Cambridge Assessment International Education

Interactive

Interactive Learner Guide

Cambridge IGCSE® (9–1)
Mathematics 0980

For examination from 2020

Cambridge Pathway

In order to help us develop the highest quality resources, we are undertaking a continuous programme of review; not only to measure the success of our resources but also to highlight areas for improvement and to identify new development needs.

We invite you to complete our survey by visiting the website below. Your comments on the quality and relevance of our resources are very important to us.

www.surveymonkey.co.uk/r/GL6ZNJB

Contents

About this guide

This guide introduces you to your Cambridge IGCSE (9–1) Mathematics (0980) course and how you will be assessed. You should use this guide alongside the support of your teacher.

By the end of this guide, you should:

- ✓ have an overview of the course and what you will learn about
- ✓ understand the structure of the assessment that you will be taking
- ✓ be able to plan your revision
- ✓ know how to show your skills to the best of your ability.

Section 1: Syllabus content

Find out what topics you will be learning about. Your teacher can give you more detail.

Section 2: How you will be assessed

Find out:

- how many examinations you will take
- how long each examination lasts
- what different question types the examination will contain
- how to tackle each examination.

Section 3: What skills will be assessed

Find out what areas of knowledge, understanding and skills you will need to demonstrate throughout the course and in your examinations.

Section 4: Example candidate response

Take a look at a learner's response taken from a real examination. Find out:

- how to interpret the question
- how to avoid common mistakes
- how to improve your exam technique.

Section 5: Revision

Discover:

- ways to help you plan your revision
- example revision planners
- some basic revision skills
- some 'top revision tips'
- revision checklist for each topic.

Section 1: Syllabus content - what you need to know about

This section gives you an outline of the syllabus content for this course. Only the top-level topics of the syllabus have been included here, which are the same for both the **Core** and **Extended** courses. In the 'overview' column you are given a very basic idea of what each topic covers.

Learners taking the **Extended** course need to know all of the Core content as well as some extra content. This extra content requires learners to explore topics and sub-topics of the Core syllabus in more detail, to cover some more complex techniques, and to learn new sub-topics.

Ask your teacher for more detail about each topic, including the differences between the Core and Extended courses. You can also find more detail in the Revision checklists of this guide.

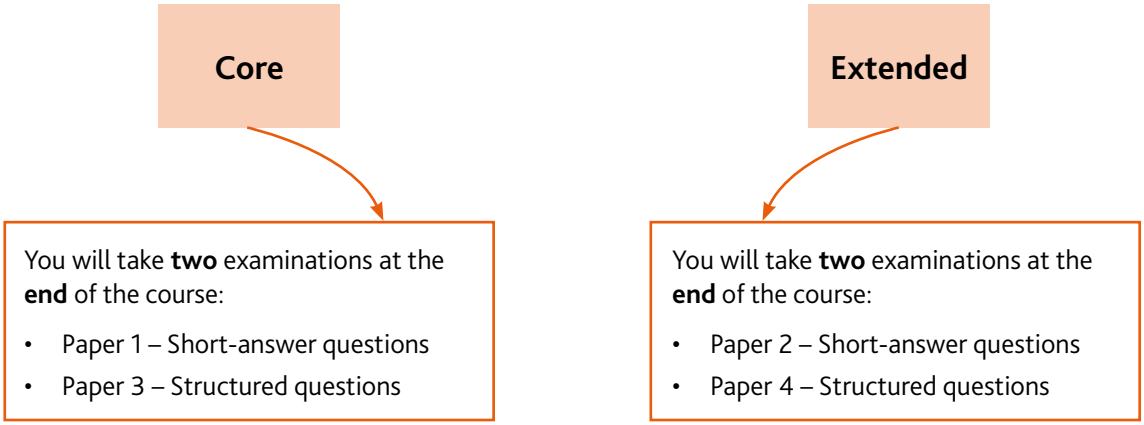
Topic	Overview
Number	Number, squares and cubes, directed numbers, fractions, decimals and percentages, ordering, indices, 'four rules', estimates, bounds, ratio, proportion, rate, percentage, time, money and finance
	Sets, exponential growth and decay **(Extended only)**
Algebra and graphs	Basic algebra, algebraic manipulation, equations, sequences, proportion, graphs of functions
	Linear programming, functions **(Extended only)**
Geometry	Language, constructions, symmetry, angle properties, loci
Mensuration	Measures, mensuration
Co-ordinate geometry	Straight-line graphs
Trigonometry	Bearings, trigonometry
Matrices and transformations	Vectors, transformations
	Matrices **(Extended only)**
Probability	Probability
Statistics	Statistics

Section 2: How you will be assessed

You will be assessed at the end of the course using two components:

- Paper 1 (Core) or Paper 2 (Extended)
- Paper 3 (Core) or Paper 4 (Extended).

Your teacher will advise you which papers are best for you, depending on your progress and strengths.



Components at a glance

The table summarises the key information about each component for each syllabus. You can find details and advice on how to approach each component on the following pages.

Component		How long and how many marks	Skills assessed	Details	Percentage of the qualification
Core	Paper 1 (Short-answer)	1 hour 56 marks	Mathematical techniques, applying mathematical techniques to solve problems	You are assessed on the Core syllabus content using short-answer questions	35%
	Paper 3 (Structured questions)	2 hours 104 marks	Mathematical techniques, applying mathematical techniques to solve problems	You are assessed on the Core syllabus content using structured questions	65%
Extended	Paper 2 (Short-answer)	1 hour 30 minutes 70 marks	Mathematical techniques, applying mathematical techniques to solve problems	You are assessed on the Extended syllabus content using short-answer questions	35%
	Paper 4 (Structured answer)	2 hours 30 minutes 130 marks	Mathematical techniques, applying mathematical techniques to solve problems	You are assessed on the Extended syllabus content using short-answer questions	65%

About the components

It is important that you understand the different types of question in each component and how you should approach them.

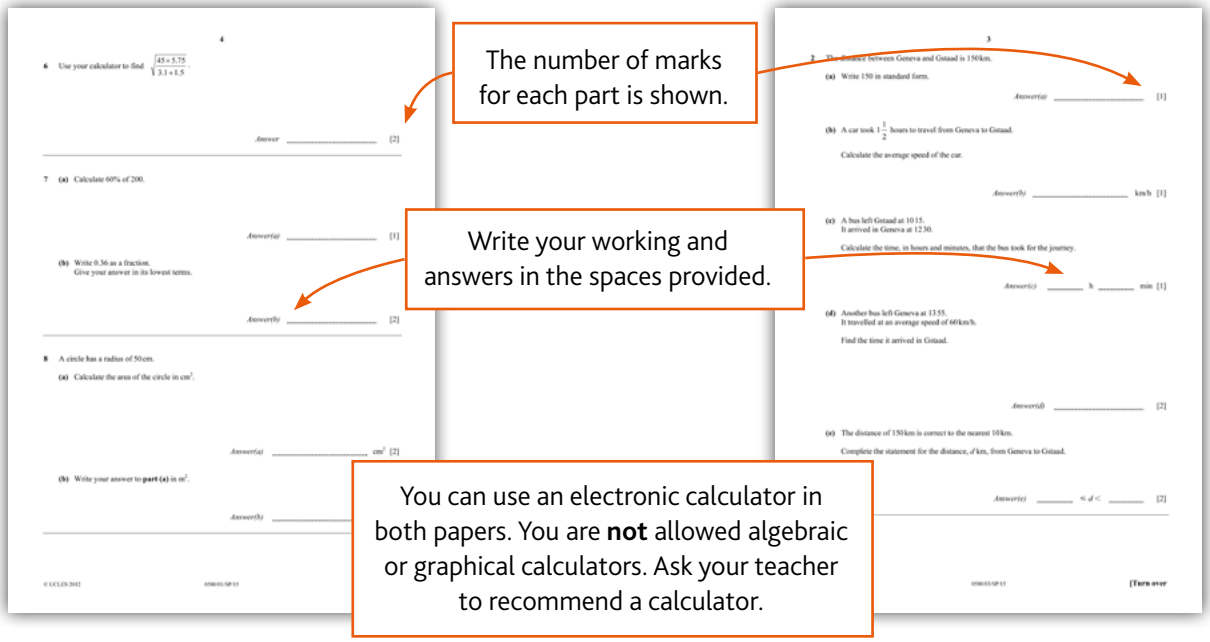
Core: Paper 1 (Short-answer) and Paper 3 (Structured)

Paper 1 and Paper 3 mainly assess your knowledge of mathematical techniques. Some questions will assess how you apply mathematics to solve problems.

You need to answer all questions on each paper.

Paper 1

Paper 3

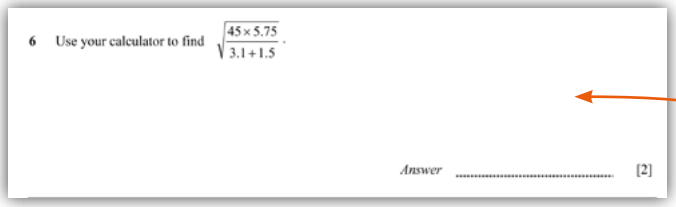


The number of marks for each part is shown.

Write your working and answers in the spaces provided.

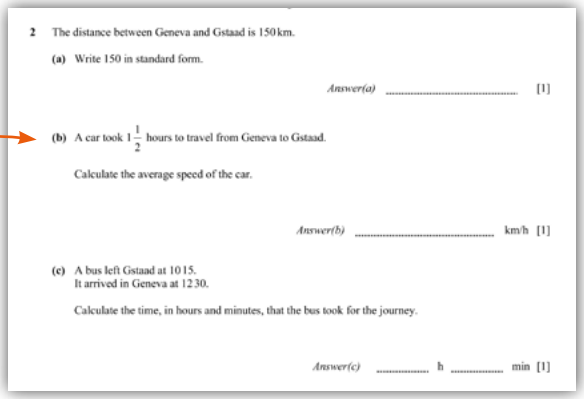
You can use an electronic calculator in both papers. You are **not** allowed algebraic or graphical calculators. Ask your teacher to recommend a calculator.

Question types and advice



Paper 1 contains only short-answer questions.

Paper 3 contains structured questions. This means that each question is split into parts. Often the answers to later parts will depend on the answers to earlier parts.



1. **Read** the questions carefully to make sure that you understand what is being asked.
2. Give your answers to the accuracy indicated in the question. If none is given, and the answer isn't exact, then:

- give your answer to **three significant figures**

  12.3 ✓ 12.298 x

- or if the answer is in degrees, then give it to **one decimal place**

  23.1° ✓ 23° x

3. Include **units** with your answers if they are not given on the paper.

   1 kg of apples costs… £1.20 ✓ 1.20 x

4. **Show your working**. Show as much working as you can for all your questions.

   ~~Wrong working~~

   ~~Wrong answer~~

   Right working

   Right answer

Use the value of π from your calculator, if it gives one. Or use **3.142**, which is given on the front page of the question paper.

Make sure that you give your answer in the form asked for in the question, e.g. some questions ask for answers to be given in terms of π.

You can gain marks for the correct working even if you have an incorrect answer or cannot complete the whole question.

If you make a mistake, draw a line through the incorrect working and answer so that it is clear you do not want this to be marked.

If you need more space, ask for another sheet of paper.

Equipment for the exam

Make sure you have:

- a blue or black pen (a spare pen is always a good idea)
- a pencil (for graphs and diagrams)
- an electronic calculator
- a protractor
- a pair of compasses
- a ruler.

Timing

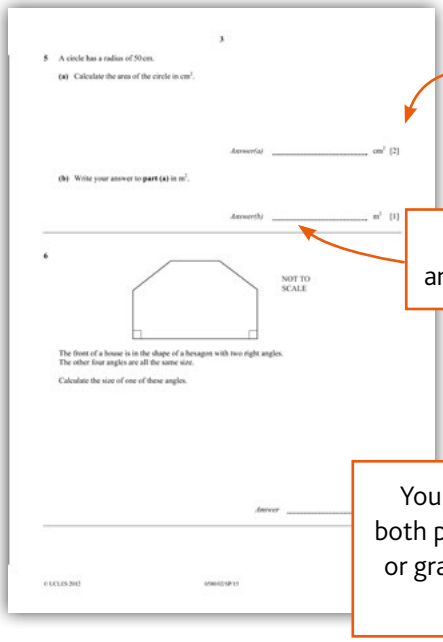
- If you are stuck on a question, don't waste too much time trying to answer it – go on to the next question and come back to the one you are stuck on at the end.
- Use any time that you have left at the end of the exam to go back and check your answers and working.

Extended: Paper 2 (Short–answer) and Paper 4 (Structured)

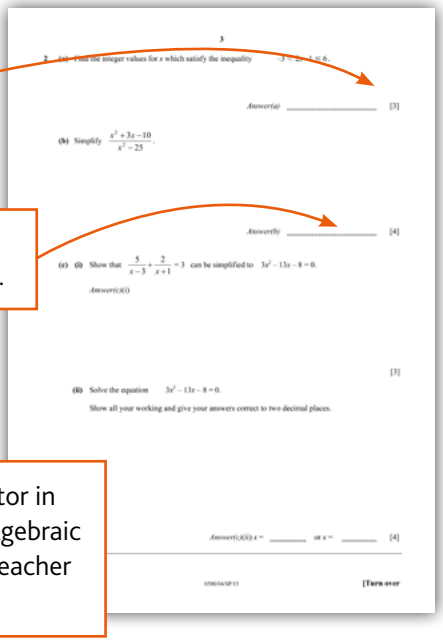
Paper 2 and Paper 4 assess your knowledge of mathematical techniques and how you use mathematics to solve problems.

You need to answer **all** questions on both papers.

Paper 2



Paper 4

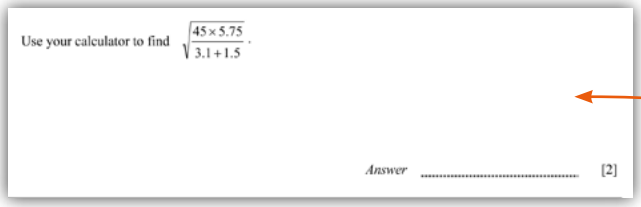


The number of marks for each part is shown.

Write your working and answers in the spaces provided.

You can use an electronic calculator in both papers. You are **not** allowed algebraic or graphical calculators. Ask your teacher to recommend a calculator.

Question types and advice

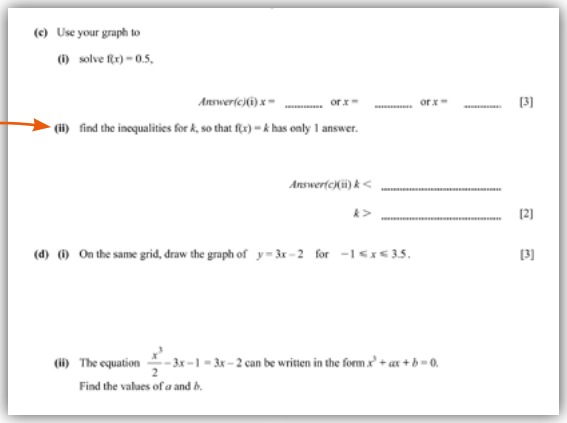


Use your calculator to find $\sqrt{\frac{45 \times 5.75}{3.1 + 1.5}}$.

Answer ..... [2]

Paper 2 questions are short-answer questions. Towards the end of the paper, questions may be longer.

Paper 4 contains structured questions. This means that each question is split into parts. Often the answers to later parts depend on the answers to earlier parts.



(c) Use your graph to

(i) solve $f(x) = 0.5$,

Answer(c)(i) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(ii) find the inequalities for k, so that $f(x) = k$ has only 1 answer.

Answer(c)(ii) $k <$ .....

$k >$ ..... [2]

(d) (i) On the same grid, draw the graph of $y = 3x - 2$ for $-1 \leqslant x \leqslant 3.5$. [3]

(ii) The equation $\frac{x^3}{2} - 3x - 1 = 3x - 2$ can be written in the form $x^3 + ax + b = 0$.

Find the values of a and b.

1. **Read** the questions carefully to make sure that you understand what is being asked.
2. Give your answers to the accuracy indicated in the question. If none is given, and the answer isn't exact, then:

- give your answer to **three significant figures**
  12.3 ✓ 12.298 x
- or if the answer is in degrees, then give it to **one decimal place**
  23.1° ✓ 23° x

3. Include **units** with your answers if they are not given on the paper.
   1 kg of apples costs… £1.20 ✓ 1.20 x
4. **Show your working**. Show as much working as you can for all your questions.
   ~~Wrong working~~
   ~~Wrong answer~~
   Right working
   Right answer

Use the value of π from your calculator, if it gives one. Or use **3.142**, which is given on the front page of the question paper.

Make sure that you give your answer in the form asked for in the question, e.g. some questions ask for answers to be given in terms of π.

You can gain marks for the correct working even if you have an incorrect answer or cannot complete the whole question.

If you make a mistake, draw a line through the incorrect working and answer so that it is clear you do not want this to be marked.

If you need more space, ask for another sheet of paper.

Equipment for the exam

Make sure you have:

- a blue or black pen (a spare pen is always a good idea)
- a pencil (for graphs and diagrams)
- an electronic calculator
- a protractor
- a pair of compasses
- a ruler.

Timing

- If you are stuck on a question, don't waste too much time trying to answer it – go on to the next question and come back to the one you are stuck on at the end.
- Use any time that you have left at the end of the exam to go back and check your answers and working.

Section 3: What skills will be assessed

The areas of knowledge, understanding and skills that you will be assessed on are called **assessment objectives** (AOs).

AO1 Mathematical techniques	AO2 Applying mathematical techniques to solve problems

The tables explain what each assessment objective means and what percentage of the whole qualification is assessed using that objective. Your teacher will be able to give you more information about how each of the assessment objectives are tested in each component.

AO1

AO1 is all about demonstrating that you have knowledge of mathematical techniques.

Candidates should be able to:	What this means	Where
organise, interpret and present information accurately in written, tabular, graphical and diagrammatic forms	use tables, graphs and diagrams	**Core assessment** All two components: Paper 1 (42–48 marks) Paper 3 (78–88 marks) Percentage of IGCSE: 75–85% **Extended assessment** All two components: Paper 2 (28–35 marks) Paper 4 (52–65 marks) Percentage of IGCSE: 40–50%
perform calculations by suitable methods		
use an electronic calculator and also perform some straightforward calculations without a calculator		
understand systems of measurement in everyday use and make use of them in the solution of problems		
estimate, approximate and work to degrees of accuracy appropriate to the context and convert between equivalent numerical forms	**degrees of accuracy**, e.g. decimal places or significant figures **equivalent numerical forms**, e.g. between fractions, decimals and percentages, or between normal numbers and standard form	
use mathematical and other instruments to measure and to draw to an acceptable degree of accuracy	**mathematical instruments**, e.g. a pair of compasses, a protractor and a ruler	
interpret, transform and make appropriate use of mathematical statements expressed in words or symbols	use mathematical statements written in words or symbols	
recognise and use spatial relationships in two and three dimensions, particularly in solving problems		
recall, apply and interpret mathematical knowledge in the context of everyday situations		

AO2

AO2 is all about applying mathematical techniques to solve problems

In questions which are set in context and/or which require a sequence of steps to solve, candidates should be able to:	What this means	Where
make logical deductions from given mathematical data		**Core assessment** All two components: Paper 1 (8–14 marks) Paper 3 (16–26 marks) Percentage of IGCSE: 15–25% **Extended assessment** All two components: Paper 2 (35–42 marks) Paper 4 (65–78 marks) Percentage of IGCSE: 50–60%
recognise patterns and structures in a variety of situations, and form generalisations	recognise and extend patterns	
respond to a problem relating to a relatively unstructured situation by translating it into an appropriately structured form	take information and organise it to answer a problem	
analyse a problem, select a suitable strategy and apply an appropriate technique to obtain its solution	identify and use suitable approaches to problems	
apply combinations of mathematical skills and techniques in problem solving		
set out mathematical work, including the solution of problems, in a logical and clear form using appropriate symbols and terminology	set out work in a clear and logical way using mathematical symbols and language	

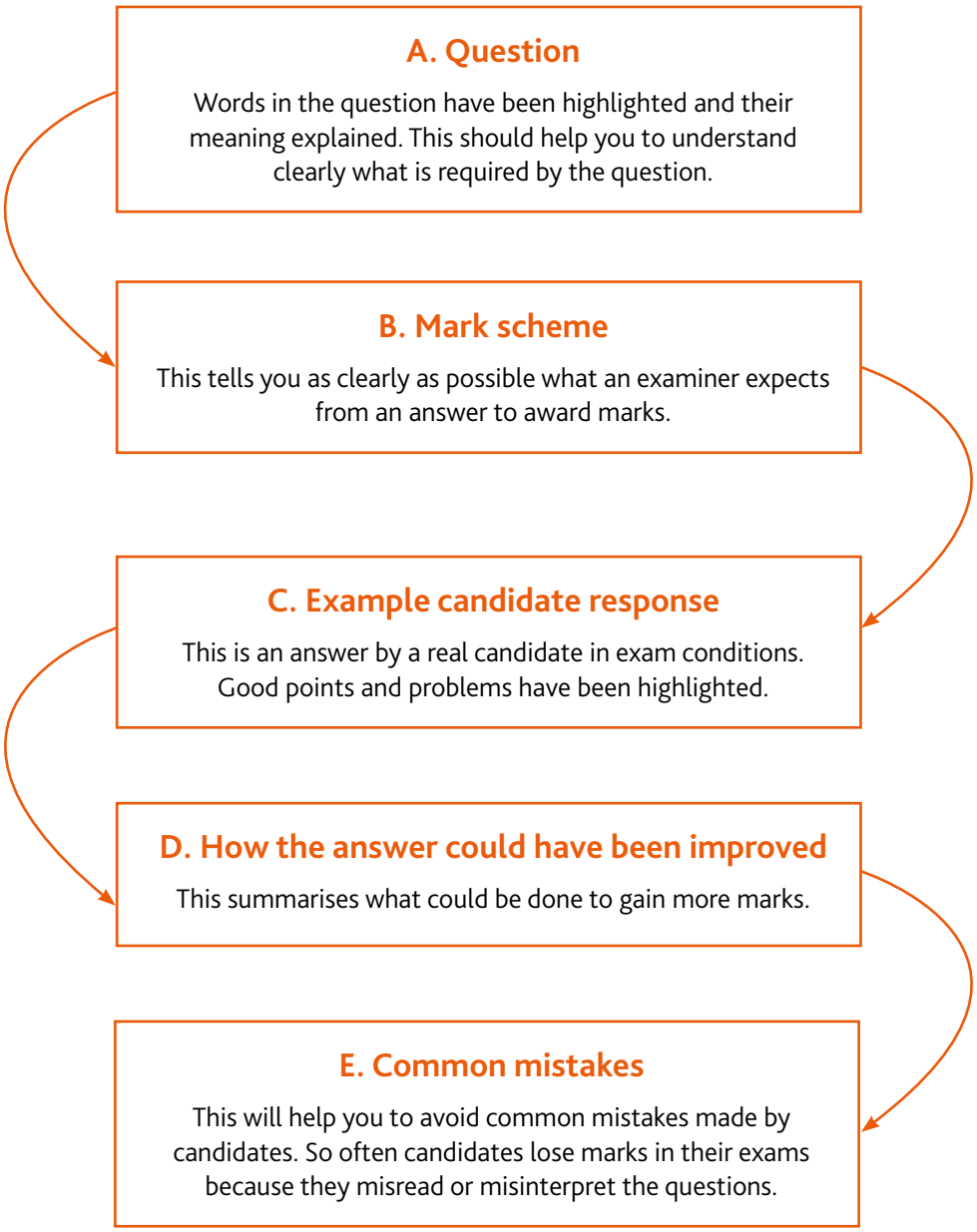
Your teacher will be able to give you more information about how each of the assessment objectives is tested.

Section 4: Example candidate response

This section takes you through an example question and learner response from a Cambridge IGCSE (9–1) Mathematics (0980) past paper. It will help you to see how to identify words within questions and to understand what is required in your response. Understanding the questions will help you to know what you need to do with your knowledge, for example, you might need to describe something, explain something, argue a point of view, apply the knowledge in a different way, or list what you know.

All information and advice in this section is specific to the example question and response being demonstrated. It should give you an idea of how your responses might be viewed by an examiner but it is not a list of what to do in all questions. In your own examination, you will need to pay careful attention to what each question is asking you to do.

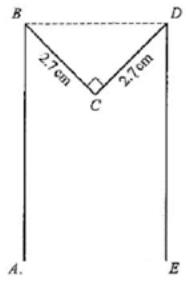
This section is structured as follows:



A. Question

The question used in this example, question 9, is from Paper 3 (Core). It represents the type of structured question you will see in both Paper 3 (Core) and Paper 4 (Extended). A structured question means that it is broken into several parts. Often, later parts will depend on your answers to earlier parts.

9



NOT TO SCALE

(a) In the diagram above, AB and ED are vertical.
The diagram is symmetrical about a line through C parallel to AB.
Angle $BCD = 90°$ and $BC = CD = 2.7$ cm.

(i) Calculate BD.

Answer(a)(i) $BD =$ ..... cm [2]

(ii) Complete the statement.

Triangle BCD is right-angled and ..... [1]

(iii) Find the size of angle ABC.

Answer(a)(iii) Angle $ABC =$ ..... [1]

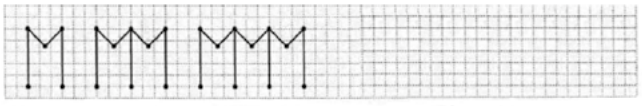


Diagram 1 Diagram 2 Diagram 3 Diagram 4

(b) The pattern of diagrams above is continued by adding more lines and dots.

(i) On the grid, draw diagram 4. [1]

(ii) Complete the table below.

Diagram	1	2	3	4	5
Number of lines	4	7			

[2]

(c) How many lines will there be in

(i) Diagram 9.

Answer(c)(i) ..... [1]

(ii) Diagram n?

Answer(c)(ii) ..... [2]

(d) The number of lines in Diagram r is 76.

Find the value of r.

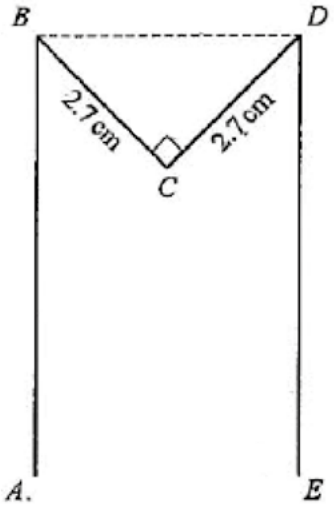
Answer(d) $r =$ ..... [2]

(e) Write down an expression, in terms of n, for the number of **dots** in Diagram n.

Answer(e) ..... [1]

Now let's look more closely at the question.

9



NOT TO SCALE

NOT TO SCALE
This means that you cannot find the answer by measuring the diagram.

In the diagram above... means that you need to use the diagram to help you answer the question.

(a) In the diagram above, AB and ED are vertical.
The diagram is symmetrical about a line through C parallel to AB.
Angle $BCD = 90°$ and $BC = CD = 2.7$ cm.

(i) Calculate BD.

Calculate... means that you need to give a numerical answer. Make sure you show steps in your working, especially when there is more than one step in your calculation.

Complete the statement... means that you need to use the correct mathematical word(s) to fill in the gap(s). Here, the gap is at the end of the sentence.

Answer(a)(i) $BD =$ ..... cm [2]

(ii) Calculate the statement.

Triangle BCD is right-angled and ..... [1]

(iii) Find the size of angle ABC.

Find... in this question, find is another word for 'calculate', meaning you need to calculate the size of the angle. Find can also mean 'measure', it depends on the question being asked.

Answer(a)(iii) Angle $ABC =$ ..... [1]

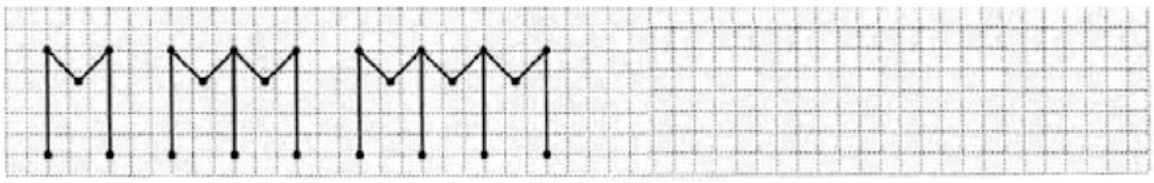


Diagram 1 Diagram 2 Diagram 3 Diagram 4

(b) The pattern of diagrams above is continued by adding more lines and dots.

(i) On the grid, draw diagram 4.

(ii) Complete the table below.

Diagram	1	2	3	4	5
Number of lines	4	7			

(c) How many lines will there be in

(i) Diagram 9.

Answer(c)(i) ..... [1]

(ii) Diagram n?

Answer(c)(ii) ..... [2]

(d) The number of lines in Diagram r is 76.

Find the value of r.

Answer(d) $r =$ ..... [2]

(e) Write down an expression, in terms of n, for the number of **dots** in Diagram n.

Answer(e) ..... [1]

On the grid... tells you that you need to draw your answer on the grid provided.

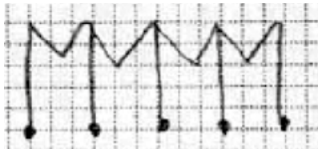
Complete the table... means that you need to put your answers in the table. Look carefully at the table to identify what data you need to enter. Here, you need to enter the number of lines for diagrams 3,4 and 5. You can use the diagrams for 3 and 4, but have to spot a pattern in the data to find the answer for diagram 5.

How many... requires a numerical or algebraic answer.

B. Mark scheme

Your examination papers will be marked and the overall number of marks for each paper will be recorded. Your marks will then be converted to a grade.

The mark scheme provides the final answers for each sub-part of a question and, when appropriate, the required lines of working to reach that answer.

Answer	Mark	Notes
(a)(i) 3.82 Final answer	2 (1)	Full marks (2) are awarded for any answer that rounds to 3.82. If the candidate's answer is incorrect, **1 method mark** can be awarded for sight of **one** of the following in their working (maximum 1 mark): $2.7^2 + 2.7^2$ OR $\sin 45 = \frac{27}{BD}$ OR $\cos 45 = \frac{27}{BD}$
(a)(ii) Isosceles	1	This is the only acceptable answer for this part of the question.
(a)(iii) 45	1	This is the only acceptable answer for this part of the question.
(b)(i) 	1	This is the only acceptable answer for this part of the question.
(b)(ii) <table><tr><td>Diagram</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Number of lines</td><td>**10**</td><td>**13**</td><td>**16**</td></tr></table>	2 (1)	Full marks (2) are awarded is all gaps are correctly filled. If the candidate's answer is not fully correct, **1 mark** can be awarded for **one** of the following (maximum 1 mark): Two correct values in the table, e.g. 10 and 13 correct, but a number other than 16 as the third value. OR Incorrect values for diagram 4 and diagram 5 but the correct difference between them. The correct difference is 3, so the values 14 and 17, or 15 and 18, for example, would be awarded 1 mark.

Sometimes the answer has to be exactly as given in the mark scheme. Other times there will be a range of acceptable answers.

Sometimes marks can be awarded for correct lines or steps of the working in a calculation even if the final answer is incorrect. This is why it's so important to always **show your working**.

If you use a correct method that is not included in the mark scheme, then method marks can still be awarded.

Answer	Mark	Notes
(c)(i) 28	1	This is the only acceptable answer for this part of the question.
(c)(ii) $3n + 1$	2 (1)	Full marks (2) are awarded for $3n + 1$. OR Any expression that would simplify to $3n + 1$, e.g. $6n + 2$. If the candidate's answer is not correct, then **1 mark** can be awarded for **one** of the following (maximum 1 mark): Having '$3n$' in the expression but adding/subtracting incorrectly, e.g. $3n + a$, where a is not 1, such as $3n + 4$ or $3n - 2$. OR Having '+ 1' in the expression but multiplying n incorrectly, e.g. $dn + 1$, where d is a number other than 3, such as $5n + 1$ or $2n + 1$.
(d) 25	2 (1)	Full marks (2) are awarded for the answer '25' OR $3n + 1 = 76$ $3n = 76$ $n = 25$ If the candidate's final answer is incorrect, then **1 method mark** can be awarded for: Incorrectly solving $3n + 1 = 76$ OR Putting their incorrect expression from (c)(ii) equal to 76 and solving, e.g. $3n + 4 = 76$ $3n = 72$ $n = 24$
(e) $3n + 2$	1	Full marks (1) are awarded for $3n + 2$. OR An expression that would simplify to $3n + 2$, e.g. $6n + 4$. If the candidate's answer is incorrect but demonstrates the required mathematical understanding, award **1 mark**. The understanding required for this question is that there is *one more dot compared to the lines*, which is demonstrated by adding 1 to their expression in (c)(ii). For example, if their answer to (c)(ii) was $2n + 1$, then an answer here or $2n + 2$ would be awarded 1 mark.

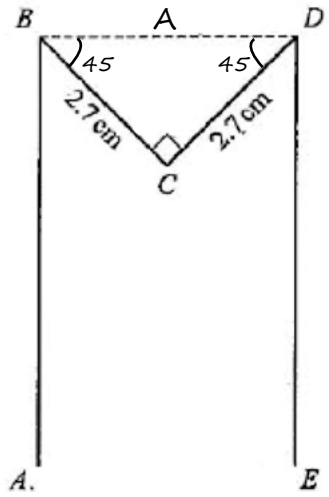
If the **required** mathematical understanding has been demonstrated, the candidate might get awarded the marks even if their answer is wrong.

Now let's look at the sample candidate's response to question 9 and the examiner's comments on this response.

C. Example candidate response and examiner comments

The examiner's comments are in the orange boxes.

9



NOT TO SCALE

(a)(i) mark: 1 out of 2

The final answer is incorrect because it is not to three significant figures. The candidate gets 1 mark for their working but nothing for their final answer. Make sure you read the instructions on the **front of the question paper** about rounding.

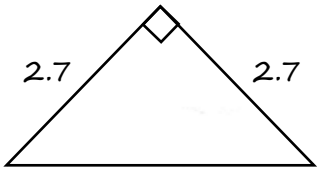
(a) In the diagram above, AB and ED are vertical.
The diagram is symmetrical about a line through C parallel to AB.
Angle $BCD = 90°$ and $BC = CD = 2.7$ cm.

(i) Calculate BD.

$2.7^2 + 2.7^2 = y^2$

$\sqrt{14.5}$

The candidate has shown their working clearly. **1 method mark** is awarded for '$2.7^2 + 2.7^2$'.



The final answer is incorrect because is has been rounded to two significant figures.

Answer(a)(i) BD = 3.8 cm [2]

(ii) Complete the statement.

Triangle BCD is right-angled and equilibrium = equal side [1]

(a)(ii) mark: 0 out of 1

Only the precise answer is awarded the mark. The candidate could not remember the mathematical name for this particular type of triangle.

(iii) Find the size of angle ABC.

$90 - 45 = 45$

(a)(iii) mark: 1 out of 1

The candidate correctly gave the only acceptable answer for this question.

Answer(a)(iii) Angle ABC = 45 [1]

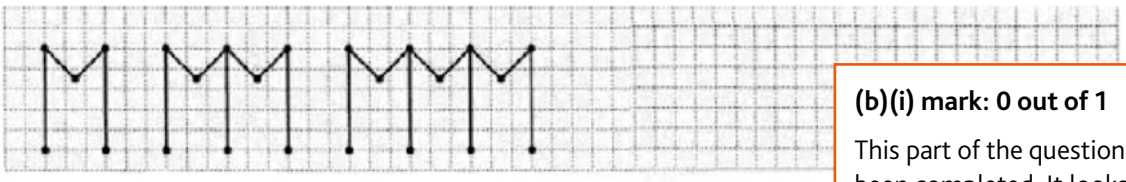


Diagram 1 Diagram 2 Diagram 3 Diagr

(b) The pattern of diagrams above is continued by adding more lines and dots.

(i) On the grid, draw diagram 4.

(ii) Complete the table below.

Diagram	1	2	3	4	5
Number of lines	4	7	10	13	16

3 3 3 3

[2]

(c) How many lines will there be in

(i) Diagram 9.

3(9) + 1 = 28

Answer(c)(i) 28

(ii) Diagram n?

3n + 1

Answer(c)(ii) 3n + 1

(d) The number of lines in Diagram r is 76.

Find the value of r.

3n + 1 = 76

3n = 75

n = 75/5 n = 15

Answer(d) r = 15

(e) Write down an expression, in terms of n, for the number of dots i

Answer(e) 3n + 1 [1]

(b)(i) mark: 0 out of 1

This part of the question has not been completed. It looks as though the candidate has missed this.

(b)(ii) mark: 2 out of 2

The table is correctly completed and the candidate is awarded full marks.

(c)(i) mark: 1 out of 1

The candidate has given the correct answer. They have also shown their working, which is good practice.

(c)(ii) mark: 2 out of 2

The candidate has given the correct answer and is awarded full marks.

(d) mark: 1 out of 2

The answer is incorrect because of an error when dividing 75. Including working means that 1 method mark is awarded despite the incorrect final answer.

The candidate has shown their working clearly. They are awarded **1 method mark** for '$3n + 1 = 76$'.

(e) mark: 0 out of 1

The candidate has been asked for an expression for the number of **dots** in diagram n. The expression they have given is the same as the answer for (c)(ii), which is for the number of **lines**. It is clear from the diagram that there are more dots than lines, so either they didn't read the question properly or did not understand what was required.

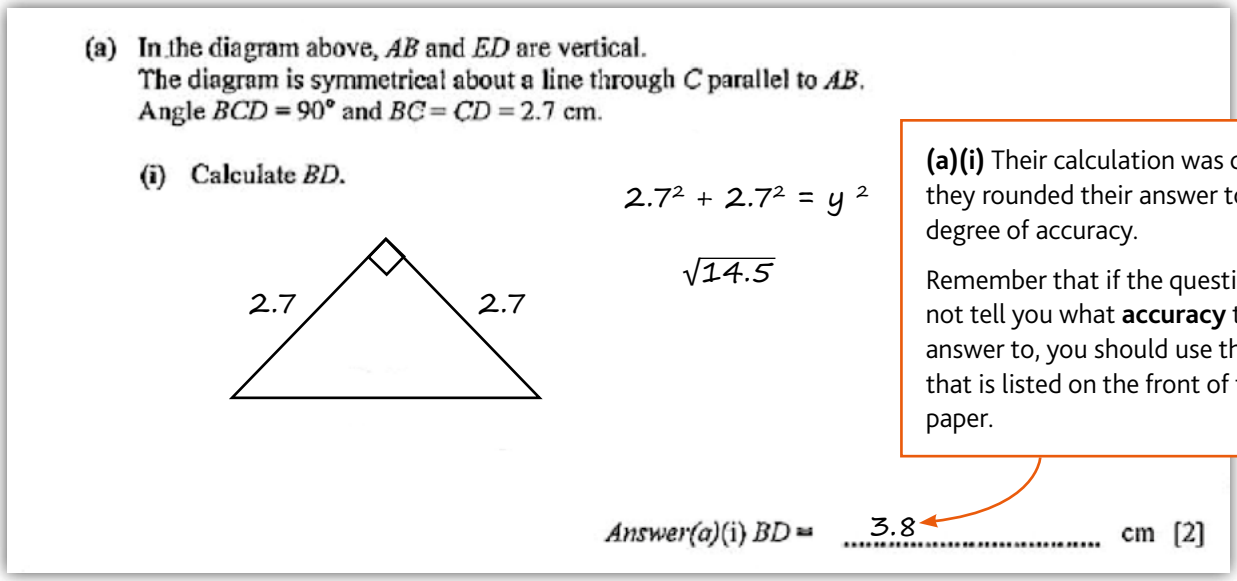
Total mark awarded = 8 out of 13

The candidate displays a clear understanding of the question and the areas of mathematics being tested by showing developed and accurate solutions for most of the question parts. However, they made a number of errors or missed question parts.

D. How the answer could have been improved

The candidate's answer could have been improved if the candidate made sure that they:

- gave their answers to the correct accuracy
- knew the mathematical names and properties of 2D shapes
- answered all of the parts of the question
- checked their working for errors
- checked their answers to make sure they made sense in the context of the question.



(a) In the diagram above, AB and ED are vertical.
The diagram is symmetrical about a line through C parallel to AB.
Angle $BCD = 90°$ and $BC = CD = 2.7$ cm.

(i) Calculate BD.

$2.7^2 + 2.7^2 = y^2$

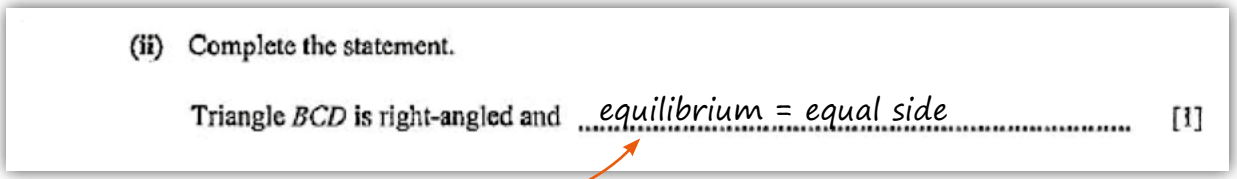
$\sqrt{14.5}$

2.7 2.7

Answer(a)(i) BD = 3.8 cm [2]

(a)(i) Their calculation was correct but they rounded their answer to the wrong degree of accuracy.

Remember that if the question does not tell you what **accuracy** to give your answer to, you should use the accuracy that is listed on the front of the question paper.



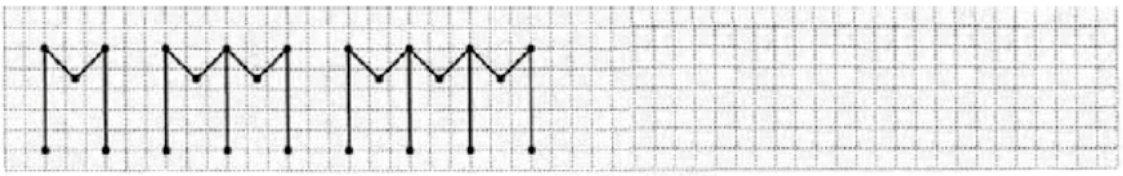
(ii) Complete the statement.

Triangle BCD is right-angled and equilibrium = equal side [1]

(a)(ii) Only the precise mathematical name was an acceptable answer and the candidate did not know it.

It is important to know and understand key mathematical terms because:

- for questions like this you will only get awarded the marks for the absolute correct answer
- some questions might use these terms to give you important information; if you don't know what these terms mean, then you will miss important facts from the question that you need to use to answer it accurately.



(b) The pattern of diagrams above is continued

(i) On the grid, draw diagram 4.

(b)(i) was not answered so no marks could be awarded.

The candidate seems to understand the rest of the question so it looks like they didn't see this part.

Check through the paper at the end to make sure that you have answered all of the questions.

(d) The number of lines in Diagram r is 76.

Find the value of r.

$3n + 1 = 76$

$3n = 75$

$n = 75/5 \quad n = 15$

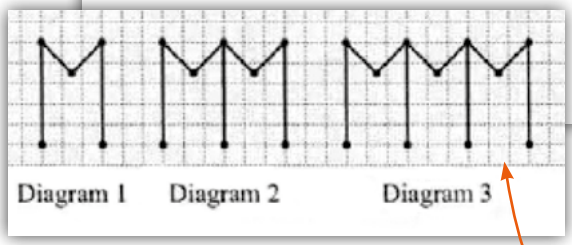
Answer(d) $r =$ 15 [2]

(d) The working shows that they have understood the question but there is an error in the calculation; they incorrectly found that 75 ÷ 5 = 15. The correct answer is 75 ÷ 3 = 25.

By showing their working, they were able to get 1 of the available marks.

Remember to check through your work at the end to avoid calculation errors like this. The candidate could have checked their answer by substituting 15 into 3n + 1 to see if this gave the answer 76.

(e) Write down an expression, in terms of n, for the number of **dots** in Diagram n.



Answer(e) $3n + 1$ [1]

(e) The candidate gave the same expression as they gave for the number of lines in Diagram n. If you look at the diagrams you can see that there are more dots than lines, so it does not make sense for the expression for the number of dots in Diagram n to be the same as the expression for the number of lines in Diagram n.

Remember to check that your answers to questions make sense, particularly in questions with numerical answers, for example the cost of an item in a sale.

E. Common mistakes

There were a number of common mistakes made by other candidates on this question.

- **Accuracy of answers**
  In part (a)(i), common errors were to round to 2 significant figures, as we saw in the example, or to give the answer '3.81' due to truncating (cutting off) the answer at 2 decimal places rather than rounding.
- **Misinterpreting the question**
  For part (a)(ii), the most common error was to repeat the information that had been given in the question or to give a property of the shape, rather than its name.
- **Lack of knowledge**
  In part (a)(iii), lots of candidates did not realise that the triangle being isosceles would lead them to the answer. Some tried to use trigonometry and others gave lengths rather than an angle.
  For part (c)(ii), a number of candidates gave the answer 'n + 3' or '3', which was from the term-to term rule for the sequence. This showed a lack of understanding of the nth term for a sequence.
- **Not checking answers**
  In part (c)(i), common errors were to give the answer 25 or 31, which are the number of lines for Diagrams 8 and 10 (rather than 9). It is likely that these candidates did not read the question carefully or check their answers.
- **Inefficient method making it easier to make mistakes**
  In part (d), there were a number of candidates who found the correct answer by counting on from the sequence rather than using algebra. A correct answer using this method is awarded the marks, but this is a more time-consuming process than solving the equation and it is easier to make errors.

General advice

In order to do your best when answering a mathematics question, make sure you:

- revise all of the topics for the syllabus you are studying before the exam
- make sure you understand what all the key terms mean
- read the question carefully and make sure that you answer the question that is being asked
- leave time to look through the paper at the end to check that you have answered all questions
- show your working; this is particularly important for questions where you are asked to 'show that …'
- set your working out clearly so that it is easy to follow, this makes it easier to keep track of what you have done and makes checking back through your work easier; try to write it in a logical order in the answer space
- write your working and answers clearly; if you want to change an answer then you should cross the answer out and write the replacement above, trying to change numbers on the answer line can lead to unclear figures
- check your working and answers to avoid errors
- give your answer to the appropriate level of accuracy; either the accuracy indicated in the question or the accuracy given on the front of the paper
- avoid rounding values part way through your calculation; round when you get the answer
- check that the answer that you have given is sensible and realistic for what is being asked
- use a pencil when drawing diagrams or completing graphs; this means that you can change your answer more easily if you have made a mistake
- take care when reading scales
- if you are asked for reasons for your answer then use the correct mathematical terms.

Section 5: Revision

It is important that you plan your revision in plenty of time for the examinations and that you develop a revision technique that works for you.

Planning your revision

A well-structured revision plan can give you the best chance of success in your examinations. As early as possible (at least six weeks before the examinations for each subject) identify the time you will spend revising and **schedule** slots for revision of this subject alongside your other subjects.

To create a revision schedule, you could use an overall planner for the weeks leading up to the examinations. You could then create weekly revision plans at the start of each week, which include the detail of which subjects you will revise and when. There are some example planners on the next page but there are lots of other ways you can do this. Planning takes time but will help you be more productive.

Use the following as a checklist to help you create your schedule:

- ☐ Write down the dates and times of each of the examinations you are taking, in a calendar, diary or planner.
- ☐ Work out how much time you have before each examination, so you can leave yourself plenty of time to revise each subject.

For each subject make sure you:

- ☐ know how long each examination paper is
- ☐ know what each examination paper is going to assess
- ☐ work out how much time you can spend on each topic so that you revise all topics.

It is important to have breaks in order to stay alert and productive, so make sure you:

- ☐ include one rest day per week, or break this up into shorter rest breaks across a week
- ☐ include at least two hours of rest before bed time; working too late is unlikely to be productive
- ☐ take regular breaks during revision; revising for hours without a break will overload you
- ☐ have short revision sessions and short breaks between each session
- ☐ know ways to relax during your breaks; for example, physical exercise can be good during breaks.

It is important to be flexible and realistic, so make sure you:

- ☐ include most days leading up to the exams **and** include any days or times when you are not able to revise (for example due to attending school, eating meals, participating in sports and hobbies)
- ☐ are honest with yourself about how much time you can really spend on each subject and topic
- ☐ don't get upset about plans that did not work – think of new plans that are easier to achieve.

It might help to:

- ☐ include a mixture of subjects each day
- ☐ break up the material in your subjects into manageable chunks.
- ☐ Plan to **return** to topics and **review** them; revisiting a topic means that you can check that you still remember the material and it should help you to recall more of the topic.
- ☐ Include doing past paper examinations in your plan.

Revision planners

There are many different planners, calendars and timetables you could use to plan your revision. The ones provided in this section are just examples. They range from an overview of all the weeks leading up to the first examination, to the detail of what you will be revising each day.

Use colour-coding for different subjects, time off, examinations and so on. Plan which subjects you are going to revise in which slots. You could then add more detail such as topics to be covered. The planner can be as detailed, large and colourful as you like. Remember to tick off sections as you complete them and to review your plans if needed.

Overview planner

In the example below, imagine that the first examination is on 1 June. Here, the box has just been highlighted but you should write down the paper number, the subject and the time of the examination. You should do this for **all the examinations** you have. This helps you to visualise how much time you have before each examination. You can use this to block out whole or half days when you can't revise. You can also include as much or as little detail about your daily or weekly revision plan as you like.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

Weekly planner

This allows you to input greater detail about what you will revise each week. In the example below, each day is split into three.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning							
Afternoon							
Evening							

In the example below, each day has been split into 1-hour slots so you can include even more detail.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
08:00 - 09:00							
09:00 - 10:00							
10:00 - 11:00							
11:00 - 12:00							
12:00 - 13:00							
13:00 - 14:00							
14:00 - 15:00							
15:00 - 16:00							
16:00 - 17:00							
17:00 - 18:00							
18:00 - 19:00							
19:00 - 20:00							
20:00 - 21:00							

General revision advice

Here are some useful tips to help you with your revision. Use this as a checklist.

- ☐ Make accurate notes during the course.
- ☐ Look at the revision checklists and be really clear what topics you need to know.
- ☐ Check that your notes are complete and make sense.

If you need to improve your notes, you could:

- ☐ • ask your teacher for help, especially if you don't understand some of your notes
- ☐ • ask a friend if you can copy missed work, but make sure you understand it
- ☐ • find more information on topics using your teacher, textbook, the library or the internet; your teacher will have a full copy of the syllabus
- ☐ • use different note-taking methods such as colour-coded notes, tables, spider-diagrams and mind maps; Venn diagrams can be very useful when you need to compare and contrast things.

- ☐ Make lots of new notes: they don't have to be neat, you can use scrap paper or a digital notepad. Remember that the process of writing and reviewing your notes helps you to remember information.
- ☐ Be organised: keep your notes, textbooks, exercise books and websites to hand.
- ☐ Find a revision method that works for you; this might be working alone, with friends, with parents, online, at school, at home or a mixture of many different methods.
- ☐ Have a clear revision plan, schedule or timetable for each subject you are studying.
- ☐ Vary your revision activities: your revision programme should do more than remind you what you can and cannot do – it should help you to improve.
- ☐ Use revision checklists to analyse how confident you feel in each topic.
- ☐ Try doing some past examination papers; use the mark schemes to assess yourself.
- ☐ Use plenty of pens, colours, paper and card of different sizes to make your notes more fun.

Test yourself in different ways, for example by:

- ☐ • playing 'Teach the topic'
- ☐ • using Question and answer cards
- ☐ • answering real exam questions

- ☐ Buy a good revision guide.

You might also find it helpful to:

☐	Target single issues such as correcting those little things you always get wrong, or reminding yourself about any facts/issues/skills that you have never been too sure of.
☐	Spend most of your time on specific skills, knowledge or issues that you have found more difficult when practising them, either during revision or earlier in the course during tests or mock exams.
☐	Spend some time focussing on your strengths as well, so that you can improve.

Top tips for revision of Cambridge IGCSE (9–1) Mathematics

1. Summarise, recall and apply

Make sure that you can recall and apply the key information and mathematical techniques on each topic that you need for the exam.

i. Write a summary of the key information of a topic.

ii. Collect together some questions that test the knowledge and skills of this topic. Ask your teacher for practice questions or suitable past examination questions, or use practice books or textbooks.

iii. Test your recall by covering over the summary and trying to remember the details, or use the summary as part of the 'Teach the topic' (Tip 3) or 'Question and answer cards' (Tip 4) activities.

iv. After you have spent some time revising and practising the knowledge and skills, answer the questions that you collected together on the topic. You might do this later on the same day as revising, or a few days later. Answer as many questions as you can in order to practise applying your knowledge.

v. Try creating your own questions by adapting existing ones and use these for practice when you return to a topic.

2. Mind maps

Mind maps are a great way to revise the links between different factors or to explore a larger topic. They can also be used to brainstorm your ideas.

i. Use a blank sheet of paper and turn it on its side (landscape).

ii. Put the topic title in the middle of the page and build the mind map outwards using lines called 'branches'.

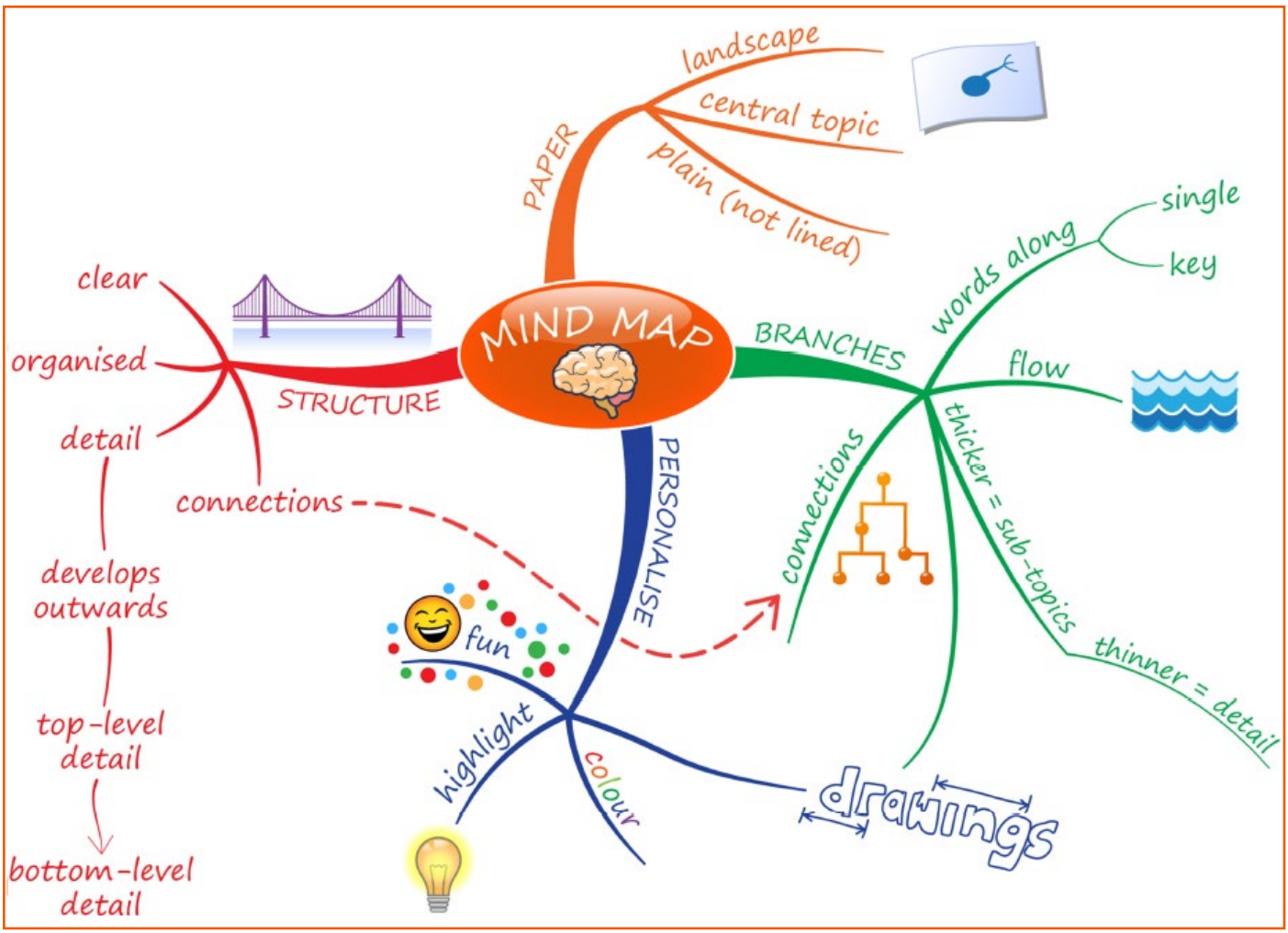
- The first branches are from the central topic to sub-topics; draw these as thick lines.
- Add new branches from the sub-topics to include more detail; draw these as thinner lines.
- Add even more detail to a point by adding more branches.

This creates a hierarchy of information from 'overview' (the thick branches) to 'fine detail' (thinnest branches).

iii. Write single key words or phrases along a branch and add drawings for visual impact.

iv. Use different colours, highlighter pens, symbols and arrows to highlight key facts or issues.

It is a good idea to use a large piece of plain A3 (or larger) paper and lots of coloured pens.



3. Teach the topic

This is a very simple but effective technique that focusses on knowledge recall. It tests the brain and rehearse the information you need to know for a certain topic and so will help your revision.

i. Create some topic cards with key bullet points of information on. Leave space for ticks.
ii. Give these to your parents, family or friends for example.
iii. Give yourself 10 minutes maximum to teach your audience the main points of the topic. You could use a mini-whiteboard or flip chart to help.
iv. Your audience tick off all the points you mention in your presentation and give you a final score.

The brain loves competition, so if you do not score full marks, you can try again the next day, or compete against friends. This system of repeat and rehearsal is very effective, especially with more complex topics, and doesn't take much preparation.

4. Question and answer (Q&A) cards

This is very similar to 'Teach the topic' but less formal and less public for those who dislike performing in front of others. It tests knowledge recall and rehearses the information you need to know for a certain topic.

i. Pick a topic and create two sets of cards: question cards and answer cards. You might find it helpful to make the question cards a different size or use different coloured card for answers.
ii. Make sure you have the topic, or something appropriate depending on what you are focusing on, as a heading on each card. The questions should test your knowledge and understanding of key areas of the course.
iii. A friend or family member uses the cards to test you in short 5 or 10 minute periods at any time during the day.
iv. You could also do this alone by reading the questions to yourself, giving the answer and then checking the correct answer card.
v. This game can be adapted by using the cards to find matching pairs: turn all cards face down across the space in front of you. Turn over two cards, leaving them where they are. If they match (one is a question card and the other is the corresponding answer card) pick up the pair and put them to one side. If they don't match, try to remember where they are and what is on each card, then turn them back over. Turn over two other cards. Continue until you have matched all pairs.

5. Question paper and mark schemes

Looking at past question papers and the mark scheme helps you to familiarise yourself with what to expect and what the standard is.

i. Ask your teacher for past paper questions with mark schemes for the course – ask your teacher for help to make sure you are answering the correct questions and to simplify the mark scheme.
ii. Look at the revision checklist and identify which topic a given question relates to – you might need to ask your teacher to help you do this.
iii. Once you have finished revising a topic or unit, time yourself answering some appropriate exam questions. Check the mark schemes to see how well you would have scored, or give the answers to your teacher to check.
iv. Add details or notes to the mark scheme where you missed out on marks in your original answers using a different coloured pen. Use these notes when you revise and try the question again later.

You can find plenty of past exam papers and mark schemes on the Cambridge International public website:

http://www.cambridgeinternational.org/programmes-and-qualifications/cambridge-igcse-mathematics-9-1-ukonly-0980/past-papers/

Other useful revision advice for Cambridge IGCSE (9–1) Mathematics

- Before the exam, make sure that you are familiar with your calculator, and confident in using it.
- Look at the Example Candidate Response earlier in this guide. Can you identify the strengths of the response and where they have made mistakes or lost marks?
- When you are attempting a past paper (or questions from a past paper), complete it without referring to your notes so that you get a true idea of your strengths and weaknesses. Then, go back through the paper using your notes and a different coloured pen to make corrections and changes. After you have done as much as you can on the paper, mark it using the mark scheme. Take notes of any points that you lost marks on.
- Don't just revise the topics that you enjoy and are confident in. If you identify an area that you are weaker in then try to revisit the topic by reviewing your notes and doing some practice questions, then use exam questions to check whether you now understand.
- Return to topics later in your revision to check that you still remember and understand the topic, and to help to ensure that you recall more of the material when you get to the examination.

Now use the revision checklists on the next pages to help guide your revision.

Revision checklists for Cambridge IGCSE (9–1) Mathematics

The tables below can be used as a revision checklist: **It doesn't contain all the detailed knowledge you need to know, just an overview**. For more detail see the syllabus and talk to your teacher.

You can use the tick boxes in the checklists to show when you have revised and are happy that you do not need to return to it. Tick the 'R', 'A', and 'G' column to record your progress. The 'R', 'A' and 'G' represent different levels of confidence, as follows:

- R = RED: means you are really unsure and lack confidence in that area; you might want to focus your revision here and possibly talk to your teacher for help
- A = AMBER: means you are reasonably confident in a topic but need some extra practice
- G = GREEN: means you are very confident in a topic

As your revision progresses, you can concentrate on the RED and AMBER topics, in order to turn them into GREEN topics. You might find it helpful to highlight each topic in red, orange or green to help you prioritise.

You can use the 'Comments' column to:

- add more information about the details for each point
- include a reference to a useful resource
- add learning aids such as rhymes, poems or word play
- highlight areas of difficulty or things that you need to talk to your teacher about.

Click on the relevant link below to go directly to the appropriate checklist:

Core syllabus content

Extended syllabus content

Core syllabus content

Core: Number

Question type	You should be able to	R	A	G	Comments
Number	Identify and use:				
	• natural numbers	☐	☐	☐	
	• integers (positive, negative and zero)	☐	☐	☐	
	• prime numbers	☐	☐	☐	
	• write a number as a product of its prime factors	☐	☐	☐	
	• square numbers	☐	☐	☐	
	• common factors and highest common factor (HCF) of two or more numbers	☐	☐	☐	
	• common multiples and lowest common multiple (LCM) of two or more numbers	☐	☐	☐	
	• rational numbers	☐	☐	☐	
	• irrational numbers (e.g. π, $\sqrt{2}$)	☐	☐	☐	
	• real numbers	☐	☐	☐	
Squares, square roots, cubes and cube roots	Calculate:				
	• squares of numbers	☐	☐	☐	
	• square roots of numbers	☐	☐	☐	
	• cubes of numbers	☐	☐	☐	
	• cube roots of numbers	☐	☐	☐	

Core: Number

Question type	You should be able to	R	A	G	Comments
Directed numbers	Use directed numbers in practical situations, for example temperature changes, flood levels	☐	☐	☐	
Fractions, decimals and percentages	Use the language and notation of simple, vulgar and decimal fractions and percentages in appropriate contexts	☐	☐	☐	
	Recognise equivalent fractions, decimals and percentages	☐	☐	☐	
	Convert between fractions, decimals and percentages	☐	☐	☐	
Ordering	Order quantities by magnitude and demonstrate familiarity with the symbols =, ≠ , >, <, ≥, ≤	☐	☐	☐	
Indices and standard form (links to Algebraic manipulation)	Understand the meaning and rules of indices, including evaluating indices such as 2^5, 5^{-2}, 100^0 and working out calculations such as $2^{-3} \times 2^4$.	☐	☐	☐	
	Use the rules of indices for:				
	• multiplication (addition of indices), e.g. $4^3 \times 4^5$	☐	☐	☐	
	• division (subtraction of indices), e.g. $5^7 \div 5^3$	☐	☐	☐	
	• index numbers raised to an index, e.g. $(4^3)^2$	☐	☐	☐	
	Use the standard form $A \times 10^n$ where n is a positive or negative integer and $1 \leq A < 10$	☐	☐	☐	
	• convert numbers into and out of standard form	☐	☐	☐	
	• calculate with numbers in standard form	☐	☐	☐	

Core: Number

Question type	You should be able to	R	A	G	Comments
Four rules (+ − × ÷)	Use the four rules for calculations with: • whole numbers • decimals • vulgar and mixed fractions • correct ordering of operations (BIDMAS / BODMAS) and use of brackets	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	
Estimates	Make estimates of numbers, quantities and lengths Give approximations to a specified number of: • significant figures • decimal places Round off answers to reasonable accuracy in the context of a given problem	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	
Bounds	Give upper and lower bounds for data given to a specified accuracy, e.g. measured lengths	☐	☐	☐	
Ratio, proportion, rate	Understand ratio Divide a quantity in a given ratio Understand direct and inverse proportion Use scales in practical situations Use common measures of rate Calculate average speed	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	

Core: Number

Question type	You should be able to	R	A	G	Comments
Percentages	Calculate a percentage of a quantity	☐	☐	☐	
	Express one quantity as a percentage of another quantity	☐	☐	☐	
	Calculate percentage increase or decrease	☐	☐	☐	
Use of an electronic calculator	Use a calculator efficiently	☐	☐	☐	
	Check accuracy of calculations	☐	☐	☐	
Time	Calculate time in terms of the 24-hour and 12-hour clock	☐	☐	☐	
	Read:				
	• clocks	☐	☐	☐	
	• dials	☐	☐	☐	
	• timetables	☐	☐	☐	
Money	Calculate using money	☐	☐	☐	
	Convert from one currency to another	☐	☐	☐	

Core: Number

Question type	You should be able to	R	A	G	Comments
Personal and small business finance	Use given data to solve problems on personal and small business finance: • earnings • simple interest • compound interest (you do not need to know the compound interest formula) • discount • profit and loss Extract data from tables and charts	☐	☐	☐	

Core: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Basic algebra	Use letters to express generalised numbers	☐	☐	☐	
	Express basic arithmetic processes algebraically	☐	☐	☐	
	Substitute numbers in formulae	☐	☐	☐	
	Construct simple expressions and set up simple equations	☐	☐	☐	
	Transform simple formulae	☐	☐	☐	
Algebraic manipulation	Manipulate directed numbers	☐	☐	☐	
	Use brackets:				
	• expand a single bracket e.g. $3x(2x - 4y)$	☐	☐	☐	
	• expand a pair of brackets e.g. $(x - 4)(x - 7)$	☐	☐	☐	
	Extract common factors, e.g. factorise $9x^2 + 15xy$	☐	☐	☐	
Rules of indices	Use and interpret positive, negative and zero indices	☐	☐	☐	
	Use the rules of indices, e.g. to simplify algebra such as				
	• $3x^4 \times 5x$	☐	☐	☐	
	• $10x^3 \div 2x^2$	☐	☐	☐	
	• $(x^6)^2$	☐	☐	☐	

Core: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Equations and inequalities	Solve simple linear equations in one unknown	☐	☐	☐	
	Solve simultaneous linear equations in two unknowns	☐	☐	☐	
Number sequences (links to *Squares, square roots, cubes and cube roots*)	Continue a number sequence	☐	☐	☐	
	Recognise patterns in sequences	☐	☐	☐	
	Recognise relationships between difference sequences	☐	☐	☐	
	Find the *n*th term of sequences for:				
	• liner sequences	☐	☐	☐	
	• simple quadratic sequences	☐	☐	☐	
	• cubic sequences	☐	☐	☐	
Practical graphs (links to *Co-ordinate geometry*)	Interpret and use graphs in practical situations including:				
	• travel graphs	☐	☐	☐	
	• conversion graphs	☐	☐	☐	
	Draw graphs from given data	☐	☐	☐	

Core: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Graphs of functions (links to *Co-ordinate geometry*)	Construct tables of values for functions of the form (where *a* and *b* are integer constants): • $ax + b$ • $\pm x^2 + ax + b$ • $\frac{a}{x}$ $(x \neq 0)$ Draw and interpret such graphs Solve linear and quadratic equations approximately by graphical methods	☐	☐	☐	

Core: Geometry

Question type	You should be able to	R	A	G	Comments
Geometrical language	Use and interpret the geometrical terms:				
	• point	☐	☐	☐	
	• line	☐	☐	☐	
	• parallel	☐	☐	☐	
	• perpendicular	☐	☐	☐	
	• bearing	☐	☐	☐	
	• right angle, acute, obtuse and reflex angles	☐	☐	☐	
	• similar	☐	☐	☐	
	• congruent	☐	☐	☐	
	Use and interpret the vocabulary of:				
	• triangles; right-angled, scalene, isosceles, equilateral	☐	☐	☐	
	• quadrilaterals	☐	☐	☐	
	• circles	☐	☐	☐	
	• polygons	☐	☐	☐	
	• simple solid figures including nets	☐	☐	☐	

Core: Geometry

Question type	You should be able to	R	A	G	Comments
Geometrical constructions	Measure lines and angles	☐	☐	☐	
	Construct a triangle given the three sides, using a ruler and a pair of compasses only	☐	☐	☐	
	Construct other simple geometrical figures from given data using a ruler and a protractor	☐	☐	☐	
	Construct, using a straight edge and a pair of compasses only:				
	• angle bisectors	☐	☐	☐	
	• perpendicular bisectors	☐	☐	☐	
Scale drawings	Read and make scale drawings	☐	☐	☐	
Similarity	Calculate lengths of similar figures	☐	☐	☐	
Symmetry	Recognise symmetry properties for triangles, quadrilaterals and circles	☐	☐	☐	
	Recognise line symmetry in two dimensions	☐	☐	☐	
	Recognise and find the order of rotational symmetry in two dimensions	☐	☐	☐	

Core: Geometry

Question type	You should be able to	R	A	G	Comments
Angle properties	Calculate unknown angles using the following geometrical properties (you **must** use the correct geometrical terminology when giving reasons for your answers): • angles at a point • angles at a point on a straight line and intersecting straight lines • angles within parallel lines • angle properties of triangles • angle properties of quadrilaterals • angle properties of regular polygons • angle in a semi-circle • angle between tangent and radius of a circle	☐	☐	☐	
Loci	Use the following loci and the method of intersecting loci for sets of points in two dimensions which are: • at a given distance from a point • at a given distance from a straight line • equidistant from two points • equidistant from two intersecting straight lines	☐	☐	☐	

Core: Mensuration

Question type	You should be able to	R	A	G	Comments
Measures	• Use current units of:				
	• mass	☐	☐	☐	
	• length	☐	☐	☐	
	• area	☐	☐	☐	
	• volume	☐	☐	☐	
	• capacity	☐	☐	☐	
	In practical situations				
	Express quantities in terms of smaller or larger units, including units of area and volume	☐	☐	☐	
	Convert between units, including units of area and volume	☐	☐	☐	
Mensuration (links to *Geometrical constructions*)	Carry out calculations involving:				
	• perimeter and area of a rectangle	☐	☐	☐	
	• perimeter and area of a triangle	☐	☐	☐	
	• perimeter and area of parallelogram	☐	☐	☐	
	• perimeter and area of a trapezium	☐	☐	☐	
	• perimeter and area of compound shapes made by combining				
	• rectangles, triangles, parallelograms and/or trapeziums	☐	☐	☐	

Core: Mensuration

Question type	You should be able to	R	A	G	Comments
Circles	Do calculations involving circumference and area of a circle	☐	☐	☐	
3D shapes	Do calculations involving: • volume of a cuboid, prism and cylinder • surface area of a cuboid and cylinder	☐ ☐	☐ ☐	☐ ☐	
Combining 3D shapes	Carry out calculations involving: • area of a compound shape made by combining cuboids, prisms and/or cylinders • volume of a compound shape made by combining cuboids, prisms and/or cylinders	☐ ☐	☐ ☐	☐ ☐	

Core: Co-ordinate geometry

Question type	You should be able to	R	A	G	Comments
Straight line graphs (links to *Practical graphs*)	Work with Cartesian co-ordinates in two dimensions	☐	☐	☐	
Gradient	Find the gradient of a straight line when graph is given	☐	☐	☐	
Equation of a straight line	Interpret and obtain the equation of a straight line graph in the form $y = mx + c$	☐	☐	☐	
Equation of a parallel line	Determine the equation of a straight line parallel to a given line e.g. find the equation of a line parallel to $y = 4x - 1$ that passes through (0, –3)	☐	☐	☐	

Core: Trigonometry

Question type	You should be able to	R	A	G	Comments
Bearings	Use and interpret three-figure bearings measured clockwisefrom the North, i.e. 000°–360°	☐	☐	☐	
Trigonometry	Find unknown sides and/or angles in right-angled triangles by applying: • Pythagoras' theorem • sine, cosine and tangent ratios for acute angles Give your answers in degrees to one decimal place when the answer is a decimal	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	

Core: Matrices and transformations

Question type	You should be able to	R	A	G	Comments
Vectors in two dimensions (links to *Trigonometry*)	Describe a translation by using a vector represented by, e.g. $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$ or **a**	☐	☐	☐	
	Add and subtract vectors	☐	☐	☐	
	Multiply a vector by a scalar	☐	☐	☐	
Transformations	Reflect simple plane figures in horizontal or vertical lines	☐	☐	☐	
	Rotate simple plane figures through multiples of 90° about:				
	• the origin	☐	☐	☐	
	• their vertices	☐	☐	☐	
	• the midpoints of their sides	☐	☐	☐	
	Construct translations of simple plane figures	☐	☐	☐	
	Construct enlargements of simple plane figures (positive and fractional scale factors)	☐	☐	☐	
	Recognise and describe:				
	• reflections	☐	☐	☐	
	• rotations	☐	☐	☐	
	• translations	☐	☐	☐	
	• enlargements (positive and fractional scale factors)	☐	☐	☐	

Core: Probability

Question type	You should be able to	R	A	G	Comments
Calculate probability (links to *Four rules*)	Calculate the probability of a single event as a fraction decimal or percentage Solve problems involving probability by extracting and using information from tables or graphs	☐ ☐	☐ ☐	☐ ☐	
Probability scale	Understand and use the probability scale from 0 to 1	☐	☐	☐	
Event probability	Understand that the probability of an event occurring = 1 - the probability of the event **not** occurring	☐	☐	☐	
Relative frequency	Understand relative frequency as an estimate of probability	☐	☐	☐	

Core: Statistics

Question type	What I need to do	R	A	G	Comments
Data collection	Collect, classify and tabulate statistical data Read, interpret and draw simple inferences from tables and statistical diagrams	☐ ☐	☐ ☐	☐ ☐	
Data analysis diagrams	Construct and use: • bar charts • pie charts • pictograms • simple frequency distributions • histograms with equal intervals • scatter diagrams (with lines of best fit)	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	
Mean, median, mode and range	Calculate, for individual and discrete data • mean • median • mode • range and distinguish between the purpose for which they are used	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	
Correlation	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram	☐	☐	☐	
Line of best fit	Draw a straight line of best fit by eye	☐	☐	☐	

Extended syllabus content (includes required Core content)

Extended: Number

Question type	You should be able to	R	A	G	Comments
Number	Identify and use:				
	• natural numbers	☐	☐	☐	
	• integers (positive, negative and zero)	☐	☐	☐	
	• prime numbers	☐	☐	☐	
	• write a number as a product of its prime factors	☐	☐	☐	
	• square numbers	☐	☐	☐	
	• common factors and highest common factor (HCF) of two or more numbers	☐	☐	☐	
	• common multiples and lowest common multiple (LCM) of two or more numbers	☐	☐	☐	
	• rational numbers	☐	☐	☐	
	• irrational numbers (e.g. π, $\sqrt{2}$)	☐	☐	☐	
	• real numbers	☐	☐	☐	

Extended: Number

Question type	You should be able to		R	A	G	Comments
Set notation and language	Use language, notation and Venn diagrams to describe sets and represent relationships between sets.					
	Definition of sets, e.g.					
	$A = \{x: x \text{ is a natural number}\}$					
	$B = \{(x,y): y = mx + c\}$					
	$C = \{x: a \leq x \leq b\}$					
	$D = \{a, b, c, \ldots\}$					
	Notation, e.g.					
	number of elements in set A	n(A)				
	'is an element of'	$\in$				
	'is not an element of'	$\notin$				
	complement of set A	A'				
	the empty set	$\emptyset$				
	the universal set					
	A is a subset of B	$A \subseteq B$				
	A is a proper subset of B	$A \subset B$				
	A is not a subset of B	$A \nsubseteq B$				
	A is not a proper subset of B	$A \not\subset B$				
	union of A and B	$A \cup B$				
	intersection of A and B	$A \cap B$				

Extended: Number

Question type	You should be able to	R	A	G	Comments
Squares, square roots, cubes and cube roots	Calculate: • squares of numbers	☐	☐	☐	
	• square roots of numbers	☐	☐	☐	
	• cubes of numbers	☐	☐	☐	
	• cube roots of numbers	☐	☐	☐	
Directed numbers	Use directed numbers in practical situations, for example temperature changes, flood levels	☐	☐	☐	
Fractions, decimals and percentages	Use the language and notation of simple, vulgar and decimal fractions and percentages in appropriate contexts	☐	☐	☐	
	Recognise equivalent fractions, decimals and percentages	☐	☐	☐	
	Convert between fractions, decimals and percentages	☐	☐	☐	
	Convert recurring decimals (e.g. 0.7) to fractions	☐	☐	☐	
Ordering	Order quantities by magnitude and demonstrate familiarity with the symbols =, ≠ , >, <, ≥, ≤	☐	☐	☐	

Extended: Number

Question type	You should be able to	R	A	G	Comments
Indices and standard form (links to *Algebraic manipulation*)	Understand the meaning and rules of indices, including evaluating indices, e.g. 5^{-2} and doing calculations such as $2^{-3} \times 2^{4}$.	☐	☐	☐	
	Understand the meaning and rules of fractional indices	☐	☐	☐	
	Evaluate fractional indices (positive and negative)	☐	☐	☐	
	Use the rules of indices for: • multiplication (addition of indices), e.g. $4^{3} \times 4^{5}$	☐	☐	☐	
	• division (subtraction of indices), e.g. $5^{7} \div 5^{3}$	☐	☐	☐	
	• index numbers raised to an index, e.g. $(4^{3})^{2}$	☐	☐	☐	
	Use the standard form $A \times 10^{n}$ where n is a positive or negative integer and $1 \leqslant A < 10$ • convert numbers into and out of standard form	☐	☐	☐	
	• calculate with numbers in standard form	☐	☐	☐	
Four rules (+ - × ÷)	Use the four rules for calculations with: • whole numbers	☐	☐	☐	
	• decimals	☐	☐	☐	
	• vulgar and mixed fractions	☐	☐	☐	
	• correct ordering of operations (BIDMAS / BODMAS) and use of brackets	☐	☐	☐	

Extended: Number

Question type	You should be able to	R	A	G	Comments
Estimates	Make estimates of numbers, quantities and lengths	☐	☐	☐	
	Give approximations to a specified number of:				
	• significant figures	☐	☐	☐	
	• decimal places	☐	☐	☐	
	Round off answers to reasonable accuracy in the context of a given problem	☐	☐	☐	
Bounds	Give upper and lower bounds for data given to a specified accuracy, e.g. measured lengths	☐	☐	☐	
	Obtain appropriate upper and lower bounds to solutions of simple problems given data to a specified accuracy, e.g. calculate the lower and upper bounds for the area and perimeter of a rectangle	☐	☐	☐	
Ratio, proportion, rate (links to *Direct and inverse proportion*)	Understand ratio	☐	☐	☐	
	Divide a quantity in a given ratio	☐	☐	☐	
	Understand direct and inverse proportion	☐	☐	☐	
	Use scales in practical situations	☐	☐	☐	
	Use common measures of rate	☐	☐	☐	
	Calculate average speed	☐	☐	☐	

Extended: Number

Question type	What I need to do	R	A	G	Comments
Percentages	Calculate a percentage of a quantity	☐	☐	☐	
	Express one quantity as a percentage of another quantity	☐	☐	☐	
	Calculate percentage increase or decrease	☐	☐	☐	
	Calculate reverse percentages, e.g. finding the cost price given the selling price and the percentage profit	☐	☐	☐	
Use of an electronic calculator	Use a calculator efficiently	☐	☐	☐	
	Check accuracy of calculations	☐	☐	☐	
Time	Calculate times in terms of the 24-hour and 12-hour clock	☐	☐	☐	
	Read clocks, dials and timetables	☐	☐	☐	
Money	Calculate using money	☐	☐	☐	
	Convert from one currency to another	☐	☐	☐	

Extended: Number

Question type	You should be able to	R	A	G	Comments
Personal and small business finance	Use given data to solve problems on personal and small business finance: • earnings • simple interest • compound interest – you must **know** the compound interest formula Value of investment = $= P\left(1 + \frac{r}{100}\right)^n$ where P is the amount invested, r is the percentage rate of interest and n is the number of years of compound interest. • discount • profit and loss Extract data from tables and charts	☐	☐	☐	
Exponential growth and decay	Use exponential growth and decay in relation to population and finance, e.g. depreciation, bacteria growth				

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Basic algebra	Use letters to express generalised numbers	☐	☐	☐	
	Express basic arithmetic processes algebraically	☐	☐	☐	
	Substitute numbers in formulae	☐	☐	☐	
	Construct simple expressions and set up simple equations	☐	☐	☐	
	Transform complicated equations and formulae, e.g. formulae where the subject appears twice	☐	☐	☐	
Algebraic manipulation	Manipulate directed numbers	☐	☐	☐	
	Use brackets:				
	• expand a single bracket e.g. $3x(2x - 4y)$	☐	☐	☐	
	• expand a pair of brackets e.g. $(x - 4)(x - 7)$	☐	☐	☐	
	Extract common factors, e.g. factorise $9x^2 + 15xy$	☐	☐	☐	
	Expand products of algebraic expressions	☐	☐	☐	
	Factorise, where possible, expressions of the form:				
	• $ax + bx + kay + kby$	☐	☐	☐	
	• $a^2x^2 - b^2y^2$	☐	☐	☐	
	• $a^2 + 2ab + b^2$	☐	☐	☐	
	• $ax^2 + bx + c$	☐	☐	☐	

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Algebraic fractions	Manipulate algebraic fractions, e.g. • $\frac{x}{3} + \frac{x-4}{2}$ • $\frac{2x}{3} + \frac{3(x-5)}{2}$ • $\frac{3a}{4} + \frac{5ab}{3}$ • $\frac{3a}{4} \div \frac{9a}{10}$ • $\frac{1}{x-2} + \frac{2}{x-3}$ Factorise and simplify rational expressions (algebraic fractions) such as $\frac{x^2 - 2x}{x^2 - 5x + 6}$	☐	☐	☐	
Rules of indices	Use and interpret positive, negative and zero indices Use and interpret fractional indices, e.g. solve $32^x = 2$ Use the rules of indices, e.g. to simplify: $3x^{-4} \times \frac{2}{3}x^{\frac{1}{2}}$ $\frac{2}{5}x^{\frac{1}{2}} \div 2x^{-2}$ $\left(\frac{2x^5}{3}\right)^3$	☐	☐	☐	

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Equations and inequalities	Solve simple linear equations in one unknown	☐	☐	☐	
	Solve simultaneous linear equations in two unknowns	☐	☐	☐	
	Solve quadratic equations by:				
	• factorisation	☐	☐	☐	
	• completing the square	☐	☐	☐	
	• using the quadratic formula	☐	☐	☐	
	Solve simple linear inequalities	☐	☐	☐	
Linear programming	Represent inequalities graphically, including using the conventions of				
	• broken lines for strict inequalities	☐	☐	☐	
	• shading unwanted regions	☐	☐	☐	
	Solve simple linear programming problems using graphical representations of inequalities	☐	☐	☐	

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Number sequences (links to *Squares, square roots, cubes and cube roots*)	Continue a number sequence	☐	☐	☐	
	Recognise patterns in sequences	☐	☐	☐	
	Recognise relationships between difference sequences	☐	☐	☐	
	Find the *n*th term of sequences for:				
	• linear sequences	☐	☐	☐	
	• quadratic sequences	☐	☐	☐	
	• cubic sequences	☐	☐	☐	
	• exponential sequences	☐	☐	☐	
	Find the *n*th term of for sequences that are a simple combination of the sequences listed above	☐	☐	☐	
Direct and inverse proportion (links to Ratio, proportion, rate)	Express direct proportion algebraically	☐	☐	☐	
	Express inverse proportion algebraically	☐	☐	☐	
	Use algebraic expressions of direct and inverse proportion to find unknown quantities	☐	☐	☐	
Practical graphs (links to *Coordinate geometry*)	Interpret and use graphs in practical situations including:				
	• travel graphs	☐	☐	☐	
	• conversion graphs	☐	☐	☐	
	Draw graphs from given data	☐	☐	☐	

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Practical graphs (links to *Coordinate geometry*) continued	Apply the idea of rate of change to: • distance–time graphs • speed–time graphs • acceleration and deceleration Calculate distance travelled as an area under a linear speed–time graph	☐	☐	☐	
Graphs of functions (links to *Coordinate geometry*)	Construct tables of values and draw graphs for functions of the form: • ax^n where a is a rational constant and $n = -2, -1, 0, 1, 2, 3$ and simple sums of not more than three of these • a^x where a is a positive integer Solve associated equations approximately by graphical methods Draw and interpret graphs representing exponential growth and decay problems	☐	☐	☐	
Gradients of curves	Estimate gradients of curves by drawing tangents	☐	☐	☐	
Function notation	Use function notation, e.g. $f(x) = 3x - 5$, $f: x \mapsto 3x - 5$ to describe simple functions Find inverse functions $f^{-1}(x)$ Form composite functions as defined by $gf(x) = g(f(x))$	☐	☐	☐	

Extended: Geometry

Question type	You should be able to	R	A	G	Comments
Geometrical language	Use and interpret the geometrical terms:				
	• point	☐	☐	☐	
	• line	☐	☐	☐	
	• parallel	☐	☐	☐	
	• perpendicular	☐	☐	☐	
	• bearing	☐	☐	☐	
	• right angle, acute, obtuse and reflex angles	☐	☐	☐	
	• similar	☐	☐	☐	
	• congruent	☐	☐	☐	
	Use and interpret the vocabulary of:				
	• triangles; right-angled, scalene, isosceles, equilateral	☐	☐	☐	
	• quadrilaterals	☐	☐	☐	
	• circles	☐	☐	☐	
	• polygons	☐	☐	☐	
	• simple solid figures including nets	☐	☐	☐	

Extended: Geometry

Question type	What I need to do	R	A	G	Comments
Geometrical constructions	Measure lines and angles	☐	☐	☐	
	Construct a triangle given the three sides, using a ruler and a pair of compasses only	☐	☐	☐	
	Construct other simple geometrical figures from given data using a ruler and a protractor	☐	☐	☐	
	Construct, using a straight edge and a pair of compasses only:				
	• angle bisectors	☐	☐	☐	
	• perpendicular bisectors	☐	☐	☐	
Scale drawings	Read and make scale drawings	☐	☐	☐	
Similarity	Calculate lengths of similar figures	☐	☐	☐	
	Use relationships between areas of similar triangles and in similar figures	☐	☐	☐	
	Use relationships between volumes and surface areas of similar solids	☐	☐	☐	
Symmetry	Recognise symmetry properties for triangles, quadrilaterals and circles	☐	☐	☐	
	Recognise line symmetry in two dimensions	☐	☐	☐	
	Recognise and find the order of rotational symmetry in two dimensions	☐	☐	☐	

Extended: Geometry

Question type	You should be able to	R	A	G	Comments
Symmetry (continued)	Use the following symmetry properties of circles: • equal chords are equidistant from the centre • perpendicular bisector of a chord passes through the centre • tangents from an external point are equal in length Recognise and use symmetry properties of: • prism – including the cylinder • pyramid – including the cone	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	

Extended: Geometry

Question type	You should be able to	R	A	G	Comments
Angle properties	Calculate unknown angles using the following geometrical properties (you **must** use the correct geometrical terminology when giving reasons for your answers):				
	• angles at a point	☐	☐	☐	
	• angles at a point on a straight line and intersecting straight lines	☐	☐	☐	
	• angles formed within parallel lines	☐	☐	☐	
	• angle properties of triangles and quadrilaterals	☐	☐	☐	
	• angle properties of regular polygons	☐	☐	☐	
	• angle in a semi-circle	☐	☐	☐	
	• angle between tangent and radius of a circle	☐	☐	☐	
	• angles properties of irregular polygons	☐	☐	☐	
	• angle at the centre of a circle is twice the angle at the circumference	☐	☐	☐	
	• angles in the same segment are equal	☐	☐	☐	
	• angles in opposite segments are supplementary	☐	☐	☐	
	• angles in cyclic quadrilaterals	☐	☐	☐	

Extended: Geometry

Question type	You should be able to	R	A	G	Comments
Loci	Use the following loci and the method of intersecting loci for sets of points in two dimensions which are: • at a given distance from a point • at a given distance from a straight line • equidistant from two points • equidistant from two intersecting straight lines	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	

Extended: Mensuration

Question type	What I need to do	R	A	G	Comments
Measures	Use current units of: • mass • length • area • volume • capacity In practical situations • Express quantities in terms of smaller or larger units, including units of area and volume • Convert between units, including units of area and volume	☐	☐	☐	
Mensuration (links to *Geometrical constructions*)	Carry out calculations involving: • perimeter and area of a rectangle • perimeter and area of a triangle • perimeter and area of parallelogram • perimeter and area of a trapezium • perimeter and area of compound shapes made by combining rectangles, triangles, parallelograms and/or trapeziums	☐	☐	☐	

Core: Mensuration

Question type	You should be able to	R	A	G	Comments
Circles	Carry out calculations involving circumference and area of a circle	☐	☐	☐	
	Solve problems involving arc length and sector area of a circle as fractions of the circumference and area of a circle	☐	☐	☐	
3D shapes	Carry out calculations involving: • volume of a cuboid, prism and cylinder	☐	☐	☐	
	• surface area of a cuboid and cylinder	☐	☐	☐	
	Carry out calculations involving: • surface area and volume of a sphere	☐	☐	☐	
	• surface area and volume of a pyramid	☐	☐	☐	
	• surface area and volume of a cone **(Formulae will be given for the surface area and volume of the sphere, pyramid and cone)**	☐	☐	☐	
Combining 3D shapes	Carry out calculations involving: • area of a compound shape made by combining cuboids, prisms and/or cylinders	☐	☐	☐	
	• volume of a compound shape made by combining cuboids, prisms and/or cylinders	☐	☐	☐	

Core: Co-ordinate geometry

Question type	What I need to do	R	A	G	Comments
Co-ordinates (links to *Practical graphs*)	Work with Cartesian co-ordinates in two dimensions	☐	☐	☐	
Straight lines	Find the gradient of a straight line graph Calculate the gradient of a straight line from the co-ordinates of two points on it	☐ ☐	☐ ☐	☐ ☐	
Length and midpoint	Calculate the length and the co-ordinates of the midpoint of a straight line from the co-ordinates of its end points	☐	☐	☐	
Equation of a straight line	Interpret and obtain the equation of a straight line graph in the form $y = mx + c$	☐	☐	☐	
Equation of a parallel line	Determine the equation of a straight line parallel to a given line, e.g. find the equation of a line parallel to $y = 4x - 1$ that passes through $(0, -3)$	☐	☐	☐	
Gradients of related lines	Find the gradient of parallel and perpendicular lines, e.g. • find the gradient of a line perpendicular to $y = 3x + 1$ • find the equation of a line perpendicular to one passing through the co-ordinates $(1, 3)$ and $(-2, -9)$.	 ☐ ☐	 ☐ ☐	 ☐ ☐	

Core: Trigonometry

Question type	You should be able to	R	A	G	Comments
Bearings	Use and interpret three-figure bearings measured clockwise from the North, i.e. 000°–360°	☐	☐	☐	
Trigonometry	Find unknown sides and/or angles in right-angled triangles by applying:				
	• Pythagoras' theorem	☐	☐	☐	
	• sine, cosine and tangent ratios for acute angles	☐	☐	☐	
	Solve trigonometric problems in two dimensions involving angles of elevation and depression	☐	☐	☐	
	Extend sine and cosine values to angles between 90° and 180°	☐	☐	☐	
	Give your answers in degrees to one decimal place when the answer is a decimal	☐	☐	☐	
Trigonometric formulae	Solve problems using the sine and cosine rules for any triangle	☐	☐	☐	
	Find the area of any triangle using Area of a triangle = $\frac{1}{2}ab\sin C$	☐	☐	☐	
Application to 3D	Solve simple trigonometric problems in three dimensions including angle between a line and a plane	☐	☐	☐	

Core: Matrices and transformations

Question type	You should be able to	R	A	G	Comments
Vectors in two dimensions (links to *Trigonometry*)	Describe a translation by using a vector represented by, e.g. $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$ or **a**	☐	☐	☐	
	Add and subtract vectors	☐	☐	☐	
	Multiply a vector by a scalar	☐	☐	☐	
Transformations	Reflect simple plane figures in horizontal or vertical lines	☐	☐	☐	
	Rotate simple plane figures through multiples of 90° about:				
	• the origin	☐	☐	☐	
	• their vertices	☐	☐	☐	
	• the midpoints of their sides	☐	☐	☐	
	Construct translations of simple plane figures	☐	☐	☐	
	Construct enlargements of simple plane figures (positive, fractional and negative scale factors)	☐	☐	☐	
	Recognise and describe:				
	• reflections	☐	☐	☐	
	• rotations	☐	☐	☐	
	• translations	☐	☐	☐	
	• enlargements (positive, fractional and negative scale factors)	☐	☐	☐	

Core: Matrices and transformations

Question type	You should be able to	R	A	G	Comments
Combining vectors	Calculate the magnitude of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$ as $\sqrt{x^2+y^2}$ (using Pythagoras' theorem)	☐	☐	☐	
	Understand that magnitude is denoted by modulus signs, e.g. $\lvert\overrightarrow{AB}\rvert$ or $\lvert\mathbf{a}\rvert$	☐	☐	☐	
	Represent vectors by directed line segments	☐	☐	☐	
	Use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors	☐	☐	☐	
	Use position vectors	☐	☐	☐	
	In your answers, remember to indicate a vector in some definite way, e.g. with an arrow ($\overrightarrow{AB}$), or underling ($\underline{a}$)	☐	☐	☐	
Matrices	Display information in a matrix of any order	☐	☐	☐	
	Calculate the sum and product (where possible) of two matrices	☐	☐	☐	
	Multiply a matrix by a scalar quantity and calculate the product	☐	☐	☐	
	Use the algebra of 2 × 2 matrices including the:				
	• zero matrix	☐	☐	☐	
	• identity matrix	☐	☐	☐	
	Calculate the:				
	• determinant, $\lvert\mathbf{A}\rvert$, of a matrix	☐	☐	☐	
	• inverse, $\mathbf{A}^{-1}$ of a non-singular matrix	☐	☐	☐	

Core: Matrices and transformations

Question type	You should be able to	R	A	G	Comments
Transformation matrices, continued	Use the following transformations of the plane: • reflection (M)	☐	☐	☐	
	• rotation (R)	☐	☐	☐	
	• translation (T)	☐	☐	☐	
	• enlargement (E)	☐	☐	☐	
	• combinations of the above transformations				
	Understand in combinations of transformations, that if M(a) = b and R(b) = c, then RM(a) = c (i.e., MR(a) means apply R then M)	☐ ☐	☐ ☐	☐ ☐	
	Identify and give precise descriptions of transformations connecting given figures	☐	☐	☐	
	Describe transformations using: • co-ordinates	☐	☐	☐	
	• matrices (**not** singular matrices)	☐	☐	☐	

Core: Probability

Question type	You should be able to	R	A	G	Comments
Probability (links to *Four rules*)	Calculate the probability of a single event as a fraction decimal or percentage Solve problems involving probability by extracting and using information from tables or graphs	☐ ☐	☐ ☐	☐ ☐	
Probability scale	Understand and use the probability scale from 0 to 1	☐	☐	☐	
Event probability	Understand that the probability of an event occurring = 1 - the probability of the event not occurring				
Relative frequency	Understand relative frequency as an estimate of probability				
Combined events	Calculate the probability of simple combined events using: • possibility diagrams • tree diagrams	 ☐ ☐	 ☐ ☐	 ☐ ☐	

Extended: Statistics

Question type	What I need to do	R	A	G	Comments
Data collection	Collect, classify and tabulate statistical data Read, interpret and draw simple inferences from tables and statistical diagrams	☐ ☐	☐ ☐	☐ ☐	
Data analysis diagrams	Construct and use: • bar charts • pie charts • pictograms • simple frequency distributions • histograms with equal intervals • histograms with unequal intervals (areas are proportional to frequencies and vertical axis is frequency density) • scatter diagrams (with lines of best fit)	 ☐ ☐ ☐ ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Mean, median, mode and range	Calculate, for individual and discrete data • mean • median • mode • range and distinguish between the purpose for which they are used	 ☐ ☐ ☐ ☐ 	 ☐ ☐ ☐ ☐ 	 ☐ ☐ ☐ ☐ 	

Extended: Statistics

Question type	You should be able to	R	A	G	Comments
Grouped and continuous data	Calculate an estimate of the mean for grouped and continuous data	☐	☐	☐	
	Identify the modal class from a grouped frequency distribution	☐	☐	☐	
Frequency diagrams	Construct and use cumulative frequency diagrams	☐	☐	☐	
	Estimate and interpret from a cumulative frequency diagram:				
	• the median	☐	☐	☐	
	• percentiles	☐	☐	☐	
	• quartiles	☐	☐	☐	
	• inter-quartile range	☐	☐	☐	
Correlation	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram	☐	☐	☐	
Line of best fit	Draw a straight line of best fit by eye	☐	☐	☐	

Cambridge Assessment International Education
1 Hills Road, Cambridge, CB1 2EU, United Kingdom
t: +44 1223 553554 f: +44 1223 553558
e: **info@cambridgeinternational.org** **www.cambridgeinternational.org**