
Lemma 5	[BLM+86]	: SET020-4.p
Lemma 6	[Bon91]	: LCL111-2.p
Lemma 6	[BLM+86]	: SET021-3.p
Lemma 6	[BLM+86]	: SET021-4.p
Lemma 7	[Bon91]	: LCL138-1.p
Lemma 7	[BLM+86]	: SET022-3.p
Lemma 7	[BLM+86]	: SET022-4.p
Lemma 8	[Bon91]	: LCL139-1.p
Lemma 8	[BLM+86]	: SET023-4.p
Lemma 8	[BLM+86]	: SET023-3.p
Lemma 9	[Bon91]	: LCL140-1.p
Lemma 9	[BLM+86]	: SET024-4.p
Lemma 9	[BLM+86]	: SET024-3.p
Lemma 10	[Bon91]	: LCL141-1.p
Lemma 10	[BLM+86]	: SET025-4.p
Lemma 10	[BLM+86]	: SET025-3.p
Lemma 11	[BLM+86]	: SET025-8.p
Lemma 11	[BLM+86]	: SET025-9.p
Lemma 12	[BLM+86]	: SET027-3.p
Lemma 12	[BLM+86]	: SET027-4.p
Lemma 13	[BLM+86]	: SET028-3.p
Lemma 13	[BLM+86]	: SET028-4.p
Lemma 14	[BLM+86]	: SET029-3.p
Lemma 14	[BLM+86]	: SET029-4.p
Lemma 15	[BLM+86]	: SET030-3.p
Lemma 15	[BLM+86]	: SET030-4.p
Lemma 16	[BLM+86]	: SET031-3.p
Lemma 16	[BLM+86]	: SET031-4.p
Lemma 17	[BLM+86]	: SET032-3.p
Lemma 17	[BLM+86]	: SET032-4.p
Lemma 18	[BLM+86]	: SET033-3.p
Lemma 18	[BLM+86]	: SET033-4.p
Lemma 19	[BLM+86]	: SET034-3.p
Lemma 19	[BLM+86]	: SET034-4.p
Lemma 20	[BLM+86]	: SET035-3.p
Lemma 20	[BLM+86]	: SET035-4.p
Lemma 21	[BLM+86]	: SET036-3.p
Lemma 21	[BLM+86]	: SET036-4.p
Lemma 22	[BLM+86]	: SET037-3.p
Lemma 22	[BLM+86]	: SET037-4.p
Lemma 23	[BLM+86]	: SET038-3.p
Lemma 23	[BLM+86]	: SET038-4.p
Lemma 24	[BLM+86]	: SET039-3.p
Lemma 24	[BLM+86]	: SET039-4.p
Lemma 25	[BLM+86]	: SET040-3.p
Lemma 25	[BLM+86]	: SET040-4.p
Lemma 26	[BLM+86]	: SET041-3.p

OM2.2	[Qua92d]	: NUM281-1.p
OM2.3	[Qua92d]	: NUM282-1.p
OM3	[Qua92d]	: NUM188-1.p
OM4	[Qua92d]	: NUM189-1.p
OM5	[Qua92d]	: NUM190-1.p
OM6	[Qua92d]	: NUM191-1.p
OM7	[Qua92d]	: NUM192-1.p
oona.in	[ANL]	: PUZ009-1.p
OP1	[Qua92a]	: SET025-7.p
OP2.1	[Qua92a]	: SET101-7.p
OP2.2	[Qua92a]	: SET102-7.p
OP3.1	[Qua92a]	: SET103-7.p
OP3.2	[Qua92a]	: SET104-7.p
OP3.3	[Qua92a]	: SET105-7.p
OP4	[Qua92a]	: SET016-7.p
OP5	[Qua92a]	: SET018-7.p
OP6.1	[Qua92a]	: SET108-7.p
OP6.2	[Qua92a]	: SET109-7.p
OP6.3	[Qua92a]	: SET110-7.p
OP6.4	[Qua92a]	: SET111-7.p
OP6.5	[Qua92a]	: SET112-7.p
OP7.1	[Qua92a]	: SET020-7.p
OP7.2	[Qua92a]	: SET021-7.p
OP8.1	[Qua92a]	: SET113-7.p
OP8.2	[Qua92a]	: SET114-7.p
OP8.3	[Qua92a]	: SET115-7.p
OP8.4	[Qua92a]	: SET116-7.p
OP9.1	[Qua92a]	: SET117-7.p
OP9.2	[Qua92d]	: SET118-7.p
OP10	[Qua92a]	: SET016-7.p
OP10 cor.	[Qua92a]	: SET119-6.p
OP10 cor.	[Qua92a]	: SET120-6.p
OP10 cor.1	[Qua92a]	: SET119-7.p
OP10 cor.2	[Qua92a]	: SET120-7.p
OP11	[Qua92a]	: SET018-7.p
OP11	[Qua92a]	: SET121-6.p
OP11 cor.	[Qua92a]	: SET122-6.p
OP11 cor.1	[Qua92a]	: SET121-7.p
OP11 cor.2	[Qua92a]	: SET122-7.p
ORD1	[Qua92d]	: NUM098-1.p
ORD1 cor	[Qua92d]	: NUM099-1.p
ORD2	[Qua92d]	: NUM100-1.p
ORD5.1	[Qua92d]	: NUM101-1.p
ORD5.2	[Qua92d]	: NUM102-1.p
ORD5 cor	[Qua92d]	: NUM103-1.p
ORD6	[Qua92d]	: NUM104-1.p
ORD7.1	[Qua92d]	: NUM105-1.p
ORD7.2	[Qua92d]	: NUM106-1.p
ORD8.1	[Qua92d]	: NUM107-1.p
ORD8.2	[Qua92d]	: NUM108-1.p
ORD9	[Qua92d]	: NUM109-1.p
ORD9 cor	[Qua92d]	: NUM110-1.p
ORD11	[Qua92d]	: NUM111-1.p
ORD12	[Qua92d]	: NUM112-1.p
ORD13	[Qua92d]	: NUM113-1.p
ORD13 cor.	[Qua92d]	: NUM114-1.p
ORD14	[Qua92d]	: NUM115-1.p
ORD14 cor	[Qua92d]	: NUM116-1.p
ORD15	[Qua92d]	: NUM117-1.p
ORD16	[Qua92d]	: NUM118-1.p
ORD17	[Qua92d]	: NUM119-1.p
ORD18-5.1	[Qua92d]	: NUM126-1.p
ORD18-5.2	[Qua92d]	: NUM127-1.p
ORD18-5.3	[Qua92d]	: NUM128-1.p
ORD18-6.1	[Qua92d]	: NUM129-1.p
ORD18-6.2	[Qua92d]	: NUM130-1.p
ORD18-6.3	[Qua92d]	: NUM131-1.p
ORD18.1	[Qua92d]	: NUM120-1.p
ORD18.2	[Qua92d]	: NUM121-1.p
ORD18.3	[Qua92d]	: NUM122-1.p
ORD18.4	[Qua92d]	: NUM123-1.p
ORD18.5	[Qua92d]	: NUM124-1.p
ORD18.6	[Qua92d]	: NUM125-1.p
ORD20	[Qua92d]	: NUM132-1.p
ORD20 cor.	[Qua92d]	: NUM133-1.p
ORD21	[Qua92d]	: NUM134-1.p
ORD22	[Qua92d]	: NUM135-1.p
ORD23	[Qua92d]	: NUM136-1.p
ORD24.1	[Qua92d]	: NUM137-1.p
ORD24.2	[Qua92d]	: NUM138-1.p
ORD24.3	[Qua92d]	: NUM139-1.p
order2.ver3.in	[ANL]	: GRP025-3.p
order2.ver4.in	[ANL]	: GRP025-4.p
order3.ver3.in	[ANL]	: GRP026-3.p
order3.ver4.in	[ANL]	: GRP026-4.p
ovb6	[SET]	: LCL111-1.p
P1	[Pfe88]	: LCL083-1.p
p1.lop	[SET]	: ANA003-4.p
p1.ver1.in	[ANL]	: CAT001-1.p
p1.ver2.in	[ANL]	: CAT001-2.p
p1.ver3.in	[ANL]	: CAT001-3.p
p01a	[Sch95]	: GRP168-1.p
p01b	[Sch95]	: GRP168-2.p
p2.lop	[SET]	: ANA004-4.p
p2.ver1.in	[ANL]	: CAT002-1.p
p2.ver2.in	[ANL]	: CAT002-2.p
p2.ver3.in	[ANL]	: CAT002-3.p
p02a	[Sch95]	: GRP169-1.p
p02b	[Sch95]	: GRP169-2.p
p3.lop	[SET]	: ANA004-5.p
p3.ver1.in	[ANL]	: CAT003-1.p
p3.ver2.in	[ANL]	: CAT003-2.p
p3.ver3.in	[ANL]	: CAT003-3.p
p03a	[Sch95]	: GRP170-1.p
p03b	[Sch95]	: GRP170-2.p
p03c	[Sch95]	: GRP170-3.p
p03d	[Sch95]	: GRP170-4.p
p4.lop	[SET]	: ANA005-4.p
p4.ver1.in	[ANL]	: CAT004-1.p
p4.ver2.in	[ANL]	: CAT004-2.p
p4.ver3.in	[ANL]	: CAT004-3.p
p04a	[Sch95]	: GRP171-1.p
p04b	[Sch95]	: GRP172-1.p
p04c	[Sch95]	: GRP171-2.p
p04d	[Sch95]	: GRP172-2.p
p5.lop	[SET]	: ANA005-5.p
p5.ver1.in	[ANL]	: CAT005-1.p
p5.ver3.in	[ANL]	: CAT005-3.p
p05a	[Sch95]	: GRP173-1.p
p05b	[Sch95]	: GRP174-1.p
p6.ver1.in	[ANL]	: CAT006-1.p
p6.ver3.in	[ANL]	: CAT006-3.p
p06a	[Sch95]	: GRP175-1.p
p06b	[Sch95]	: GRP175-2.p
p06c	[Sch95]	: GRP175-3.p
p06d	[Sch95]	: GRP175-4.p
p07	[Sch95]	: GRP176-2.p
p7.ver1.in	[ANL]	: CAT007-1.p
p7.ver3.in	[ANL]	: CAT007-3.p
p8.ver1.in	[ANL]	: CAT008-1.p
p08a	[Sch95]	: GRP177-1.p
p08b	[Sch95]	: GRP177-2.p
p8_9a	[Sch95]	: GRP193-1.p
p8_9b	[Sch95]	: GRP193-2.p
p9.ver1.in	[ANL]	: CAT009-1.p
p9.ver3.in	[ANL]	: CAT009-3.p
p09a	[Sch95]	: GRP178-1.p
p09b	[Sch95]	: GRP178-2.p
p10	[Sch95]	: GRP179-1.p
p10.ver1.in	[ANL]	: CAT010-1.p
p11	[Sch95]	: GRP180-2.p
p11.ver1.in	[ANL]	: CAT011-1.p
p11.ver2.in	[ANL]	: CAT011-2.p
p11.ver3.in	[ANL]	: CAT011-3.p
p12	[Sch95]	: GRP181-2.p
p12.ver1.in	[ANL]	: CAT012-1.p
p12.ver3.in	[ANL]	: CAT012-3.p
p12x	[Sch95]	: GRP181-4.p
p13.ver1.in	[ANL]	: CAT013-1.p
p13.ver3.in	[ANL]	: CAT013-3.p
p14.ver1.in	[ANL]	: CAT014-1.p
p14.ver2.in	[ANL]	: CAT014-2.p
p14.ver3.in	[ANL]	: CAT014-3.p
p15.related.in	[ANL]	: CAT015-3.p
p15.ver1.in	[ANL]	: CAT019-1.p
p15.ver2.in	[ANL]	: CAT019-2.p
p15.ver3.no1.in	[ANL]	: CAT019-5.p
p15.ver3.no2.in	[ANL]	: CAT019-3.p
p15.ver3.no4.in	[ANL]	: CAT019-3.p
p16.ver3.in	[ANL]	: CAT016-3.p
p17.ver3.in	[ANL]	: CAT017-3.p
p17a	[Sch95]	: GRP182-2.p
p17b	[Sch95]	: GRP182-4.p
p18	[Sch95]	: GRP179-3.p
p18.ver1.in	[ANL]	: CAT018-1.p
p18.ver3.in	[ANL]	: CAT018-3.p
p19	[Sch95]	: GRP167-4.p
p20	[Sch95]	: GRP183-2.p
p20x	[Sch95]	: GRP183-4.p
p21	[Sch95]	: GRP184-2.p
p21x	[Sch95]	: GRP184-4.p
p22a	[Sch95]	: GRP185-2.p
p22b	[Sch95]	: GRP185-4.p
p23	[Sch95]	: GRP186-2.p
p23x	[Sch95]	: GRP186-4.p
p33	[Sch95]	: GRP187-1.p
p35.in	[ANL]	: SYN064-1.p
p36.in	[ANL]	: SYN065-1.p
p37.in	[ANL]	: SYN066-1.p
p38a	[Sch95]	: GRP188-2.p
p38a.in	[ANL]	: SYN067-1.p
p38b	[Sch95]	: GRP189-2.p
p38b.in	[ANL]	: SYN067-1.p
p39.in	[ANL]	: SET043-5.p

p39a	[Sch95]	: GRP190-1.p
p39b	[Sch95]	: GRP191-1.p
p39c	[Sch95]	: GRP190-2.p
p39d	[Sch95]	: GRP191-2.p
p40.in	[ANL]	: SET044-5.p
p40a	[Sch95]	: GRP192-1.p
p41.in	[ANL]	: SET045-5.p
p42.in	[ANL]	: SET046-5.p
p43.in	[ANL]	: SET047-5.p
p44.in	[ANL]	: SYN068-1.p
p45.in	[ANL]	: SYN069-1.p
p46.in	[ANL]	: SYN070-1.p
PC1	[Qua92a]	: SET363-6.p
PC2	[Qua92a]	: SET364-6.p
PC3	[Qua92a]	: SET365-6.p
PC4.1	[Qua92a]	: SET366-6.p
PC4.2	[Qua92a]	: SET367-6.p
PC4.3	[Qua92a]	: SET368-6.p
PC5	[Qua92a]	: SET369-6.p
PC6	[Qua92a]	: SET370-6.p
PC7	[Qua92a]	: SET371-6.p
PC8	[Qua92a]	: SET372-6.p
PC9	[Qua92d]	: SET373-6.p
PC10	[Qua92d]	: SET374-6.p
PC11	[Qua92d]	: SET375-6.p
PC12	[Qua92d]	: SET376-6.p
PC12 cor.1	[Qua92d]	: SET377-6.p
PC12 cor.2	[Qua92d]	: SET378-6.p
PC12 cor.3	[Qua92d]	: SET379-6.p
Pelletier 1	[Pel86]	: SYN040-1.p
Pelletier 2 (Size 1)	[Pel86]	: SYN001-1.g
Pelletier 3	[Pel86]	: SYN041-1.p
Pelletier 4	[Pel86]	: LCL181-2.p
Pelletier 5	[Pel86]	: LCL230-2.p
Pelletier 6 (Size 1)	[Pel86]	: SYN001-1.g
Pelletier 7 (Size 1)	[Pel86]	: SYN001-1.g
Pelletier 8 (Size 1)	[Pel86]	: SYN001-1.g
Pelletier 9 (Size 2)	[Pel86]	: SYN001-1.g
Pelletier 10	[Pel86]	: SYN044-1.p
Pelletier 11 (Size 1)	[Pel86]	: SYN001-1.g
Pelletier 12 (Size 3)	[Pel86]	: SYN001-1.g
Pelletier 13	[Pel86]	: SYN045-1.p
Pelletier 14 (Size 2)	[Pel86]	: SYN001-1.g
Pelletier 15	[Pel86]	: SYN046-1.p
Pelletier 16	[Pel86]	: SYN041-1.p
Pelletier 17	[Pel86]	: SYN047-1.p
Pelletier 18	[Pel86]	: SYN048-1.p
Pelletier 19	[Pel86]	: SYN049-1.p
Pelletier 20	[Pel86]	: SYN050-1.p
Pelletier 21	[Pel86]	: SYN051-1.p
Pelletier 22	[Pel86]	: SYN052-1.p
Pelletier 23	[Pel86]	: SYN053-1.p
Pelletier 24	[Pel86]	: SYN054-1.p
Pelletier 25	[Pel86]	: SYN055-1.p
Pelletier 26	[Pel86]	: SYN056-1.p
Pelletier 27	[Pel86]	: SYN057-1.p
Pelletier 28	[Pel86]	: SYN058-1.p
Pelletier 29	[Pel86]	: SYN059-1.p
Pelletier 30	[Pel86]	: SYN060-1.p
Pelletier 31	[Pel86]	: SYN061-1.p
Pelletier 32	[Pel86]	: SYN062-1.p
Pelletier 33	[Pel86]	: SYN063-1.p
Pelletier 34	[Pel86]	: SYN036-1.p
Pelletier 35	[Pel86]	: SYN064-1.p
Pelletier 36	[Pel86]	: SYN065-1.p
Pelletier 37	[Pel86]	: SYN066-1.p
Pelletier 38	[Pel86]	: SYN067-1.p
Pelletier 39	[Pel86]	: SET043-5.p
Pelletier 40	[Pel86]	: SET044-5.p
Pelletier 41	[Pel86]	: SET045-5.p
Pelletier 42	[Pel86]	: SET046-5.p
Pelletier 43	[Pel86]	: SET047-5.p
Pelletier 44	[Pel86]	: SYN068-1.p
Pelletier 45	[Pel86]	: SYN069-1.p
Pelletier 46	[Pel86]	: SYN070-1.p
Pelletier 47	[Pel86]	: PUZ031-1.p
Pelletier 48	[Pel86]	: SYN071-1.p
Pelletier 49	[Pel86]	: SYN072-1.p
Pelletier 50	[Pel86]	: SYN073-1.p
Pelletier 51	[Pel86]	: SYN074-1.p
Pelletier 52	[Pel86]	: SYN075-1.p
Pelletier 53	[Pel86]	: SYN076-1.p
Pelletier 54	[Pel86]	: SYN077-1.p
Pelletier 55	[Pel86]	: PUZ001-2.p
Pelletier 56	[Pel86]	: SYN078-1.p
Pelletier 57	[Pel86]	: SYN079-1.p
Pelletier 58	[Pel86]	: SYN080-1.p
Pelletier 59	[Pel86]	: SYN081-1.p
Pelletier 60	[Pel86]	: SYN082-1.p
Pelletier 61	[Pel86]	: SYN083-1.p
Pelletier 62	[Pel86]	: SYN084-1.p
Pelletier 62	[Pel86]	: SYN084-2.p
Pelletier 63	[Pel86]	: GRP011-4.p
Pelletier 64	[Pel86]	: GRP010-4.p
Pelletier 65	[Pel86]	: GRP001-4.p
Pelletier 66	[Pel86]	: LCL076-1.p
Pelletier 67	[Pel86]	: LCL077-1.p
Pelletier 68	[Pel86]	: LCL078-1.p
Pelletier 69	[Pel86]	: LCL039-1.p
Pelletier 72 (Size 4)	[Pel86]	: MSC007-1.g
Pelletier 73 (Size 4)	[Pel86]	: MSC007-2.g
Pelletier 74	[Pel86]	: GRA001-1.p
pigeon.in (Size 4)	[OTT]	: MSC007-1.g
pigs.ver1.in	[ANL]	: PUZ029-1.p
PO1	[Qua92a]	: SET054-7.p
PO3	[Qua92a]	: SET027-7.p
PRIM	[RRY+72]	: NUM015-1.p
prob1.ver1.in	[ANL]	: ANA003-2.p
prob1.ver1.in	[ANL]	: BOO008-1.p
prob1.ver2.in	[ANL]	: ANA003-1.p
prob1.ver2.in	[ANL]	: BOO008-2.p
prob2.ver1.in	[ANL]	: ANA005-2.p
prob2_part1.ver1.in	[ANL]	: BOO003-1.p
prob2_part1.ver2.in	[ANL]	: BOO003-2.p
prob2_part2.ver1	[ANL]	: BOO004-1.p
prob2_part2.ver2.in	[ANL]	: BOO004-2.p
prob3_part1.ver1.in	[ANL]	: BOO005-1.p
prob3_part1.ver2.in	[ANL]	: BOO005-2.p
prob3_part2.ver1	[ANL]	: BOO006-1.p
prob3_part2.ver2.in	[ANL]	: BOO006-2.p
prob4_part1.ver1	[ANL]	: BOO009-1.p
prob4_part1.ver2.in	[ANL]	: BOO009-2.p
prob4_part2.ver1	[ANL]	: BOO010-1.p
prob4_part2.ver2.in	[ANL]	: BOO010-2.p
prob7.ver1	[ANL]	: BOO011-1.p
prob7.ver2.in	[ANL]	: BOO011-2.p
prob8.ver1	[ANL]	: BOO012-3.p
prob8.ver2.in	[ANL]	: BOO012-2.p
prob9.ver1	[ANL]	: BOO013-3.p
prob9.ver2.in	[ANL]	: BOO013-2.p
prob10.ver2.in	[ANL]	: BOO014-2.p
prob10.ver2.in	[ANL]	: BOO015-2.p
prob.10.ver1	[ANL]	: BOO014-3.p
Problem for C Reduction	[Sho76]	: SYN011-1.p
Problem 1	[AZ89]	: SYN037-1.p
Problem 1	[Ble90]	: ANA003-4.p
Problem 1	[Jec93a]	: LDA001-1.p
Problem 1	[LO85a]	: GRP001-2.p
Problem 1	[WM89]	: TOP006-1.p
Problem 1	[Wosb]	: GRP029-1.p
PROBLEM 1	[Zha93]	: GRP002-3.p
Problem 2	[Ble90]	: ANA004-4.p
Problem 2	[Jec93a]	: LDA002-1.p
Problem 2	[LO85a]	: GRP022-2.p
Problem 2	[WM89]	: TOP007-1.p
Problem 2	[WM88a]	: COL049-1.p
Problem 2	[Wosb]	: GRP030-1.p
PROBLEM 2	[Zha93]	: ROB005-1.p
Problem 2.01	[WR27]	: LCL169-1.p
Problem 2.02	[WR27]	: LCL170-1.p
Problem 2.03	[WR27]	: LCL171-1.p
Problem 2.04	[WR27]	: LCL172-1.p
Problem 2.05	[WR27]	: LCL173-1.p
Problem 2.06	[WR27]	: LCL174-1.p
Problem 2.07	[WR27]	: LCL175-1.p
Problem 2.08	[WR27]	: LCL176-1.p
Problem 2.1	[WR27]	: LCL176-1.p
Problem 2.11	[WR27]	: LCL177-1.p
Problem 2.12	[WR27]	: LCL178-1.p
Problem 2.13	[WR27]	: LCL179-1.p
Problem 2.14	[WR27]	: LCL180-1.p
Problem 2.15	[WR27]	: LCL181-1.p
Problem 2.16	[WR27]	: LCL182-1.p
Problem 2.17	[WR27]	: LCL183-1.p
Problem 2.18	[WR27]	: LCL184-1.p
Problem 2.2	[WR27]	: LCL185-1.p
Problem 2.21	[WR27]	: LCL186-1.p
Problem 2.24	[WR27]	: LCL187-1.p
Problem 2.25	[WR27]	: LCL188-1.p
Problem 2.26	[WR27]	: LCL189-1.p
Problem 2.27	[WR27]	: LCL189-1.p
Problem 2.3	[WR27]	: LCL190-1.p
Problem 2.31	[WR27]	: LCL191-1.p
Problem 2.32	[WR27]	: LCL192-1.p
Problem 2.33	[WR27]	: LCL192-1.p
Problem 2.36	[WR27]	: LCL193-1.p
Problem 2.37	[WR27]	: LCL194-1.p
Problem 2.38	[WR27]	: LCL195-1.p
Problem 2.4	[WR27]	: LCL196-1.p
Problem 2.41	[WR27]	: LCL197-1.p
Problem 2.42	[WR27]	: LCL198-1.p
Problem 2.43	[WR27]	: LCL198-1.p
Problem 2.45	[WR27]	: LCL199-1.p
Problem 2.46	[WR27]	: LCL200-1.p

Problem 2.47	[WR27]	: LCL201-1.p
Problem 2.48	[WR27]	: LCL202-1.p
Problem 2.49	[WR27]	: LCL203-1.p
Problem 2.5	[WR27]	: LCL204-1.p
Problem 2.51	[WR27]	: LCL205-1.p
Problem 2.52	[WR27]	: LCL206-1.p
Problem 2.521	[WR27]	: LCL207-1.p
Problem 2.53	[WR27]	: LCL208-1.p
Problem 2.54	[WR27]	: LCL209-1.p
Problem 2.55	[WR27]	: LCL210-1.p
Problem 2.56	[WR27]	: LCL211-1.p
Problem 2.6	[WR27]	: LCL212-1.p
Problem 2.61	[WR27]	: LCL213-1.p
Problem 2.61	[WR27]	: LCL214-1.p
Problem 2.62	[WR27]	: LCL215-1.p
Problem 2.63	[WR27]	: LCL215-1.p
Problem 2.64	[WR27]	: LCL216-1.p
Problem 2.65	[WR27]	: LCL217-1.p
Problem 2.67	[WR27]	: LCL218-1.p
Problem 2.68	[WR27]	: LCL219-1.p
Problem 2.69	[WR27]	: LCL220-1.p
Problem 2.73	[WR27]	: LCL221-1.p
Problem 2.74	[WR27]	: LCL222-1.p
Problem 2.75	[WR27]	: LCL223-1.p
Problem 2.76	[WR27]	: LCL224-1.p
Problem 2.77	[WR27]	: LCL225-1.p
Problem 2.8	[WR27]	: LCL226-1.p
Problem 2.81	[WR27]	: LCL227-1.p
Problem 2.82	[WR27]	: LCL228-1.p
Problem 2.83	[WR27]	: LCL229-1.p
Problem 2.85	[WR27]	: LCL230-1.p
Problem 2.86	[WR27]	: LCL231-1.p
Problem 3	[Ble90]	: ANA004-5.p
Problem 3	[Jec93a]	: LDA003-1.p
Problem 3	[LO85a]	: RNG008-7.p
Problem 3	[WM89]	: TOP008-1.p
Problem 3	[Wosb]	: GRP007-1.p
PROBLEM 3	[Zha93]	: BOO002-1.p
Problem 3.1	[WR27]	: LCL232-1.p
Problem 3.11	[WR27]	: LCL233-1.p
Problem 3.12	[WR27]	: LCL234-1.p
Problem 3.13	[WR27]	: LCL235-1.p
Problem 3.14	[WR27]	: LCL236-1.p
Problem 3.2	[WR27]	: LCL234-1.p
Problem 3.21	[WR27]	: LCL237-1.p
Problem 3.22	[WR27]	: LCL238-1.p
Problem 3.24	[WR27]	: LCL239-1.p
Problem 3.26	[WR27]	: LCL240-1.p
Problem 3.27	[WR27]	: LCL241-1.p
Problem 3.3	[WR27]	: LCL242-1.p
Problem 3.31	[WR27]	: LCL243-1.p
Problem 3.33	[WR27]	: LCL244-1.p
Problem 3.34	[WR27]	: LCL245-1.p
Problem 3.35	[WR27]	: LCL246-1.p
Problem 3.37	[WR27]	: LCL247-1.p
Problem 3.4	[WR27]	: LCL248-1.p
Problem 3.41	[WR27]	: LCL249-1.p
Problem 3.42	[WR27]	: LCL250-1.p
Problem 3.43	[WR27]	: LCL251-1.p
Problem 3.44	[WR27]	: LCL252-1.p
Problem 3.45	[WR27]	: LCL253-1.p
Problem 3.47	[WR27]	: LCL254-1.p
Problem 3.48	[WR27]	: LCL255-1.p
Problem 4	[Ble90]	: ANA005-4.p
Problem 4	[Jec93a]	: LDA004-1.p
Problem 4	[LO85a]	: GRP002-4.p
Problem 4	[WM89]	: TOP009-1.p
Problem 4	[Wosb]	: GRP008-1.p
PROBLEM 4	[Zha93]	: GRP014-1.p
Problem 5	[Ble90]	: ANA005-5.p
Problem 5	[Jec93a]	: LDA005-1.p
Problem 5	[LO85a]	: BOO002-1.p
Problem 5	[WM89]	: TOP010-1.p
Problem 5	[Wosb]	: GRP031-1.p
PROBLEM 5	[Zha93]	: LCL109-2.p
Problem 5.1	[Pla82]	: MSC005-1.p
Problem 5.2	[Pla82]	: SYN003-1.g
Problem 5.3	[Pla82]	: SYN004-1.g
Problem 5.4	[Pla82]	: SYN005-1.g
Problem 5.5	[Pla82]	: PRV009-1.p
Problem 5.6	[Pla82]	: PUZ011-1.p
Problem 5.7	[Pla82]	: PLA002-1.p
Problem 5.8	[Pla82]	: SYN006-1.p
Problem 6	[Jec93a]	: LDA006-1.p
Problem 6	[LO85a]	: RNG009-7.p
Problem 6	[WM89]	: TOP011-1.p
Problem 6	[Wosb]	: GRP009-1.p
PROBLEM 6	[Zha93]	: COL049-1.p
Problem 7	[Jec93a]	: LDA007-1.p
Problem 7	[WM89]	: TOP012-1.p
Problem 7	[Wosb]	: GRP010-1.p
PROBLEM 7	[Zha93]	: RNG009-5.p
Problem 8	[Jec93a]	: LDA007-3.p
Problem 8	[WM89]	: TOP013-1.p
PROBLEM 8	[Zha93]	: COL003-1.p
Problem 9	[AZ89]	: SYN036-3.p
Problem 9	[Jec93a]	: LDA008-1.p
Problem 9	[WM89]	: TOP014-1.p
Problem 9	[Wosb]	: GRP012-1.p
PROBLEM 9	[Zha93]	: RNG010-5.p
Problem 10	[Jec93a]	: LDA009-1.p
Problem 10	[WM89]	: TOP015-1.p
PROBLEM 10	[Zha93]	: RNG011-5.p
Problem 11	[Jec93a]	: LDA010-1.p
Problem 11	[WM89]	: TOP016-1.p
Problem 11	[Wosb]	: GRP013-1.p
Problem 12	[Jec93a]	: LDA011-1.p
Problem 12	[WM89]	: TOP017-1.p
Problem 12	[Wosb]	: GRP032-3.p
Problem 13	[Jec93a]	: LDA012-1.p
Problem 13	[WM89]	: TOP018-1.p
Problem 13	[Wosb]	: GRP033-3.p
Problem 13	[Wosb]	: GRP033-4.p
Problem 14	[WM89]	: TOP019-1.p
Problem 14	[Wosb]	: GRP034-3.p
Problem 15	[Wosb]	: GRP035-3.p
Problem 16	[Wosb]	: GRP036-3.p
Problem 17	[LS74]	: NUM016-1.p
Problem 17	[Wosb]	: GRP037-3.p
Problem 18	[Wosb]	: GRP038-3.p
Problem 20	[Wosb]	: GRP040-4.p
Problem 21	[Wosb]	: RNG001-5.p
Problem 22	[Wosb]	: RNG004-3.p
Problem 23	[Wosb]	: RNG005-1.p
Problem 23	[Wosb]	: RNG005-2.p
Problem 24	[Wosb]	: RNG037-1.p
Problem 24	[Wosb]	: RNG037-2.p
Problem 25	[Wosb]	: RNG006-1.p
Problem 25	[Wosb]	: RNG006-2.p
Problem 25	[Wosb]	: RNG006-3.p
Problem 26	[LS74]	: NUM017-1.p
Problem 26	[Smu78b]	: PUZ032-1.p
Problem 27	[Smu78b]	: PUZ023-1.p
Problem 27	[Wosb]	: RNG038-1.p
Problem 27	[Wosb]	: RNG038-2.p
Problem 28	[Wosb]	: RNG039-1.p
Problem 28	[Wosb]	: RNG039-2.p
Problem 29	[LS74]	: NUM002-1.p
Problem 29	[LS74]	: NUM004-1.p
Problem 29	[Wosb]	: RNG040-1.p
Problem 29	[Wosb]	: RNG040-2.p
Problem 30	[Wosb]	: RNG041-1.p
Problem 31	[Smu78b]	: PUZ024-1.p
Problem 32	[Wosb]	: SYN014-2.p
Problem 33	[Wosb]	: SYN015-2.p
Problem 35	[Smu78b]	: PUZ025-1.p
Problem 39	[Smu78b]	: PUZ026-1.p
Problem 41	[LS74]	: NUM019-1.p
Problem 42	[Smu78b]	: PUZ027-1.p
Problem 76t1	[LS74]	: NUM025-2.p
Problem 95	[Smu78b]	: PUZ021-1.p
Problem 221-223	[BLM$^+$86]	: ALG001-1.p
Problem 221-223	[BLM$^+$86]	: ALG001-2.p
Problem 224-225	[BLM$^+$86]	: GRP015-1.p
Problem 226-227	[BLM$^+$86]	: GRP016-1.p
Problem 228-231	[BLM$^+$86]	: GRP001-3.p
Problem 232	[BLM$^+$86]	: NUM008-1.p
Problem 233	[BLM$^+$86]	: NUM009-1.p
Problem 234-235	[BLM$^+$86]	: NUM010-1.p
Problem 236-237	[BLM$^+$86]	: NUM011-1.p
Problem 238-241	[BLM$^+$86]	: NUM012-1.p
Problem 242-244	[BLM$^+$86]	: NUM013-1.p
Problem 245	[BLM$^+$86]	: NUM018-1.p
Problem 246-248	[BLM$^+$86]	: NUM006-1.p
PROOF I	[AH90]	: RNG025-1.p
PROOF II	[AH90]	: RNG034-1.p
PROOF III	[AH90]	: RNG028-2.p
PROOF IV	[AH90]	: RNG027-2.p
PROOF V	[AH90]	: RNG029-2.p
PROOF VI	[AH90]	: RNG010-2.p
Proposition 1a	[Jec93b]	: COL077-1.p
Proposition 1b	[Jec93b]	: COL078-1.p
Proposition 2a	[Jec93b]	: COL079-1.p
Proposition 2b	[Jec93b]	: COL080-1.p
Proposition 2c	[Jec93b]	: COL081-1.p
PV1	[MOW76]	: PRV001-1.p
q1-10.lop (Size 10)	[SET]	: PUZ034-1.g
q1-2.lop (Size 8)	[SET]	: PUZ034-1.g
q1-9.lop (Size 9)	[SET]	: PUZ034-1.g
Q2	[Qua89b]	: GEO074-2.p
Q3.1	[Qua89b]	: GEO075-2.p
QG1	[FSB93]	: GRP123-1.g
QG1	[Sla93]	: GRP123-1.g

QG1	[SFS95]	: GRP123-1.g
QG1-ni	[Sla93]	: GRP131-1.g
QG1a	[Sla93]	: GRP123-6.g
QG2	[FSB93]	: GRP124-1.g
QG2	[Sla93]	: GRP124-1.g
QG2	[SFS95]	: GRP124-1.g
QG2-ni	[Sla93]	: GRP132-1.g
QG2a	[Sla93]	: GRP124-6.g
QG3	[FSB93]	: GRP125-1.g
QG3	[Sla93]	: GRP125-1.g
QG3	[SFS95]	: GRP125-1.g
QG3-ni	[Sla93]	: GRP133-1.g
QG4	[FSB93]	: GRP126-1.g
QG4	[Sla93]	: GRP126-1.g
QG4	[SFS95]	: GRP126-1.g
QG4-ni	[Sla93]	: GRP134-1.g
QG5	[FSB93]	: GRP127-1.g
QG5	[Sla93]	: GRP127-1.g
QG5	[SFS95]	: GRP127-1.g
QG5-ni	[Sla93]	: GRP135-1.g
QG6	[FSB93]	: GRP128-1.g
QG6	[Sla93]	: GRP128-1.g
QG6	[SFS95]	: GRP128-1.g
QG7	[FSB93]	: GRP129-1.g
QG7	[Sla93]	: GRP129-1.g
QG7	[SFS95]	: GRP129-1.g
QG8	[Sla93]	: GRP130-1.g
Question 1	[Wos93]	: COL029-1.p
Question 2	[Wos93]	: COL049-1.p
Question 3	[Wos93]	: COL003-1.p
Question 4	[Wos93]	: COL067-1.p
Question 5	[Wos93]	: COL003-1.p
Question 5	[Wos93]	: COL040-1.p
Question 5	[Wos93]	: COL042-1.p
Question 5	[Wos93]	: COL043-1.p
Question 5	[Wos93]	: COL044-1.p
Question 5	[Wos93]	: COL067-1.p
Question 6	[Wos93]	: COL069-1.p
Question 7	[Wos93]	: COL047-1.p
Question 11	[Wos93]	: COL068-1.p
Question 12	[Wos93]	: COL070-1.p
Question 13	[Wos93]	: COL008-1.p
Question 14	[Wos93]	: COL071-1.p
Question 15	[Wos93]	: COL005-1.p
Question 16	[Wos93]	: COL072-1.p
Question 17	[Wos93]	: COL047-1.p
Question 18	[Wos93]	: COL073-1.p
QW	[MRS72]	: SYN034-1.p
QW	[WM76]	: SYN034-1.p
R1	[MOW76]	: RNG001-1.p
R1	[MOW76]	: RNG001-4.p
R2	[MOW76]	: RNG004-1.p
R2	[MOW76]	: RNG004-2.p
R2.1	[Qua89b]	: GEO054-3.p
R2.2	[Qua89b]	: GEO055-3.p
R3	[MOW76]	: RNG008-2.p
R3.1	[Qua89b]	: GEO056-3.p
R3.2	[Qua89b]	: GEO057-3.p
R4	[Qua89b]	: GEO058-3.p
R5	[Qua89b]	: GEO059-3.p
R6	[Qua89b]	: GEO060-2.p
R-85	[MW92]	: LCL117-1.p
R-86	[MW92]	: LCL118-1.p
R-87	[MW92]	: LCL119-1.p
R-88	[MW92]	: LCL120-1.p
RA1	[LW92]	: ROB003-1.p
RA1.1	[Qua92a]	: SET302-6.p
RA1.2	[Qua92a]	: SET303-6.p
RA1.3	[Qua92a]	: SET304-6.p
RA2	[LW92]	: ROB010-1.p
RA2.1	[Qua92a]	: SET305-6.p
RA2.2	[Qua92a]	: SET306-6.p
RA3	[LW92]	: ROB005-1.p
RA3	[Qua92a]	: SET307-6.p
RA3 cor.1	[Qua92a]	: SET308-6.p
RA3 cor.2	[Qua92a]	: SET309-6.p
RA3 cor.3	[Qua92a]	: SET310-6.p
RA4	[LW92]	: ROB006-1.p
RA4	[Qua92a]	: SET311-6.p
RA5	[LW92]	: ROB007-1.p
RA5	[Qua92a]	: SET312-6.p
RA6	[Qua92a]	: SET313-6.p
RA7	[Qua92a]	: SET314-6.p
RA7 cor.	[Qua92a]	: SET315-6.p
RA8	[Qua92a]	: SET316-6.p
RA8 cor.1	[Qua92a]	: SET317-6.p
RA8 cor.2	[Qua92a]	: SET318-6.p
RA8 cor.3	[Qua92a]	: SET319-6.p
RA8 cor.4	[Qua92a]	: SET320-6.p
RA9.1	[Qua92a]	: SET321-6.p
RA9.2	[Qua92a]	: SET322-6.p
RA10	[Qua92d]	: SET323-6.p

RA-1	[WWM$^+$90]	: ROB024-1.p
RA-2	[WWM$^+$90]	: ROB025-1.p
ramsey1.lop	[SET]	: PUZ028-2.p
ramsey3.lop	[SET]	: PUZ028-3.p
ramsey3a.lop	[SET]	: PUZ028-4.p
RC-1	[WWM$^+$90]	: LCL119-1.p
RC-2	[WWM$^+$90]	: LCL168-1.p
RE1	[Qua92a]	: SET515-6.p
RE2	[Qua92a]	: SET516-6.p
RE3	[Qua92a]	: SET517-6.p
RE4	[Qua92a]	: SET518-6.p
RE5.1	[Qua92a]	: SET519-6.p
RE5.2	[Qua92a]	: SET520-6.p
RE6.1	[Qua92a]	: SET521-6.p
RE6.2	[Qua92a]	: SET522-6.p
RE7	[Qua92a]	: SET523-6.p
RE8.1	[Qua92a]	: SET524-6.p
RE8.2	[Qua92a]	: SET525-6.p
RE9.1	[Qua92a]	: SET526-6.p
RE9.2	[Qua92a]	: SET527-6.p
RE9 cor.	[Qua92a]	: SET528-6.p
RE10.1	[Qua92a]	: SET529-6.p
RE10.2	[Qua92a]	: SET530-6.p
RG-102	[MW92]	: LCL121-1.p
RG-103	[MW92]	: LCL122-1.p
RG-104	[MW92]	: LCL123-1.p
RG-105	[MW92]	: LCL124-1.p
RG-106	[MW92]	: LCL125-1.p
RG-107	[MW92]	: LCL126-1.p
RG-108	[MW92]	: LCL127-1.p
RG-109	[MW92]	: LCL128-1.p
RG-110	[MW92]	: LCL129-1.p
RG-111	[MW92]	: LCL130-1.p
RG-112	[MW92]	: LCL131-1.p
RL1	[Qua92a]	: SET380-6.p
RL2	[Qua92a]	: SET381-6.p
RL2 cor.2	[Qua92a]	: SET382-6.p
RL2 cor.2	[Qua92d]	: SET383-6.p
RL3 cor.1	[Qua92a]	: SET384-6.p
RL3 cor.2	[Qua92a]	: SET385-6.p
RL4	[Qua92d]	: SET386-6.p
ROB1	[MRS72]	: SYN035-1.p
ROB1	[WM76]	: SYN035-1.p
ROB2	[MRS72]	: GRP001-5.p
ROB2	[WM76]	: GRP001-5.p
Robbins	[LM92]	: ROB023-1.p
robbins.in	[OTT]	: ROB003-1.p
robbins.occ.in	[OTT]	: ROB005-1.p
RP1.1	[Qua92a]	: SET477-6.p
RP1.2	[Qua92a]	: SET478-6.p
RP2.1	[Qua92a]	: SET479-6.p
RP2.2	[Qua92a]	: SET480-6.p
RP3	[Qua92a]	: SET481-6.p
RP4	[Qua92a]	: SET482-6.p
RP5	[Qua92a]	: SET483-6.p
RP6	[Qua92a]	: SET484-6.p
RP7	[Qua92a]	: SET485-6.p
RP8	[Qua92a]	: SET486-6.p
RP9	[Qua92a]	: SET487-6.p
RP10	[Qua92a]	: SET488-6.p
RP11.1	[Qua92a]	: SET489-6.p
RP11.2	[Qua92a]	: SET490-6.p
RS0	[Qua92d]	: SET237-6.p
RS0 cor.	[Qua92d]	: SET238-6.p
RS1	[Qua92a]	: SET239-6.p
RS2	[Qua92a]	: SET240-6.p
RS3	[Qua92a]	: SET241-6.p
RS4	[Qua92a]	: SET242-6.p
RS5	[Qua92a]	: SET243-6.p
RS6.1	[Qua92a]	: SET244-6.p
RS6.2	[Qua92a]	: SET245-6.p
RS6.3	[Qua92a]	: SET246-6.p
RS6.4	[Qua92a]	: SET247-6.p
RS7	[Qua92a]	: SET248-6.p
RS8	[Qua92a]	: SET249-6.p
RS8 cor.	[Qua92a]	: SET250-6.p
RS9.1	[Qua92a]	: SET251-6.p
RS10.1	[Qua92a]	: SET252-6.p
RS10.2	[Qua92a]	: SET253-6.p
RS11.1	[Qua92a]	: SET254-6.p
RS11.2	[Qua92a]	: SET255-6.p
RS11.3	[Qua92a]	: SET256-6.p
RS12	[Qua92a]	: SET257-6.p
RT1	[LW91]	: RNG008-7.p
RT2	[LW91]	: RNG009-7.p
RT3	[LW91]	: RNG035-7.p
RT4	[LW91]	: RNG036-7.p
S1	[MOW76]	: SET012-1.p
S1	[Pfe88]	: LCL082-1.p
S1n	[Pla94]	: SYN085-1.g
S2	[MOW76]	: SET013-1.p
S2n	[Pla94]	: SYN086-1.g

S3	[MOW76]	: SET015-1.p
S3n	[Pla94]	: SYN087-1.g
S4	[MOW76]	: SET014-2.p
S4n	[Pla94]	: SYN088-1.g
Sages and Combinatory Logic	[Wos88]	: COL003-1.p
Salt and Mustard Problem	[LO85a]	: PUZ030-1.p
Salt-and-Mustard Problem	[MB88]	: PUZ030-1.p
salt.in	[OTT]	: PUZ030-2.p
SAM's lemma	[LM92]	: LAT005-2.p
SAM's lemma	[MOW76]	: LAT005-1.p
SAM's lemma	[McC88]	: LAT005-3.p
SAM's lemma	[Wos88]	: LAT005-4.p
SAM's lemma	[Wos88]	: LAT005-6.p
sam.in	[OTT]	: LAT005-2.p
SAMslemma.ver1.in	[ANL]	: LAT005-1.p
SAMslemma.ver1.in	[ANL]	: LAT005-5.p
sam_hyp.in	[OTT]	: LAT005-2.p
sax1.in	[OTT]	: GRP058-1.p
sax2.in	[OTT]	: GRP064-1.p
SB2.1	[Qua92a]	: SET123-6.p
SB2.2	[Qua92d]	: SET124-6.p
SB2.3	[Qua92d]	: SET125-6.p
SB3	[Qua92d]	: SET126-6.p
SB4	[Qua92d]	: SET127-6.p
SB5.1	[Qua92d]	: SET128-6.p
SB5.10	[Qua92d]	: SET137-6.p
SB5.11	[Qua92d]	: SET138-6.p
SB5.2	[Qua92d]	: SET129-6.p
SB5.3	[Qua92d]	: SET130-6.p
SB5.4	[Qua92d]	: SET131-6.p
SB5.5	[Qua92d]	: SET132-6.p
SB5.6	[Qua92d]	: SET133-6.p
SB5.7	[Qua92d]	: SET134-6.p
SB5.8	[Qua92d]	: SET135-6.p
SB5.9	[Qua92d]	: SET136-6.p
SB6.1	[Qua92d]	: SET139-6.p
SB6.2	[Qua92d]	: SET140-6.p
SB6.3	[Qua92d]	: SET141-6.p
SB7	[Qua92d]	: SET142-6.p
SC1.1	[Qua92a]	: SET344-6.p
SC1.2	[Qua92a]	: SET345-6.p
SC2	[Qua92a]	: SET346-6.p
SC3.1	[Qua92a]	: SET347-6.p
SC3.2	[Qua92a]	: SET348-6.p
SC3.3	[Qua92a]	: SET349-6.p
SC3.4	[Qua92d]	: SET350-6.p
SC4	[Qua92a]	: SET351-6.p
SC5	[Qua92a]	: SET352-6.p
SC5 cor.	[Qua92a]	: SET353-6.p
SC6	[Qua92a]	: SET354-6.p
SC7	[Qua92a]	: SET355-6.p
SC7 cor.	[Qua92a]	: SET356-6.p
SC8	[Qua92a]	: SET357-6.p
SC9	[Qua92a]	: SET358-6.p
SC10	[Qua92a]	: SET359-6.p
SC11.1	[Qua92a]	: SET360-6.p
SC11.2	[Qua92a]	: SET361-6.p
SC12	[Qua92d]	: SET362-6.p
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SE2	[Qua92d]	: NUM091-1.p
SE2 cor. 1	[Qua92d]	: NUM092-1.p
SE2 cor. 2	[Qua92d]	: NUM093-1.p
SE3.1	[Qua92d]	: NUM094-1.p
SE3.2	[Qua92d]	: NUM095-1.p
SE4	[Qua92d]	: NUM096-1.p
SE4 cor.	[Qua92d]	: NUM097-1.p
SG1	[Qua92d]	: NUM057-1.p
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SG4.1	[Qua92d]	: NUM060-1.p
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SP2	[Qua92a]	: SET061-7.p
SP3	[Qua92a]	: SET062-7.p
SP3 cor.	[Qua92a]	: SET063-7.p
SP4	[Qua92a]	: SET064-7.p
SP5	[Qua92a]	: SET065-7.p
SP6	[Qua92a]	: SET503-6.p
SP6 cor.1	[Qua92a]	: SET504-6.p
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SP7.1	[Qua92a]	: SET506-6.p
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SS1 cor.	[Qua92d]	: SET078-7.p
SS2	[Qua92a]	: SET024-7.p
SS2 cor.	[Qua92a]	: SET079-6.p
SS2 cor.1	[Qua92a]	: SET079-7.p
SS2 cor.2	[Qua92d]	: SET080-7.p
SS3	[Qua92a]	: SET081-7.p
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SS5.1	[Qua92a]	: SET083-7.p
SS5.2	[Qua92a]	: SET084-7.p
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SS6.3	[Qua92a]	: SET088-7.p
SS6.4	[Qua92a]	: SET089-7.p
SS7	[Qua92a]	: SET090-7.p
SS8.1	[Qua92a]	: SET091-7.p
SS8.2	[Qua92a]	: SET092-7.p
SS9	[Qua92a]	: SET093-7.p
SS10	[Qua92a]	: SET094-6.p
SS10	[Qua92a]	: SET094-7.p
SS11	[Qua92a]	: SET095-6.p
SS11	[Qua92a]	: SET095-7.p
SS12	[Qua92a]	: SET096-6.p
SS12	[Qua92a]	: SET096-7.p
SS13	[Qua92a]	: SET097-6.p
SS13	[Qua92a]	: SET097-7.p
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SS13 cor.	[Qua92a]	: SET098-6.p
SS13 cor.1	[Qua92a]	: SET098-7.p
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SU3	[Qua92a]	: SET185-6.p
SU4	[Qua92a]	: SET186-6.p
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SU6	[Qua92a]	: SET188-6.p
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SUC1 cor.	[Qua92d]	: NUM143-1.p
SUC2	[Qua92d]	: NUM144-1.p
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SUC3	[Qua92d]	: NUM146-1.p
SUC4	[Qua92d]	: NUM147-1.p
SUC5	[Qua92d]	: NUM148-1.p
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SUC9.1	[Qua92d]	: NUM156-1.p
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SUC13.1	[Qua92d]	: NUM165-1.p
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SY2	[Qua92d]	: NUM029-1.p
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T5	[Qua89b]	: GEO005-2.p
t5.ver1.in	[ANL]	: GEO005-1.p
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t6.ver1.in	[ANL]	: GEO006-1.p
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T8	[Qua89b]	: GEO008-3.p
t8.ver1.in	[ANL]	: GEO008-1.p
T9	[MOW76]	: GEO009-1.p
T9	[Qua89b]	: GEO009-3.p
t9.ver1.in	[ANL]	: GEO009-1.p
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T10	[Qua89b]	: GEO010-3.p
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T11	[Qua89b]	: GEO011-3.p
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T12	[MOW76]	: GEO012-1.p
T12	[Qua89b]	: GEO012-3.p
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TA	[Ver94]	: BOO003-4.p
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tandl39.ver1.in	[ANL]	: PUZ026-1.p
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TB	[Ver94]	: BOO005-4.p
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TR2	[Qua92d]	: NUM084-1.p
TR3	[Qua92d]	: NUM085-1.p
TR4	[Qua92d]	: NUM086-1.p
TR5	[Qua92d]	: NUM087-1.p
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TREC7-5	[Qua92d]	: NUM249-2.p
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TREC10	[Qua92d]	: NUM252-2.p
TREC11	[Qua92d]	: NUM253-2.p
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TREC18.1	[Qua92d]	: NUM260-2.p
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TREC18.4	[Qua92d]	: NUM263-2.p
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TREC.LEMMA4	[Qua92d]	: NUM233-1.p
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TREC.LEMMA6	[Qua92d]	: NUM235-1.p
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TREC.LEMMA6 cor.2	[Qua92d]	: NUM237-1.p
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TREC.LEMMA10	[Qua92d]	: NUM243-1.p
TREC.LEMMA11	[Qua92d]	: NUM244-1.p
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TRECDEF4 cor.	[Qua92d]	: NUM228-1.p
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U2	[Qua92a]	: SET160-6.p
U3	[Qua92a]	: SET161-6.p
U4	[Qua92a]	: SET162-6.p
U5	[Qua92a]	: SET163-6.p
U6	[Qua92a]	: SET164-6.p
U6 cor.	[Qua92a]	: SET165-6.p
U7.1	[Qua92a]	: SET166-6.p
U7.2	[Qua92a]	: SET167-6.p
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UP2.1	[Qua92a]	: SET067-7.p
UP2.2	[Qua92a]	: SET068-7.p
UP2.3	[Qua92a]	: SET069-7.p
UP2.4	[Qua92a]	: SET070-7.p
UP3	[Qua92a]	: SET071-7.p
UP4	[Qua92a]	: SET017-7.p
UP5	[Qua92a]	: SET072-7.p
UP6.1	[Qua92a]	: SET073-6.p
UP6.1	[Qua92a]	: SET073-7.p
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v4.lop	[SET]	: PRV005-1.p
v5.lop	[SET]	: PRV006-1.p
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WE2.1	[Qua92d]	: NUM065-1.p
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WE3.1	[Qua92d]	: NUM067-1.p
WE3.2	[Qua92d]	: NUM068-1.p
WE3 cor.	[Qua92d]	: NUM069-1.p
WE4.1	[Qua92d]	: NUM070-1.p
WE4.2	[Qua92d]	: NUM071-1.p
WE5	[Qua92d]	: NUM072-1.p
WE5 cor.	[Qua92d]	: NUM073-1.p
WE6	[Qua92d]	: NUM074-1.p
WE7	[Qua92d]	: NUM075-1.p
WE8	[Qua92d]	: NUM076-1.p
WE8 cor. 1	[Qua92d]	: NUM077-1.p
WE8 cor. 2	[Qua92d]	: NUM078-1.p
WE9.1	[Qua92d]	: NUM079-1.p
WE9.2	[Qua92d]	: NUM080-1.p
WE9 cor.	[Qua92d]	: NUM081-1.p
WE10	[Qua92d]	: NUM082-1.p
winds.ver1.in	[ANL]	: PUZ033-1.p
wos1	[WM76]	: GRP029-1.p
wos2	[WM76]	: GRP030-1.p
wos3	[WM76]	: GRP007-1.p
wos4	[WM76]	: GRP008-1.p
wos5	[WM76]	: GRP031-1.p
wos6	[WM76]	: GRP009-1.p
wos7	[WM76]	: GRP010-1.p
wos8	[WM76]	: GRP022-1.p
wos9	[WM76]	: GRP012-1.p
wos10	[WM76]	: GRP001-1.p
wos11	[WM76]	: GRP013-1.p
wos12	[WM76]	: GRP032-3.p
wos13	[WM76]	: GRP033-3.p
wos14	[WM76]	: GRP034-3.p
wos15	[WM76]	: GRP035-3.p
wos16	[WM76]	: GRP036-3.p
wos17	[WM76]	: GRP037-3.p
wos18	[WM76]	: GRP038-3.p
wos19	[WM76]	: GRP039-3.p
wos20	[WM76]	: GRP040-4.p
wos21	[WM76]	: RNG001-5.p
wos22	[WM76]	: RNG004-3.p
wos23	[WM76]	: RNG005-2.p
wos24	[WM76]	: RNG037-2.p
wos25	[WM76]	: RNG006-2.p
wos26	[WM76]	: NUM017-1.p
wos27	[WM76]	: RNG038-2.p
wos28	[WM76]	: RNG039-2.p
wos29	[WM76]	: RNG040-2.p
wos30	[WM76]	: RNG041-1.p
wos31	[WM76]	: SYN013-1.p
wos32	[WM76]	: SYN014-2.p
wos33	[WM76]	: SYN015-2.p
wos_nie	[SPR]	: GRP034-3.p
x2_quant.in	[OTT]	: GRP001-4.p
XGK and Equivalential Calculus	[Wos88]	: LCL024-1.p
xsquared.ver1.in	[ANL]	: GRP001-1.p
xsquared.ver2.in	[ANL]	: GRP001-2.p
zero.ver1.in	[ANL]	: RNG001-1.p
-	[ANL]	: GRP012-3.p
-	[ANL]	: GRP012-4.p
-	[Bon91]	: LCL109-3.p
-	[Bru91]	: COM003-2.p
-	[Bur87a]	: COM003-1.p
-	[Fer94]	: SYN313-1.g
-	[Fer94]	: SYN314-1.g
-	[GO86]	: COL058-1.p
-	[GO86]	: COL058-2.p
-	[GO86]	: COL058-3.p
-	[GO86]	: COL059-1.p
-	[Jec93b]	: COL074-1.p
-	[Jec93b]	: COL074-2.p
-	[Jec93b]	: COL074-3.p
-	[Jec93b]	: COL075-1.p
-	[Jec93b]	: COL075-2.p
-	[Jec93b]	: COL076-1.p
-	[Jec93b]	: COL076-2.p
-	[MB88]	: PUZ001-3.p
-	[MW88]	: COL007-1.p
-	[MW88]	: COL008-1.p
-	[MW88]	: COL009-1.p
-	[MW88]	: COL010-1.p
-	[MW88]	: COL011-1.p
-	[MW88]	: COL012-1.p
-	[MW88]	: COL013-1.p
-	[MW88]	: COL014-1.p
-	[MW88]	: COL015-1.p
-	[MW88]	: COL016-1.p
-	[MW88]	: COL017-1.p
-	[MW88]	: COL018-1.p
-	[MW88]	: COL019-1.p
-	[MW88]	: COL020-1.p
-	[MW88]	: COL021-1.p
-	[MW88]	: COL022-1.p
-	[MW88]	: COL023-1.p
-	[MW88]	: COL024-1.p
-	[MW88]	: COL025-1.p
-	[MW88]	: COL026-1.p
-	[MW88]	: COL027-1.p
-	[MW88]	: COL028-1.p
-	[MW88]	: COL029-1.p
-	[MW88]	: COL030-1.p
-	[MW88]	: COL031-1.p
-	[MW88]	: COL032-1.p
-	[MW88]	: COL033-1.p
-	[MW88]	: COL034-1.p
-	[MW88]	: COL035-1.p
-	[MW88]	: COL036-1.p
-	[MW88]	: COL037-1.p
-	[MW88]	: COL038-1.p
-	[MW88]	: COL039-1.p
-	[MW88]	: COL040-1.p
-	[MW88]	: COL041-1.p

-	[MW88]	: COL042-1.p	-	[SE94]	: SYN201-1.p
-	[MW88]	: COL043-1.p	-	[SE94]	: SYN202-1.p
-	[MW88]	: COL044-1.p	-	[SE94]	: SYN203-1.p
-	[McC92a]	: ROB021-1.p	-	[SE94]	: SYN204-1.p
-	[McC92a]	: ROB022-1.p	-	[SE94]	: SYN205-1.p
-	[Pla81]	: PLA001-1.p	-	[SE94]	: SYN206-1.p
-	[Rob63]	: GRP001-1.p	-	[SE94]	: SYN207-1.p
-	[Rob63]	: NUM017-1.p	-	[SE94]	: SYN208-1.p
-	[SE94]	: PLA004-1.p	-	[SE94]	: SYN209-1.p
-	[SE94]	: PLA004-2.p	-	[SE94]	: SYN210-1.p
-	[SE94]	: PLA005-1.p	-	[SE94]	: SYN211-1.p
-	[SE94]	: PLA005-2.p	-	[SE94]	: SYN212-1.p
-	[SE94]	: PLA006-1.p	-	[SE94]	: SYN213-1.p
-	[SE94]	: PLA007-1.p	-	[SE94]	: SYN214-1.p
-	[SE94]	: PLA008-1.p	-	[SE94]	: SYN215-1.p
-	[SE94]	: PLA009-1.p	-	[SE94]	: SYN216-1.p
-	[SE94]	: PLA009-2.p	-	[SE94]	: SYN217-1.p
-	[SE94]	: PLA010-1.p	-	[SE94]	: SYN218-1.p
-	[SE94]	: PLA011-1.p	-	[SE94]	: SYN219-1.p
-	[SE94]	: PLA011-2.p	-	[SE94]	: SYN220-1.p
-	[SE94]	: PLA012-1.p	-	[SE94]	: SYN221-1.p
-	[SE94]	: PLA013-1.p	-	[SE94]	: SYN222-1.p
-	[SE94]	: PLA014-1.p	-	[SE94]	: SYN223-1.p
-	[SE94]	: PLA014-2.p	-	[SE94]	: SYN224-1.p
-	[SE94]	: PLA015-1.p	-	[SE94]	: SYN225-1.p
-	[SE94]	: PLA016-1.p	-	[SE94]	: SYN226-1.p
-	[SE94]	: PLA017-1.p	-	[SE94]	: SYN227-1.p
-	[SE94]	: PLA018-1.p	-	[SE94]	: SYN228-1.p
-	[SE94]	: PLA019-1.p	-	[SE94]	: SYN229-1.p
-	[SE94]	: PLA020-1.p	-	[SE94]	: SYN230-1.p
-	[SE94]	: PLA021-1.p	-	[SE94]	: SYN231-1.p
-	[SE94]	: PLA022-1.p	-	[SE94]	: SYN232-1.p
-	[SE94]	: PLA022-2.p	-	[SE94]	: SYN233-1.p
-	[SE94]	: PLA023-1.p	-	[SE94]	: SYN234-1.p
-	[SE94]	: SYN103-1.p	-	[SE94]	: SYN235-1.p
-	[SE94]	: SYN104-1.p	-	[SE94]	: SYN236-1.p
-	[SE94]	: SYN105-1.p	-	[SE94]	: SYN237-1.p
-	[SE94]	: SYN106-1.p	-	[SE94]	: SYN238-1.p
-	[SE94]	: SYN107-1.p	-	[SE94]	: SYN239-1.p
-	[SE94]	: SYN108-1.p	-	[SE94]	: SYN240-1.p
-	[SE94]	: SYN109-1.p	-	[SE94]	: SYN241-1.p
-	[SE94]	: SYN110-1.p	-	[SE94]	: SYN242-1.p
-	[SE94]	: SYN111-1.p	-	[SE94]	: SYN243-1.p
-	[SE94]	: SYN112-1.p	-	[SE94]	: SYN244-1.p
-	[SE94]	: SYN113-1.p	-	[SE94]	: SYN245-1.p
-	[SE94]	: SYN114-1.p	-	[SE94]	: SYN246-1.p
-	[SE94]	: SYN115-1.p	-	[SE94]	: SYN247-1.p
-	[SE94]	: SYN116-1.p	-	[SE94]	: SYN248-1.p
-	[SE94]	: SYN117-1.p	-	[SE94]	: SYN249-1.p
-	[SE94]	: SYN118-1.p	-	[SE94]	: SYN250-1.p
-	[SE94]	: SYN119-1.p	-	[SE94]	: SYN251-1.p
-	[SE94]	: SYN120-1.p	-	[SE94]	: SYN252-1.p
-	[SE94]	: SYN121-1.p	-	[SE94]	: SYN253-1.p
-	[SE94]	: SYN122-1.p	-	[SE94]	: SYN254-1.p
-	[SE94]	: SYN123-1.p	-	[SE94]	: SYN255-1.p
-	[SE94]	: SYN124-1.p	-	[SE94]	: SYN256-1.p
-	[SE94]	: SYN125-1.p	-	[SE94]	: SYN257-1.p
-	[SE94]	: SYN126-1.p	-	[SE94]	: SYN258-1.p
-	[SE94]	: SYN127-1.p	-	[SE94]	: SYN259-1.p
-	[SE94]	: SYN128-1.p	-	[SE94]	: SYN260-1.p
-	[SE94]	: SYN129-1.p	-	[SE94]	: SYN261-1.p
-	[SE94]	: SYN130-1.p	-	[SE94]	: SYN262-1.p
-	[SE94]	: SYN131-1.p	-	[SE94]	: SYN263-1.p
-	[SE94]	: SYN132-1.p	-	[SE94]	: SYN264-1.p
-	[SE94]	: SYN133-1.p	-	[SE94]	: SYN265-1.p
-	[SE94]	: SYN134-1.p	-	[SE94]	: SYN266-1.p
-	[SE94]	: SYN135-1.p	-	[SE94]	: SYN267-1.p
-	[SE94]	: SYN136-1.p	-	[SE94]	: SYN268-1.p
-	[SE94]	: SYN137-1.p	-	[SE94]	: SYN269-1.p
-	[SE94]	: SYN138-1.p	-	[SE94]	: SYN270-1.p
-	[SE94]	: SYN139-1.p	-	[SE94]	: SYN271-1.p
-	[SE94]	: SYN140-1.p	-	[SE94]	: SYN272-1.p
-	[SE94]	: SYN141-1.p	-	[SE94]	: SYN273-1.p
-	[SE94]	: SYN142-1.p	-	[SE94]	: SYN274-1.p
-	[SE94]	: SYN143-1.p	-	[SE94]	: SYN275-1.p
-	[SE94]	: SYN144-1.p	-	[SE94]	: SYN276-1.p
-	[SE94]	: SYN145-1.p	-	[SE94]	: SYN277-1.p
-	[SE94]	: SYN146-1.p	-	[SE94]	: SYN278-1.p
-	[SE94]	: SYN147-1.p	-	[SE94]	: SYN279-1.p
-	[SE94]	: SYN148-1.p	-	[SE94]	: SYN280-1.p
-	[SE94]	: SYN149-1.p	-	[SE94]	: SYN281-1.p
-	[SE94]	: SYN150-1.p	-	[SE94]	: SYN282-1.p
-	[SE94]	: SYN151-1.p	-	[SE94]	: SYN283-1.p
-	[SE94]	: SYN152-1.p	-	[SE94]	: SYN284-1.p
-	[SE94]	: SYN153-1.p	-	[SE94]	: SYN285-1.p
-	[SE94]	: SYN154-1.p	-	[SE94]	: SYN286-1.p
-	[SE94]	: SYN155-1.p	-	[SE94]	: SYN287-1.p
-	[SE94]	: SYN156-1.p	-	[SE94]	: SYN288-1.p
-	[SE94]	: SYN157-1.p	-	[SE94]	: SYN289-1.p
-	[SE94]	: SYN158-1.p	-	[SE94]	: SYN290-1.p
-	[SE94]	: SYN159-1.p	-	[SE94]	: SYN291-1.p
-	[SE94]	: SYN200-1.p	-	[SE94]	: SYN292-1.p

-	[SE94]	: SYN293-1.p
-	[SE94]	: SYN294-1.p
-	[SE94]	: SYN295-1.p
-	[SE94]	: SYN296-1.p
-	[SE94]	: SYN297-1.p
-	[SE94]	: SYN298-1.p
-	[SE94]	: SYN299-1.p
-	[SE94]	: SYN300-1.p
-	[SE94]	: SYN301-1.p
-	[Ste87]	: RNG023-6.p
-	[Ste87]	: RNG024-6.p
-	[Ste87]	: RNG025-4.p
-	[Sti93]	: PUZ015-2.g
-	[Sti93]	: PUZ016-2.g
-	[Ver92]	: GRP041-2.p
-	[Ver92]	: GRP042-2.p
-	[Ver92]	: GRP043-2.p
-	[Ver92]	: GRP044-2.p
-	[Ver92]	: GRP045-2.p
-	[Ver92]	: GRP046-2.p
-	[Ver92]	: GRP047-2.p
-	[Ver92]	: GRP048-2.p
-	[Wos89]	: COL045-1.p
-	[Wos89]	: COL046-1.p
-	[Wos94a]	: GRP114-1.p
-	[Wos94a]	: ROB026-1.p
-	[Wos94a]	: ROB027-1.p
-	[WOLB92]	: CID001-1.p
-	[WOLB92]	: CID003-1.p
-	[WOLB92]	: CID003-2.p
-	[WOLB92]	: CIV001-1.p
-	[WOLB92]	: CIV003-1.p
-	[WOLB92]	: CIV004-1.p

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