ISA International Schools' Assessment

ISA
Mathematical Literacy
Sample Materials

Grade 7
Grade 8
Grade 9
Grade 10

Sample

ISA Mathematical Literacy Sample Materials
Grade 7, Grade 8, Grade 9 and Grade 10

This collection of mathematical literacy sample materials represents a typical range of mathematics material in ISA tests from Grade 7 to Grade 10. The purpose of this collection is to show teachers examples of the kinds of mathematical literacy that are used in the ISA.

Questions in context

This collection has 4 Units containing a total of 11 questions. Each Unit establishes a context for the questions associated with it. An actual ISA mathematical literacy test has 15-20 Units set in a wide variety of contexts, with a total of 30-35 questions.

The pages following the sample Units show the classification, descriptor and marking guide for each question.

Classification of questions

Questions are classified by competency –
    Reproduction, Connection or Reflection
and by content –
    Quantity, Change and Relationships, Space and Shape, or Uncertainty.

Question descriptors

The *descriptors* for each question provide the basis for the described scales of achievement on which ISA results are reported.

Question format

This collection has 5 multiple-choice questions and 6 open-ended questions requiring students to write a response. An actual ISA test has approximately 50 per cent multiple-choice questions and 50 per cent open-ended questions. Some of the open-ended questions only require a short answer, others require a calculation or an explanation. Examples of both kinds of open-ended questions are included. The marking guide shows how the open-ended questions are scored.

This collection of materials is not a test.

The materials in this collection have NOT been selected to represent the typical range of difficulty of an ISA test. An actual ISA test is carefully constructed to ensure that the range of difficulty of the questions reflects the range of mathematical ability of the population for each grade.

The materials in this collection cover Grades 7, 8, 9 and 10. Some materials may be too hard for Grade 7 and some materials may be too easy for Grade 10. If a teacher wants to use some of these materials for students to practise on, it is important that the teacher only selects the Units that are of an appropriate level of difficulty for their students.

Teachers should use this material as a model. Teachers can develop questions that assess similar kinds of skills using their own mathematics materials.
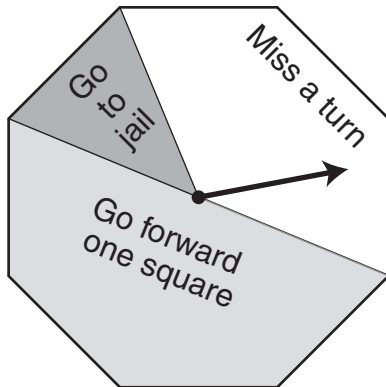
Other ISA Sample Mathematical Literacy Collections:

- Grades 3, 4 and 5
- Grades 5, 6 and 7.

Spinner

In a game, this 8-sided spinner is used.

In the diagram the spinner shows 'Miss a turn'.

1 The spinner was spun 200 times. About how many times would you expect the result 'Go to jail'?

_____

2 In one game, the spinner landed on 'Miss a turn' 30 times. What is the most likely number of times that the spinner was spun?

Show your working.

_____

_____

_____

Heartbeat

3   Sally's heart beats 80 times in one minute.

Sally wants to work out the number of times her heart beats in one day.

Which one of these calculations should she do?

- ❏   80 × 60
- ❏   80 × 24 × 7
- ❏   80 × 60 × 24
- ❏   80 × 60 × 60 × 24

4   John's heart beats 70 times in one minute.

John wants to work out the number of hours it would take his heart to beat one million times.

Which one of these calculations should he do?

- ❏   1 000 000 ÷ (70 × 60)
- ❏   1 000 000 ÷ 70 × 60
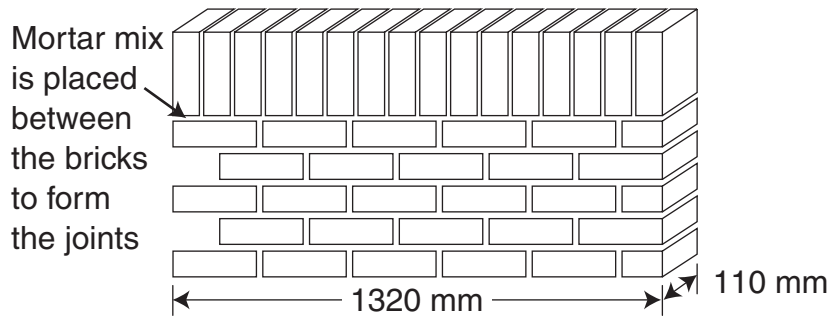- ❏   1 000 000 ÷ (70 ÷ 60)
- ❏   1 000 000 × 70 ÷ 60

5   Sally's heart pumps 270 litres of blood in one hour.
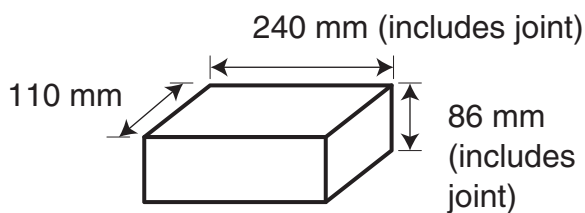
How many kilolitres of blood does it pump per day? (1 kilolitre = 1000 litres)

_____ kilolitres

Brick Wall

Mortar mix is placed between the bricks to form the joints

1320 mm

110 mm

When the 10 mm joints are added, each brick is 240 mm in length, 86 mm in height and 110 mm wide.

240 mm (includes joint)

110 mm

86 mm (includes joint)

6 The thickness of the brick wall shown above is 110 mm and its length is 1320 mm.

The height of the wall is closest to

❏ 380 mm
❏ 430 mm
❏ 540 mm
❏ 610 mm
❏ 670 mm

7 The number of bricks needed to build a wall of this type four metres long is closest to

❏ 100
❏ 130
❏ 160
❏ 190
❏ 220

Brick Wall

8 The ratio of cement to sand for the mortar mix in the joints is 1:3.
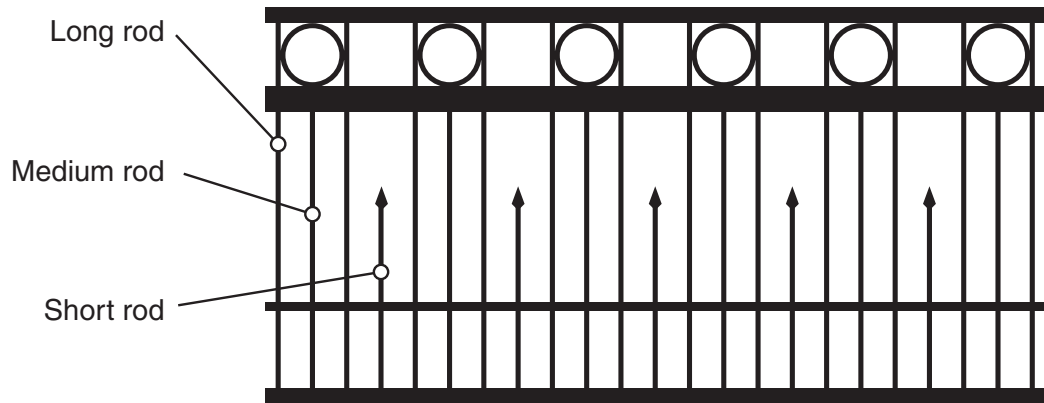
To lay 1000 bricks, 0.24 m3 of mortar mix is needed.

How much **sand** would be required to make the mortar to lay 1000 bricks?

Show your working.

_____

_____

_____

_____

_____

Fence

This section of fence is three metres long.

It contains six circles, five short rods, six medium rods and 12 long rods, as shown in the picture.

Long rod

Medium rod

Short rod

The company making the fence has 112 circles, 95 short rods, 106 medium rods and 203 long rods in stock.

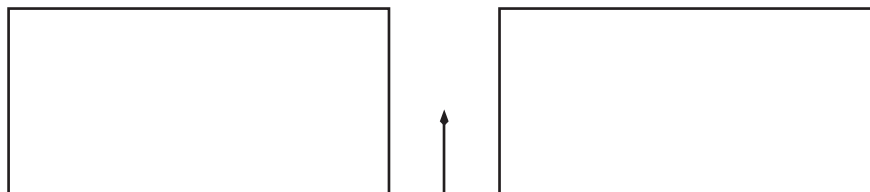**9** How many separate 3-metre sections of fencing is it possible to make with this store of materials?

Show your working.

_____

_____

_____

_____

_____

Fence

The following information is needed for the next two questions.

When two 3-metre sections are joined together to make a longer fence, one extra short rod is required in the space between each pair of 3-metre sections.

The extra space for the short rod is 20 cm.

10 How many short rods **altogether** would four 3-metre sections of fencing joined together in this way require?

- ❏   14 short rods
- ❏   15 short rods
- ❏   20 short rods
- ❏   23 short rods
- ❏   24 short rods

11 Sometimes sections of fence less than three metres are used.

How long (to the nearest cm) would a section of fence containing 33 circles be?

Show your working.

_____

_____

_____

_____

STOP HERE

SPINNER

Q1 **The spinner was spun 200 times. About how many times would you expect the result 'Go to jail'?**

Competency: Connection

Content: Uncertainty

Descriptor: Demonstrate a correct method to find the expected number of occurrences of an event with a known probability from a given number of trials.

Marking guide

Code 2   25, 'About 25', or '20–30'. Working not required. Correct method is 1/8 of 200, 200 ÷ 8, or repeated halving 200, 100, 50, 25

Code 1   Correct method but incorrect answer or incomplete

Code 0   Other

Code 9   Missing

Q2 **In one game, the spinner landed on 'Miss a turn' 30 times. What is the most likely number of times that the spinner was spun?**

Show your working.

Competency: Connection

Content: Uncertainty

Descriptor: Demonstrate a correct method for finding the most likely number of trials needed to achieve a given number of occurrences of a chance event.

Marking guide

Code 2   80. *Working not required.*
Correct method is one of: trial-and-error (e.g. 3/8 of 200 = 75, too big; 3/8 of 160 = 60, too big)

OR   "If 3/8 of n = 30, then 1/8 of n = 10 and so n = 80"

OR   other acceptable method (e.g. allocating 10 to each side of the octagon)

Code 1   Correct method but incorrect answer or incomplete
(e.g. 30 ÷ 8; 30 × 8 = 240)

Code 0   Other including 30 × 3 = 90

Code 9   Missing

HEARTBEAT

Q3 **Sally's heart beats 80 times in one minute.**

Sally wants to work out the number of times her heart beats in one day.

Which one of these calculations should she do?

Competency: Reproduction

Content: Change and Relationships

Descriptor: Select the multi-step calculation that solves a word problem involving a rate.

Key: C – 80 × 60 × 24

Q4 **John's heart beats 70 times in one minute.**

John wants to work out the number of hours it would take his heart to beat one million times.

Which one of these calculations should he do?

Competency: Reproduction

Content: Change and Relationships

Descriptor: Select the multi-step calculation that solves a word problem involving a rate.

Key: A – 1 000 000 ÷ (70 × 60)

Q5 **Sally's heart pumps 270 litres of blood in one hour.**

How many kilolitres of blood does it pump per day? (1 kilolitre = 1000 litres)

Competency: Connection

Content: Change and Relationships

Descriptor: Solve a multi-step word problem involving a rate.

Marking guide

Code 2 6.48 or 6.5. Accept 6,48 or 6,5. Also accept '6 kilolitres and 480 litres'

Code 1 Answer in litres (6480)

Code 0 Other

Code 9 Missing

BRICK WALL

Q6 The thickness of the brick wall shown above is 110 mm and its length is 1320 mm.

The height of the wall is closest to

Competency: Reproduction
Content: Shape and Space
Descriptor: Find the height of a brick wall from a diagram given the dimensions of one brick.

Key: E – 670 mm

Q7 The number of bricks needed to build a wall of this type four metres long is closest to

Competency: Connection
Content: Quantity
Descriptor: Estimate the number of bricks needed for a length of brick wall in metres given a diagram of a shorter section.

Key: B – 130

Q8 The ratio of cement to sand for the mortar mix in the joints is 1 : 3.

To lay 1000 bricks, 0.24 m³ of mortar mix is needed.

How much sand would be required to make the mortar to lay 1000 bricks?

Show your working.

Competency: Reproduction
Content: Quantity
Descriptor: Demonstrate a correct method to calculate the amount of one material needed to make a quantity of mix given the ratio of 2 components.

Marking guide

Code 2 0.18 m³ (m³ and working not required)

Code 1 Correct method but incorrect or incomplete answer, including 0.06 m³ (i.e. calculation of cement rather than sand)

Correct method is one of: Cement to sand is 1:3 so sand is ¾ of the mix ¾ of 0.24 = 0.18

OR Cement is ¼ of mix ¼ of 0.24 is 0.06 0.24 – 0.06 = 0.18

OR Trial and error e.g. 0.1 : 0.3 (adds to 0.4 wrong), 0.05 : 0.15 (adds to 0.2, close) 0.06 : 0.18 (adds to 0.24, correct)

Code 0 Other

Code 9 Missing

FENCE

Q9   **How many separate 3-metre sections of fencing is it possible to make with this store of materials?**

Show your working.

Competency: Connection
Content: Quantity
Descriptor: Demonstrate a correct method for calculating the number of sections of a fence that can be made from a given number of parts.

Marking guide

Code 3   Correct answer (16) and correct working. (At least two of these divisions shown or 203 ÷ 12 = 16 with clear explanation that long rods gives the limit)

6)112   5)95   6)106   12)203

18 r4   19   17 r4   16 r11

Therefore only 16 sections can be made.

Code 2   Correct answer without working

Code 1   Incorrect or no answer but correct method (At least two divisions performed.)

Code 0   Other

Code 9   Missing

Q10   **How many short rods altogether would four 3-metre sections of fencing joined together in this way require?**

Competency: Connection
Content: Change and Relationships
Descriptor: Use the given information (parts per section) to calculate the number of parts needed for multiple sections
Key: D – 23 short rods

Q11   **Sometimes sections of fence less than three metres are used.**

How long (to the nearest cm) would a section of fence containing 33 circles be?

Show your working.

Competency: Reflection
Content: Change and Relationships
Descriptor: Demonstrate a correct method for calculating length of fence using given information.

Marking guide

Code 4 Correct answer and method as shown below.

Most correct answers should fall within the range 1750–1890 cm or 17.5–18.9 m.

Other ranges could be considered if method is correct

Code 3 Correct answer without working

Code 2 Correct method (must take 20 cm gaps into account) but no answer or incorrect answer due to calculation error
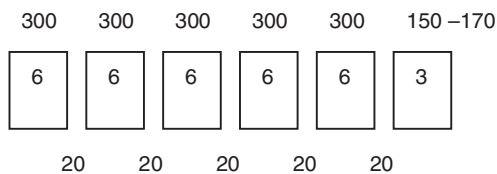
Method 1
$33 \div 6 = 5.5$, $5.5 \times 3m = 16.5$ m, $16.5m + 5 \times 0.2m = 17.5m$

Method 2
Another method is to draw an appropriate diagram and add up lengths.
e.g. $300 + 300 + 300 + 300 + 300 + 150 + 5 \times 20 = 1750$

This diagram shows: 6, 6, 6, 6, 6, 3 but 1, 6, 6, 6, 6, 6, 2 is also possible. In fact, 1, 1, 1, 1, ……………is also possible (but rather silly).

300	300	300	300	300	150 –170
6	6	6	6	6	3

20   20   20   20   20

Code 1 Correct method but gap not included (e.g. answer of 16.5)

Code 0 Other

Code 9 Missing