



Matching the ISA to the PYP and MYP curricula

The ISA assesses mathematical literacy, reading and writing, based on the Program for International Student Assessment (PISA) constructs. The ISA items address generic core skills rather than a particular curriculum. The ISA is not designed to address the full scope of the curriculum in mathematics, reading and writing for any school. It addresses as broad a range of key skills and understandings as is possible in a short, standardised pen and paper test. Matching the ISA items to the PYP or MYP curriculum must always be done with the understanding that some key parts of the curriculum will be addressed by the ISA and other key parts will not.

To assist teachers in the diagnostic interpretation of the ISA data, the ISA class report provides an individual description of the key skills addressed by each item. This allows teachers to interpret and explain student performance at the item level.

The items in each test are also classified into several broad groups to allow teachers to interpret and explain student performance in a group of related skills. The PYP and MYP curricula are divided into strands, but ISA classifications do not directly match these strands. The ISA class diagnostic reports classify the items according to the aspects used by the PISA. The purpose of this document is to show the match between the ISA/PISA classifications used to group items in the ISA class reports and the PYP and MYP strands for mathematics and the PYP scope and sequence chart for reading. Writing is not included. The ISA writing reports are self explanatory and easily matched to the PYP and MYP writing strands.

Mathematical literacy

Each task in the ISA Mathematical Literacy assessment is defined according to its *content* and the type of *competency* needed to complete it successfully. Competency variables describe the processes students use to solve mathematical problems (See Appendix A).

ISA content variables:

uncertainty

quantity

space and shape

change and relationships

ISA competency variables:

reproduction

connections

reflection

It is relatively straightforward to match the ISA content variables to the PYP and MYP strands. The main differences are of terminology.

It is more problematic to match the ISA competency variables. The PISA-generated definitions were designed with a single cohort in mind (15-year-olds). This raises an issue for an assessment like the ISA which is designed for several grade levels, since it can readily be seen that problems that are 'familiar or routine' for one grade level may require 'connections to be made' or 'the

ability to analyse, interpret, reflect and explain’ for a lower grade level. Thus a task that is appropriately classified as ‘reproduction’ for, say, Grade 7 may be a ‘connection’ or even a ‘reflection’ task for most Grade 3 students.

PYP and ISA content variables

Table 1 Content comparisons between ISA and PYP mathematics

ISA content variable	PYP strand
Uncertainty	Data Handling
Quantity	Number Measurement
Space and Shape	Shape and Space
Change and Relationships	Pattern and Function

As is evident in Table 1 the terms used vary, but the match is reasonably close. One point of difference between ISA and PYP classifications is that the two distinct strands in PYP mathematics, Number and Measurement, align neatly with the ISA content variable Quantity.

PYP and ISA competency Variables

The PYP mathematics curriculum has not been classified according to the processes students use to solve problems. However, there are some references to these skills. In the PYP description of ‘how best will students learn’ the kind of mathematical reasoning described seems mostly to fall into the Connections and Reflection categories:

- They use patterns and relationships to analyse the problem situations upon which they are working.
- They make and evaluate their own and each other’s ideas.
- They use models, facts, properties and relationships to explain their thinking.
- They justify their answers and the processes by which they arrive at solutions.

It is implicit in these descriptions, however, that as students assimilate these understandings they become more automatic, and thus the Reproduction competency is brought into play.

The ISA contains a limited number of items addressing reflection, especially at lower grade levels. This is because reflection items tend to impose a high reading load, demand extended written responses and take a substantial amount of time to solve. This limits the number of reflection items that can be used in a short pen and paper test that needs to address as broad a scope of the mathematics curriculum as possible and also avoid disadvantaging students with limited reading and writing skills.

MYP and ISA content variables

Table 2 Content comparisons between ISA and MYP mathematics

ISA content variable	MYP branch
Uncertainty	Statistics and Probability
Quantity	Number
Space and Shape	Geometry and Trigonometry
Change and Relationships	Algebra
	Discrete Mathematics

In Table 2 the terms used vary, but the match is reasonably close. The one clear exception is MYP Discrete Mathematics, which has aspects that align with each of the ISA content variables Uncertainty, Quantity and Space and Shape. Another point of difference is that the MYP branch Geometry and Trigonometry does not align neatly with the ISA content variable Space and Shape. There are concepts in MYP Geometry and Trigonometry, such as mensuration, that align with the ISA Quantity content variable.

It should be noted that, as in all such constructs, the division between variables is somewhat arbitrary and there is much overlap. For instance, many algebraic and geometric calculations rely heavily on knowledge and skills from the Quantity variable.

MYP and ISA competency variables

The ISA competencies have parallels with the skills component of the MYP mathematics curriculum. The following are some instances:

Reproduction: performing basic operations, performing higher-level operations (Number); expanding, factorizing, simplifying, substituting (Algebra); naming and classifying, applying area/volume formulae, rotating, reflecting, translating and enlarging; solving problems by applying Pythagoras' theorem, trigonometric ratios and rules, properties of shapes and angles (Geometry and Trigonometry); calculating probabilities of simple events; calculating probabilities of combined and conditional events (Statistics and Probability); performing set operations (Discrete Mathematics).

Connections: estimating, classifying, apportioning (Number); solving equations ... by a variety of methods, solving higher-level equations, manipulating rational and logarithmic expressions (Algebra); constructing plots and graphs appropriately, making inferences and drawing conclusions, analysing time-series data and other bivariate data (Statistics and Probability), constructing logical diagrams, locating paths and tours, classifying and describing topological objects (Discrete Mathematics); writing and solving problems involving the concepts at this level (all).

Reflection: Solving problems involving optimal solutions (Discrete Mathematics); performing and discussing problem-solving strategies, communicating and reasoning orally and in writing (all).

The ISA competencies also have some parallels with the MYP Mathematics Assessment Criteria: Knowledge and Understanding, Application and Reasoning, Communication and Reflection and Evaluation.

Knowledge and Understanding includes using knowledge and understanding to make deductions, using numeric, algebraic, graphical and other forms of representations, and moving between different forms of representations.

Application and Reasoning includes selecting and using appropriate mathematical knowledge and skills, recognising patterns and structures and describing them as relationships or general rules, drawing conclusions consistent with findings, and justifying mathematical relationships.

Communication includes encoding and decoding, describing in words a line of reasoning, explaining solutions, and presenting mathematical information clearly and logically.

Reflection and Evaluation includes reflecting on and evaluating methods and processes during investigations which could be open ended.

Reading literacy

Reading literacy in PISA is defined as ‘understanding, using and reflecting on written texts, in order to achieve one’s goals, to develop one’s knowledge and potential and to participate in society.’ While this definition and the construct of reading that grew out of it were developed with 15-year-olds in mind, the ISA construct of reading maintains the general thrust of a reading assessment that goes beyond the notion of decoding and literal comprehension (though at the lowest levels these are included), and recognises the full scope of situations in which reading plays a role for students from Grade 3 to Grade 10.

Each Reading task in the ISA is defined in terms of the *aspect* or approach to reading that it requires, and according to the *text format* of the reading passage on which the task is based.

Aspect variables

Retrieving Information is defined as locating one or more pieces of information in a text.

Interpreting texts is defined as constructing meaning and drawing inferences from one or more parts of a text.

Reflecting is defined as relating a text to one’s experience, knowledge and ideas.

Text format variables

Text Format variables

Continuous texts are typically composed of sentences that are, in turn, organised into paragraphs. These may fit into even larger structures such as sections, chapters and books. Continuous texts include narrative pieces, exposition, description, argument and instructional passages.

Non-continuous texts, or documents as they are known in some approaches, can be described in structural terms as texts composed of one or more lists. In less formal terms, they can be described by their everyday appearance in such formats as tables, graphs, maps and diagrams.

PYP and the ISA reading aspects

The PYP language scope and sequence chart does not classify reading by aspect or text format. Curriculum expectations for reading are grouped in relation to sample activities for each level of the PYP. Some the PYP expectations are suited to assessment in a pen and paper test and fit the PISA construct. Other expectations focus on reading strategies and reading activities that are not readily addressed by a pen and paper test. These expectations, and the expectations of students aged 3-5 years, are not considered here.

Table 3 shows one possible way of grouping those PYP expectations that can be addressed by the ISA. Many of the expectations fit under the PISA classifications of Interpreting or Reflecting. Two classifications of Form & Structure and Author's Purpose have been separated out. Under the PISA construct these kinds of skills would be categorised as reflecting if the student was required to draw on outside knowledge and interpreting if the question focused on the meaning of the content of the text.

Table 3

	Retrieving Information	Interpreting	Reflecting	Form & Structure	Author's Purpose
5-7 yrs		<p>predict what might happen next in a story ...</p> <p>know the difference between fiction and non-fiction</p>	<p>identify with a character or situation</p> <p>understand and respond to the ideas and feelings expressed in various reading materials</p>	<p>recognize that a story has a beginning, middle and an ending</p> <p>recall plot and characters of a story</p> <p>recognise and talk about a range of different text forms (eg letters, lists, recipes, stories, poetry, plays)</p>	<p>understand the role of an author or illustrator</p>
7-9 yrs	<p>read quickly and scan to find specific information</p>	<p>make inferences and be able to justify them</p> <p>respond to texts by identifying the main idea, recognizing cause and effect, distinguishing between fact and opinion, questioning and drawing conclusions</p>	<p>understand and respond to the ideas, feelings and attitudes expressed in various texts</p> <p>begin to understand that texts may be interpreted differently by different people</p>	<p>identify and describe the elements of a story (setting, plot, characters and theme)</p> <p>recognize that there are more complex story structures than beginning middle and end</p>	<p>begin to recognize the author's purpose (to inform, persuade, entertain, instruct)</p>
9-12 yrs	<p>locate and access ... information from a variety of sources</p>	<p>recognize and understand figurative language (eg similies, metaphors, idioms)</p> <p>show awareness that poems have layers of meaning ...</p> <p>understand that words can evoke mental images organize and synthesise information from a variety of sources use specific vocabulary to comment on and analyse poetry (line, couplet, stanza, rhyme scheme etc)</p>	<p>generate new questions after reading and connect these to prior knowledge and experience</p> <p>critically evaluate their own choices in books</p> <p>be aware that poems are open to a range of interpretations</p>	<p>identify the elements of plot (exposition, rising action, climax, falling action, resolution) and the pattern in story outline (choice, reversal, understanding)</p> <p>categorize literature into types (fable, myth, biography, novel, essay) and genre</p> <p>identify the five basic types of conflict in a story</p> <p>identify and discuss forms and structures</p>	<p>infer the author's purpose</p>

The ISA text format classifications match the general expectation of the PYP and MYP that students read a range of different text types.

MYP and the ISA reading aspects

The MYP does not have a scope and sequence chart for language A. The ISA/PISA aspects provide teachers with diagnostic information that can be aligned with the MYP final objectives.

APPENDIX A

ISA/PISA Mathematical Literacy Content variables

Uncertainty This content area reflects how in real life data is commonly collected, organised, analysed and displayed with a view to making interpretations and forming conclusions. Many decisions are made on the basis of statistical analysis of data. Real life also contains elements of chance where outcomes are not certain but based upon probabilities. Increasingly decision-making is qualified with a statement of risk and society is presented with more and more information to make sense of, so competence in this area is of great significance in real life.

Quantity This overarching content area also features in the three other content areas to varying degrees. It focuses on the need for quantification in order to organise the world. It is not hard to find examples of quantification in our day-to-day living. We use money, make measurements, estimate and calculate. Increasingly we make use of technology to assist us but we also still perform many calculations mentally and approximately. Quantitative reasoning requires number sense: that is, having a feel for the magnitude of numbers, using strategies and tools appropriately, and being able to check solutions for reasonableness.

Space and Shape Shapes and constructions are all around us physically as real objects but also as representations in the form of photographs, maps and diagrams. Constructing and interpreting such representations is an important skill. Using geometric shapes whose mathematical properties are known to model more complex shapes is an important problem-solving tool. Knowledge and appreciation of the beauty and function of geometric shapes and spaces has applications reaching from art to advertising.

Change and Relationships Noticing and using patterns in number and shapes, and finding and describing relationships between variables, lies at the heart of mathematics. As organisms or populations grow and as stock markets ebb and flow, we describe the patterns in words, in tables and sometimes in algebraic notation. Commonly we chart the changes in graphical form. These patterns can be linear, non-linear, cyclic or exponential, to name but a few. Being able to link between these various representations and use the language, notation and algorithms of change and relationships is critical to making sense of the patterns in our world.

ISA/PISA Mathematical Literacy Competency variables

A second set of variables upon which the ISA mathematics is constructed is the ‘competency variables’. There are three competencies in ISA:

Reproduction This is the reproduction of practised knowledge and skills. It includes simple computations or definitions of the type most familiar in conventional mathematics assessments. Problems are familiar or routine requiring only mathematical thinking limited to recognition and recall.

Connections This competency cluster requires connections to be made between different content strands or between different overarching ideas to solve straightforward problems. It reflects student ability to choose appropriate strategies and tools and apply multiple methods and steps. The competency requires the interpretation of the meaning of a solution and expects the checking of the validity of work.

Reflection This competency cluster relates to the ability to plan and implement strategies in problem settings that are likely to be unfamiliar or non-routine. Problems may contain more elements than those in the ‘Connections’ cluster. The competency requires the ability to analyse, interpret, reflect and explain. It may also require the ability to make connections between mathematics and applications involving other discipline