LUI

First names

Family name

Attach your barcode ID label here

Wednesday 1 June 2016

Question and response book

Mathematics B

Year 11 — Supervised test

Time allowed

Perusal time: 10 minutes
Working time: 120 minutes

Materials provided

- Question and response book (this book)
- Instrument-specific standards and fold-out mark distribution (at the back of this book)

Equipment

Equipment	Comments
pens (black ink only)	use black ink for your responses
pencils	pencils may be used for drafting (e.g. sketches or plots), but all drafts must then be finalised in black ink
rulers, highlighters, sharpener, eraser	ensure materials have no added text or handwriting
graphing calculator without CAS functionality (required)	all data, applications or programs stored in calculator memory must be deleted before entry to the assessment
scientific calculator (optional)	

Guidelines

- Read each question to ensure your answer meets the question requirements.
- Calculators may be used to do computations at all times.
- All working should be shown where appropriate. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working.
- Respond in the spaces provided in the response book. If you need more space to complete, rewrite or redraft a response, use the additional pages at the back of this book. Be sure to:
  - label the additional page with the question number that relates to your response
  - cancel your incorrect response by ruling a single, diagonal line through your work; if you fail to do this, your original response will be marked
  - note the page number of your additional response (e.g. see page 17).

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

DO NOT WRITE ON THIS PAGE

THIS PAGE WILL NOT BE MARKED

Question 1

In a small town there are 204 houses. The number of bedrooms in each house is recorded in the table below.

Number of bedrooms	1	2	3	4	5	6
Number of houses	39	59	48	32	16	10

a) Circle whether the data in the table is:

discrete or continuous.

You may use the statistical modes on your calculator for parts b) and c).

b) Write down the mean number of bedrooms per house.

Give your answer correct to 3 decimal places.

c) Determine the percentage of houses with more bedrooms than one standard deviation above the mean.

Clearly justify your answer.

Simple Routine; Simple Non-Routine 1, 1 mark; 3 marks

Question 2

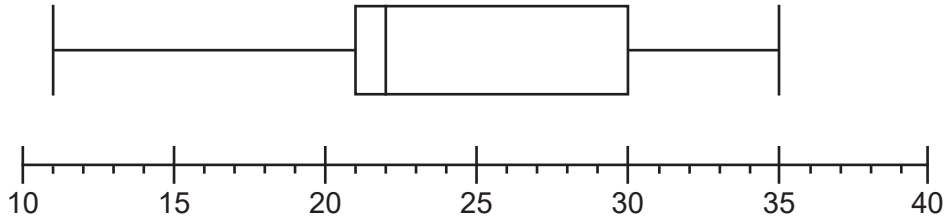
A farmer has collected samples of two different types of strawberries to help her determine which type is the best to grow. The weight in grams of the samples of each type is recorded below.

Type A

stem	leaf							
1	1	2	5	6	6	7	8	9
2	1	1	3	4	5	6		
3	2	4	5					

Key: 2 | 3 represents 23 grams

Type B



Assuming that the farmer wants the heavier strawberries, suggest which type of strawberries she should grow.

Clearly justify your answer.

Refer to different statistical measures when making your justification.

Simple Routine MAP

Do not write outside this box.

Question 3

A dataset has the following known measures of centre and spread:

Measure	mode	range	median	interquartile range
Value	12	19	9	8

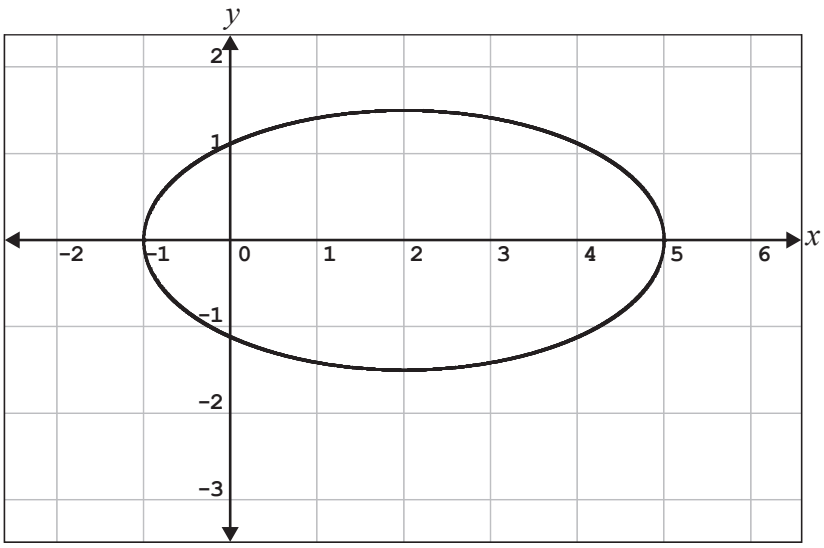
Determine the new value of each of these measures if every member of the dataset is increased by 2.

Clearly justify your answer.

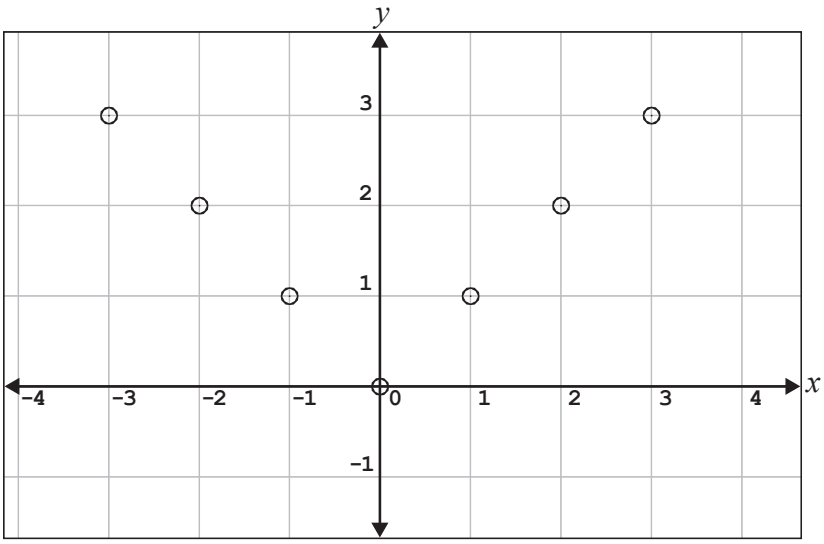
Simple Non-Routine MAP

Use the following four relations to respond to Question 4:

Relation 1

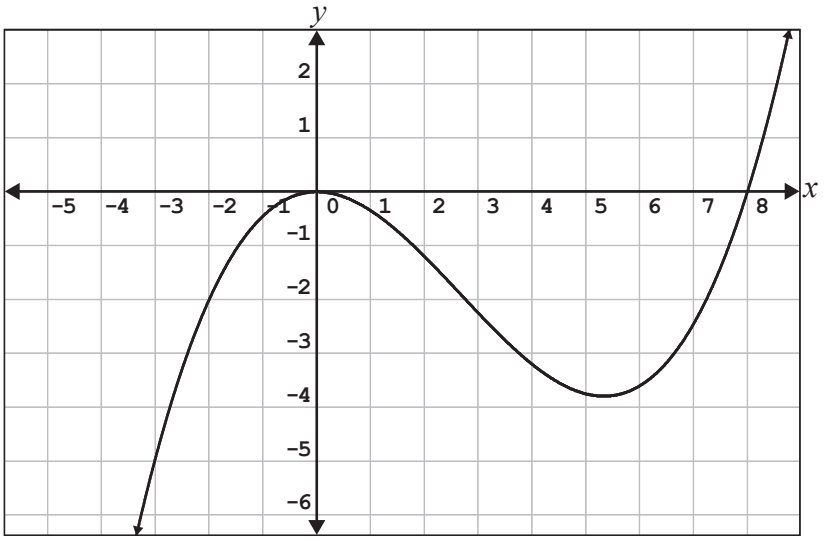


Relation 2



Relation 3 {(1, 0), (–1, 1), (–3, 2), (1, 3), (2, 4)}

Relation 4



Do not write outside this box.

Question 4

a) Identify which of the relations are functions.

Clearly justify your answers.

b) State whether each function identified in part a) is discrete or continuous.

c) Write down the domain and range for Relation 1.

domain:

range:

Simple Routine 2, 2, 2 marks

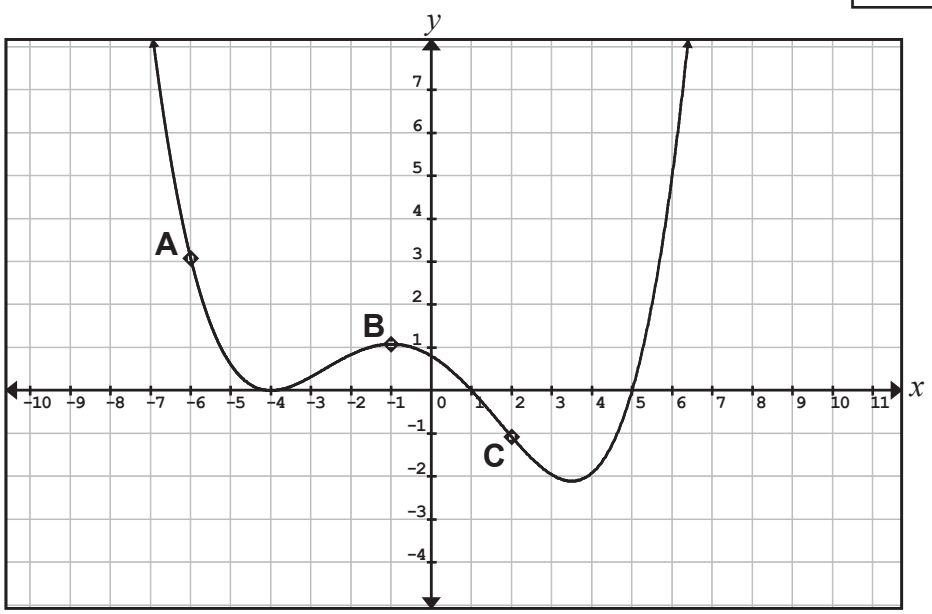
Question 5

The graph of the function $y = f(x)$ is shown below.

A copy of this graph is provided on page 15.

Sketch the function $y = f(x - 2) + 1$ on the same grid.

Clearly indicate the location of the translated points A, B and C.



Simple Non-Routine 2 marks

Do not write outside this box.

Question 6

Given that $f(x) = 2x^2 - 1$ and $g(x) = 3x + 5$ answer the following questions:

a) calculate $f(-2)$

Clearly justify your answer.

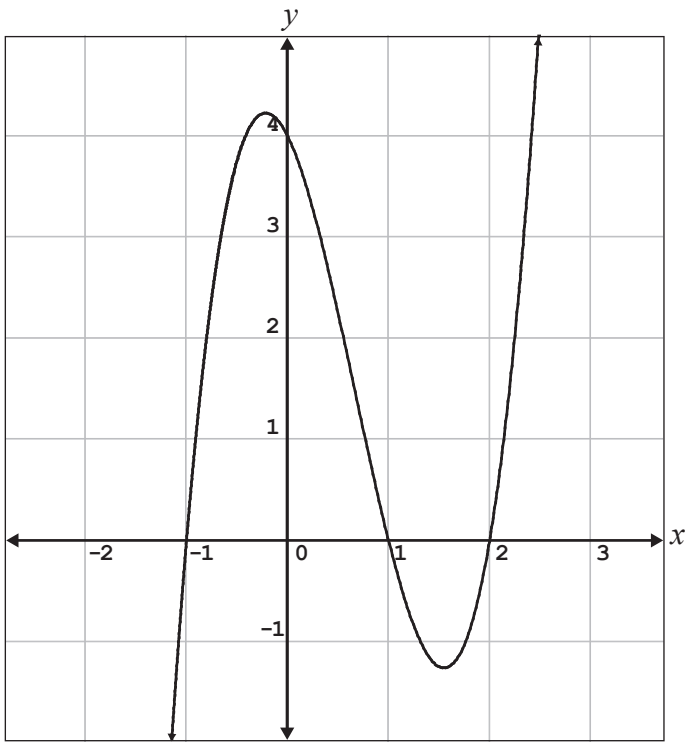
b) solve for x if $f(g(x)) = 127$

Use algebraic methods.

Simple Routine; Complex Routine — 2 marks; 4 marks

Question 7

A sketch of the cubic function $f(x) = a(x - 1)(x - b)(x + c)$ is shown below.



Determine the values of a, b and c.

Use algebraic methods.

Show mathematical reasoning.

Simple Routine MAP

Do not write outside this box.

Question 8

Solve the following simultaneous equations:

$$y = 7x + 8 \quad \text{and} \quad y = 12x - 2$$

Use algebraic methods.

A copy of this graph is provided on page 15.

Use your graphics calculator to provide a sketch to justify your solution.

Simple Routine 5 marks

Do not write outside this box.

Question 9

Entry tickets for the local show cost $32 for adults and $14 for children.
A group of 13 people pays $254 altogether.

Determine how many adults and how many children are in this group.

Use algebraic methods.

Identify all variables.

Develop appropriate equations to model this situation.

Justify the reasonableness of your result.

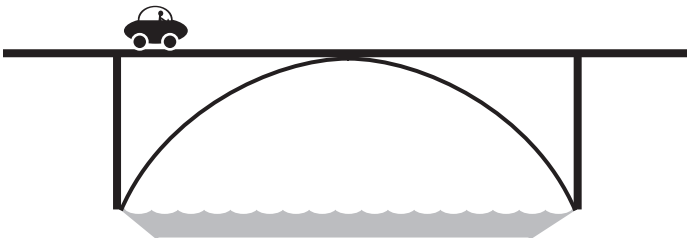
Complex Routine MAP

Do not write outside this box.

Question 10

Assume that the arch of a bridge that crosses a creek is parabolic in shape.
The distance between the supports of the bridge is 30 m.
The height of the arch above the water at the centre is 10 m.

Determine a function that models the shape of the arch.



Use algebraic methods.

Identify any parameters and variables.

Complex Routine MAP

Do not write outside this box.

Question 11

Given that π radians $\equiv 180$ degrees, complete the following:

a) convert $\frac{4\pi}{3}$ radians to degrees

b) convert $72°$ to radians

Give your answer in terms of π.

c) calculate the acute angle θ given $\cos\theta = 0.5$

Use your graphics calculator.

Give your answer in degrees.

d) solve $x = \sin\left(\frac{\pi}{15}\right)$

Use your graphics calculator.

Give your answer correct to 4 decimal places.

e) determine the exact value of $\tan\left(\frac{5\pi}{6}\right)$

Simple Routine — 1, 1, 1, 1, 2 marks

Do not write outside this box.

Question 12

a) Solve for x given that $\sqrt{2}\cos x + 6 = 5$ over the domain $0 \leq x \leq \pi$

Use algebraic methods.

Give answer/s in radians.

b) Determine how many solutions there are for the equation:

$3\sin x + 4\cos x = 2$ over the domain $0 \leq x \leq 2\pi$

A copy of this graph is provided on page 16.

Use your graphics calculator to provide a sketch to justify your solution.

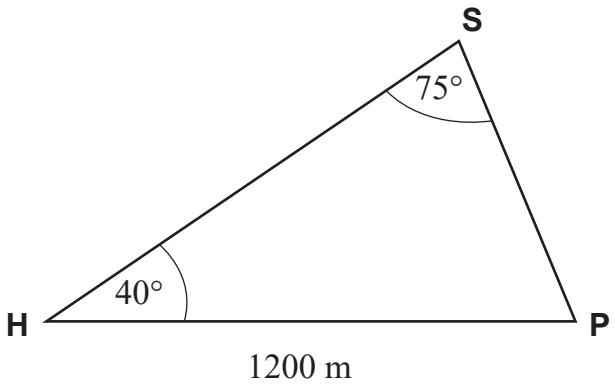
Simple Routine; Simple Non-Routine — 4 marks; 3 marks

Do not write outside this box.

Question 13

Doyle walks from his home (**H**) to the shops (**S**) via the park (**P**) and then directly back home for his morning exercise. He walks at 1.5 m/s.

Determine how long it takes him to complete his walk.



Note: This diagram is not drawn to scale.

Give your answer to the nearest minute.

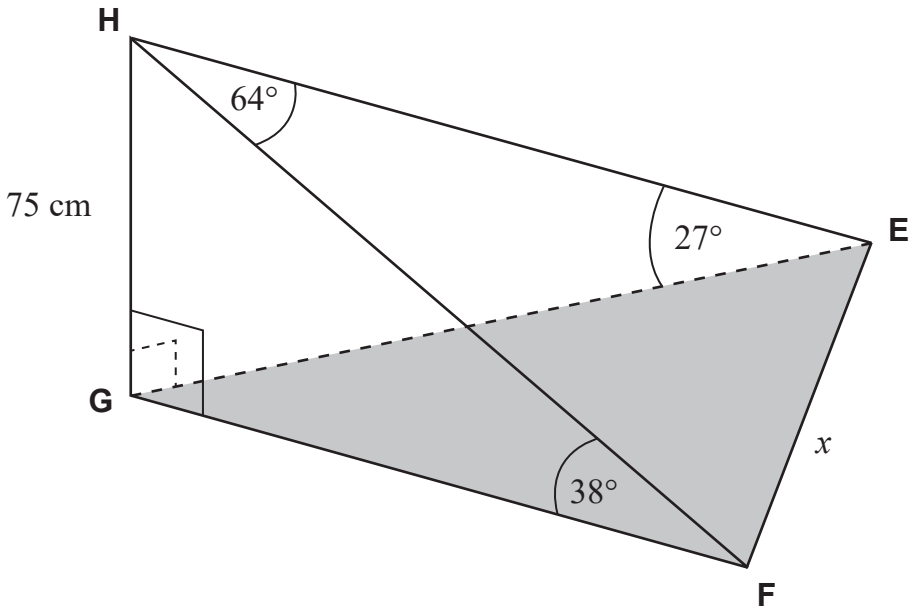
Clearly justify your answer.

Complex Routine 5 marks

Do not write outside this box.

Question 14

Given the three-dimensional diagram below, determine the value of x.



Use algebraic methods.

Complex Non-Routine MAP

END OF PAPER

Do not write outside this box.

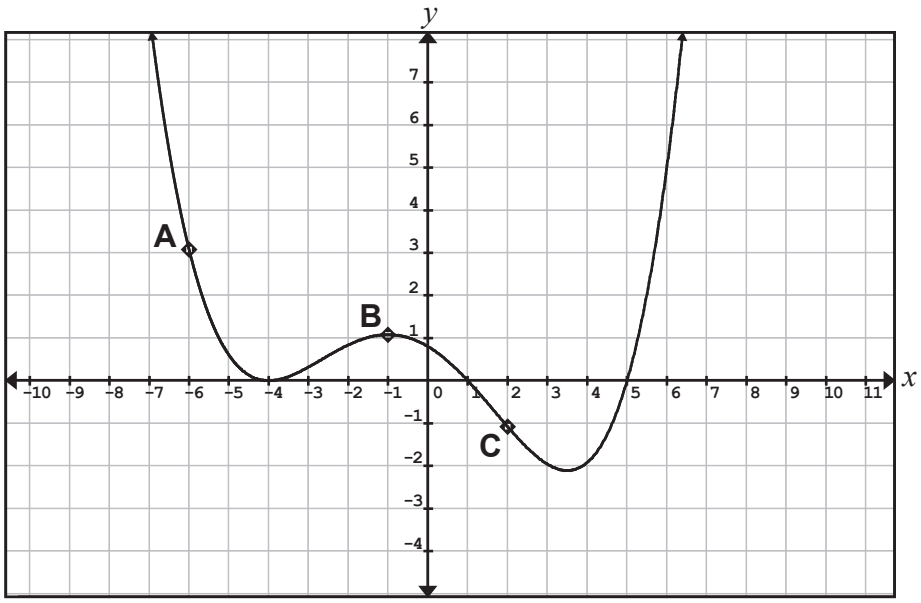
ADDITIONAL PAGE FOR STUDENT RESPONSES

If you **want** your responses on this page marked:

- cancel your original response by ruling a single diagonal line through it, and noting the page number of your replacement response (e.g. see page 15)
- cross out any responses that you **don't want** marked.

Question 5

Clearly indicate the location of the translated points A, B and C.



Question 8

Use your graphics calculator to provide a sketch to justify your solution.

Do not write outside this box.

ADDITIONAL PAGE FOR STUDENT RESPONSES

If you **want** your responses on this page marked:

- cancel your original response by ruling a single diagonal line through it, and noting the page number of your replacement response (e.g. see page 16)
- cross out any responses that you **don't want** marked.

Question 12 b)

Use your graphics calculator to provide a sketch to justify your solution.

Do not write outside this box.

ADDITIONAL PAGE FOR STUDENT RESPONSES

If you **want** your responses on this page marked:

- cancel your original response by ruling a single diagonal line through it, and noting the page number of your replacement response (e.g. see page 17)
- cross out any responses that you **don't want** marked.

Do not write outside this box.

Mark distribution

Q	Complexity	Initiative	Marks
1a	Simple	Routine	1
1b	Simple	Routine	1
1c	Simple	Non-Routine	3
2	Simple	Routine	MAP
3	Simple	Non-Routine	MAP
4a	Simple	Routine	2
4b	Simple	Routine	2
4c	Simple	Routine	2
5	Simple	Non-Routine	2
6a	Simple	Routine	2
6b	Complex	Routine	4
7	Simple	Routine	MAP
8	Simple	Routine	5
9	Complex	Routine	MAP
10	Complex	Routine	MAP
11a	Simple	Routine	1
11b	Simple	Routine	1
11c	Simple	Routine	1
11d	Simple	Routine	1
11e	Simple	Routine	2
12a	Simple	Routine	4
12b	Simple	Non-Routine	3
13	Complex	Routine	5
14	Complex	Non-Routine	MAP

DO NOT WRITE ON THIS PANEL

THIS PANEL WILL NOT BE MARKED

Mathematics B instrument-specific standards

	Standard A	Standard B	Standard C	Standard D	Standard E
	The student work has the following characteristics:				
Knowledge and procedures (KAP)	• recall, access, selection of mathematical definitions, rules and procedures in routine and non-routine simple tasks through to routine complex tasks, in life-related and abstract situations	• recall, access, selection of mathematical definitions, rules and procedures in routine and non-routine simple tasks through to routine complex tasks, in life-related and abstract situations	• recall, access, selection of mathematical definitions, rules and procedures in routine, simple life-related or abstract situations	• use of stated rules and procedures in simple situations	• statements of relevant mathematical facts
	• application of mathematical definitions, rules and procedures in routine and non-routine simple tasks, through to routine complex tasks, in life-related and abstract situations	• application of mathematical definitions, rules and procedures in routine or non-routine simple tasks, through to routine complex tasks, in either life-related or abstract situations	• application of mathematical definitions, rules and procedures in routine, simple life-related or abstract situations		
	• numerical calculations, spatial sense and algebraic facility in routine and non-routine simple tasks through to routine complex tasks, in life-related and abstract situations	• numerical calculations, spatial sense and algebraic facility in routine or non-routine simple tasks, through to routine complex tasks, in either life-related or abstract situations	• numerical calculations, spatial sense and algebraic facility in routine, simple life-related or abstract situations	• numerical sense, spatial sense and/ or algebraic facility in routine or simple tasks	
	• appropriate selection and accurate use of technology	• appropriate selection and accurate use of technology	• selection and use of technology	• use of technology	• use of technology
Modelling and problem solving (MAP)	• use of problem solving strategies to interpret, clarify and analyse problems to develop responses from routine simple tasks through to non-routine complex tasks in life-related and abstract situations	• use of problem solving strategies to interpret, clarify and analyse problems to develop responses to routine and non-routine simple tasks through to routine complex tasks in life-related or abstract situations	• use of problem solving strategies to interpret, clarify and develop responses to routine, simple problems in life-related or abstract situations	• evidence of simple problem solving strategies in the context of problems	• evidence of simple mathematical procedures
		• identification of parameters and/or variables			
	• use of data to synthesise mathematical models in simple through to complex situations	• use of data to synthesise mathematical models in simple situations	• use of mathematical models to represent routine, simple situations		
		• interpretation of results in the context of simple through to complex problems and mathematical models	• interpretation of results in the context of routine, simple problems		
Communication and justification (CAJ)	• appropriate interpretation and use of mathematical terminology, symbols and conventions from simple through to complex and from routine through to non-routine, in life-related and abstract situations	• appropriate interpretation and use of mathematical terminology, symbols and conventions in simple or complex and from routine through to non-routine, in life-related or abstract situations	• appropriate interpretation and use of mathematical terminology, symbols and conventions in simple routine situations	• use of mathematical terminology, symbols or conventions in simple or routine situations	• use of mathematical terminology, symbols or conventions
	• organisation and presentation of information in a variety of representations	• organisation and presentation of information in a variety of representations	• organisation and presentation of information	• presentation of information	• presentation of information
	• analysis and translation of information from one representation to another in life-related and abstract situations from simple through to complex and from routine through to non-routine	• analysis and translation of information from one representation to another in life-related or abstract situations, simple or complex, and from routine through to non-routine	• translation of information from one representation to another in simple routine situations		
	• use of mathematical reasoning to develop coherent, concise and logical sequences within a response from simple through to complex and in life-related and abstract situations using everyday and mathematical language	• use of mathematical reasoning to develop coherent and logical sequences within a response in simple or complex and in life-related or abstract situations using everyday and/or mathematical language	• use of mathematical reasoning to develop sequences within a response in simple routine situations using everyday or mathematical language		
	• coherent, concise and logical justification of procedures, decisions and results	• coherent and logical justification of procedures, decisions and results	• justification of procedures, decisions or results		
	• justification of the reasonableness of results				