Cambridge Assessment International Education

Interactive

Interactive Learner Guide

Cambridge IGCSE™ / Cambridge IGCSE™(9–1) Mathematics 0580 / 0980

For examination from 2020

Cambridge Pathway

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Contents

About this guide

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

It will help you to:

- ✓ understand what skills you should develop by taking this course
- ✓ understand how you will be assessed
- ✓ understand what we are looking for in the answers you write
- ✓ plan your revision programme
- ✓ revise, by providing revision tips and an interactive revision checklist (Section 6).

Key benefits

The course will help you to build your skills and knowledge across a range of mathematical techniques. You will be able to develop your problem solving and reasoning skills in a variety of situations.

The Extended course will provide you with a strong foundation to continue to study mathematics qualifications beyond IGCSE. The Core course will equip you with skills needed to support your learning in other subjects and in your general working life.

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. Highlighted cells show Extended-only content.

> 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.

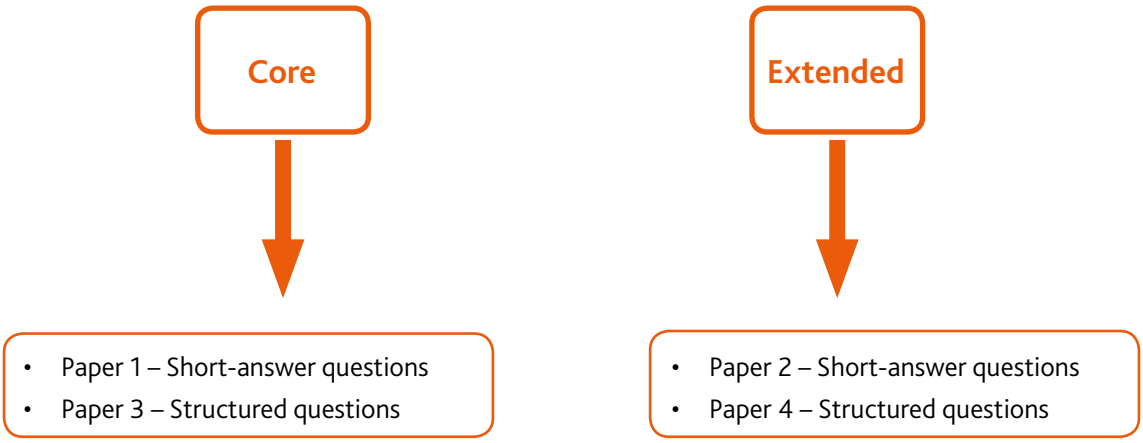
Ask your teacher for more detail about each topic, including the differences between the Core and Extended courses. You can also find more detail in the revision checklists in Section 6 of this guide.

Topic	Overview
Number	Number, sets and Venn diagrams, squares and cubes, directed numbers, fractions, decimals and percentages, ordering, indices, 'four rules', estimates, bounds, ratio, proportion, rate, percentage, time, money and finance.
	Growth and decay **(Extended only)**.
Algebra and graphs	Basic algebra, algebraic manipulation, equations, formulae sequences, drawing, sketching and interpreting graphs of functions
	Algebraic fractions, harder simultaneous equations, proportion, linear programming, functions, gradients of curves, derived functions and differentiation **(Extended only)**.
Co-ordinate geometry	Straight-line graphs
Vectors and transformations	Vectors (column), transformations
	Magnitude of a vector, represent vectors by directed line segments, position vectors **(Extended only)**.
Geometry	Language, construction, symmetry, angle properties, congruence, similarity
Mensuration	Measures, mensuration
Trigonometry	Bearings, trigonometry in right-angled triangles
	Sine rule, cosine rule, trig graphs, solving simple trig equations **(Extended only)**.
Probability	Probability
	Conditional probability **(Extended only)**.
Statistics	Statistics

Make sure you always check the latest syllabus, which is available at www.cambridgeinternational.org

Section 2: How you will be assessed

You will be assessed at the end of the course using two written examinations. The papers that you will sit are different for the Core and Extended courses.



Make sure you find out from your **teacher** which course you will be following.

Components at a glance

The table summarises the key information about each component.

Component		How long and how many marks	Skills assessed	Percentage of the qualification
Core	Paper 1 (Short-answer questions)	1 hour 56 marks	Mathematical techniques as listed in the Core syllabus, and applying those techniques to solve problems.	35%
	Paper 3 (Structured questions)	2 hours 104 marks		65%
Extended	Paper 2 (Short-answer questions)	1 hour 30 minutes 70 marks	Mathematical techniques as listed in the Core and Extended syllabus, and applying those techniques to solve problems.	35%
	Paper 4 (Structured questions)	2 hours 30 minutes 130 marks		65%

About the components

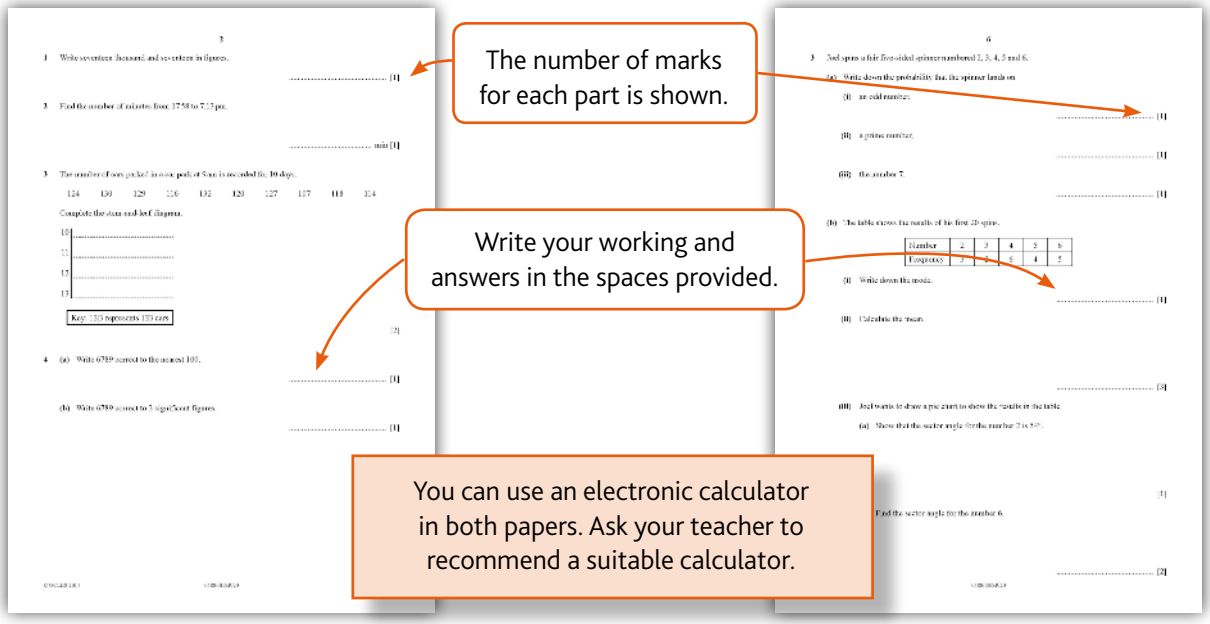
It is important that you understand the different types of question in each paper, so you know what to expect.

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

You need to answer **all** questions on each paper.

Paper 1

Paper 3

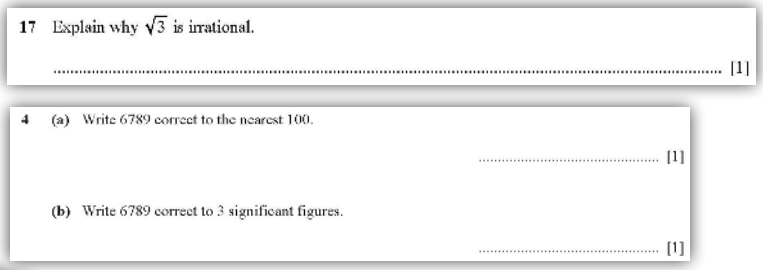


The number of marks for each part is shown.

Write your working and answers in the spaces provided.

You can use an electronic calculator in both papers. Ask your teacher to recommend a suitable calculator.

Paper 1 contains lots of short-answer questions. These are usually worth 1–3 marks each. Some might be broken up into two parts.



17 Explain why $\sqrt{3}$ is irrational.

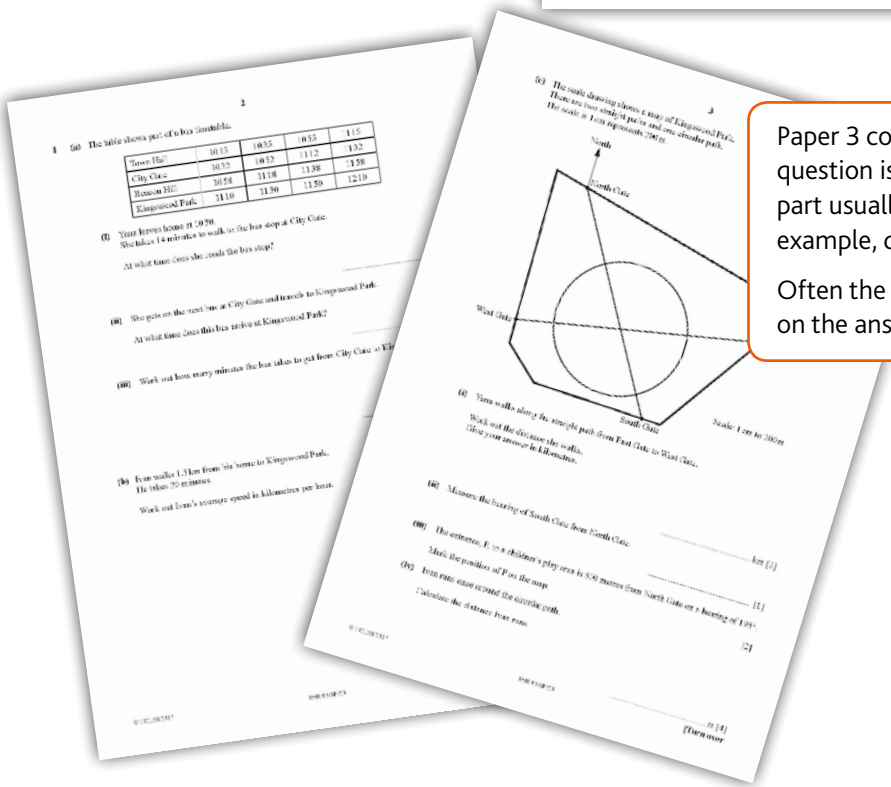
..... [1]

4 (a) Write 6789 correct to the nearest 100.

..... [1]

(b) Write 6789 correct to 3 significant figures.

..... [1]



Paper 3 contains structured questions. Each question is split into many parts, with each part usually being worth 1–4 marks. Here for example, question 1 is split over two pages.

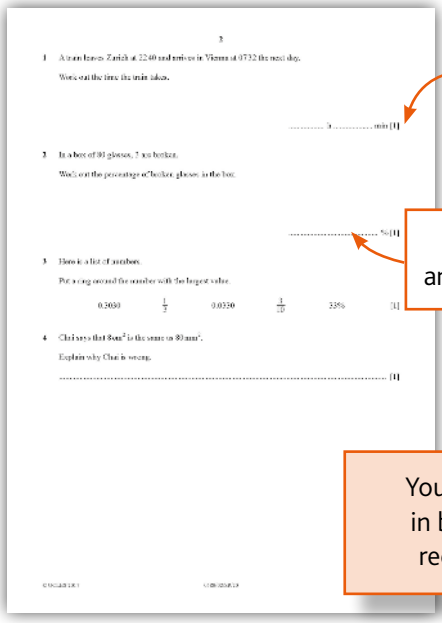
Often the answers to later parts will depend on the answers to earlier parts.

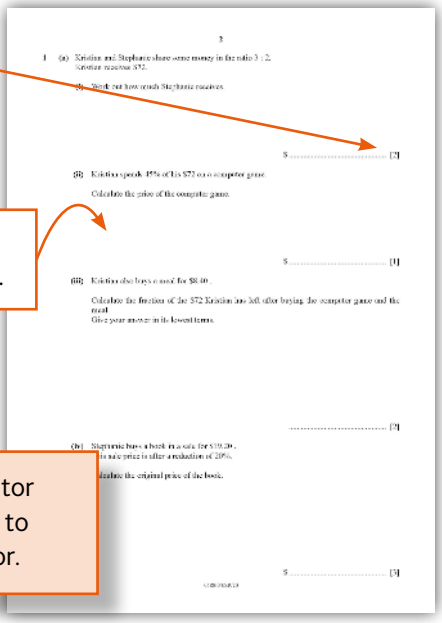
Extended: Paper 2 (Short–answer questions) and Paper 4 (Structured questions)

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

Paper 2

Paper 4



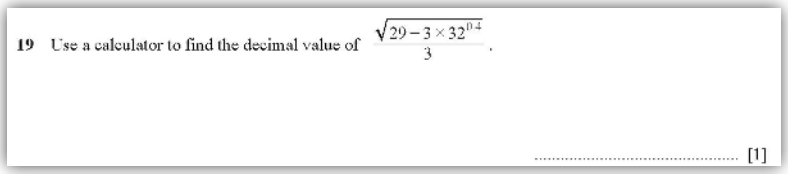


The number of marks for each part is shown.

Write your working and answers in the spaces provided.

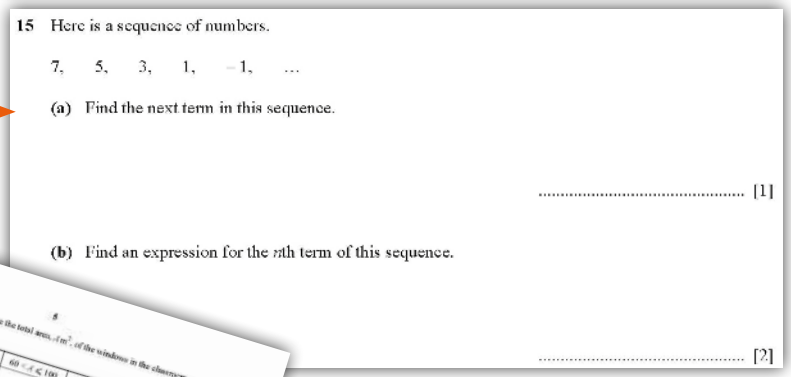
You can use an electronic calculator in both papers. Ask your teacher to recommend a suitable calculator.

Paper 2 questions are short-answer questions. Most questions are worth 1–3 marks, with some being worth 4 or 5 marks. Some questions might be broken up into two parts.



19 Use a calculator to find the decimal value of $\frac{\sqrt{29-3\times32^{0.4}}}{3}$.

..... [1]



15 Here is a sequence of numbers.

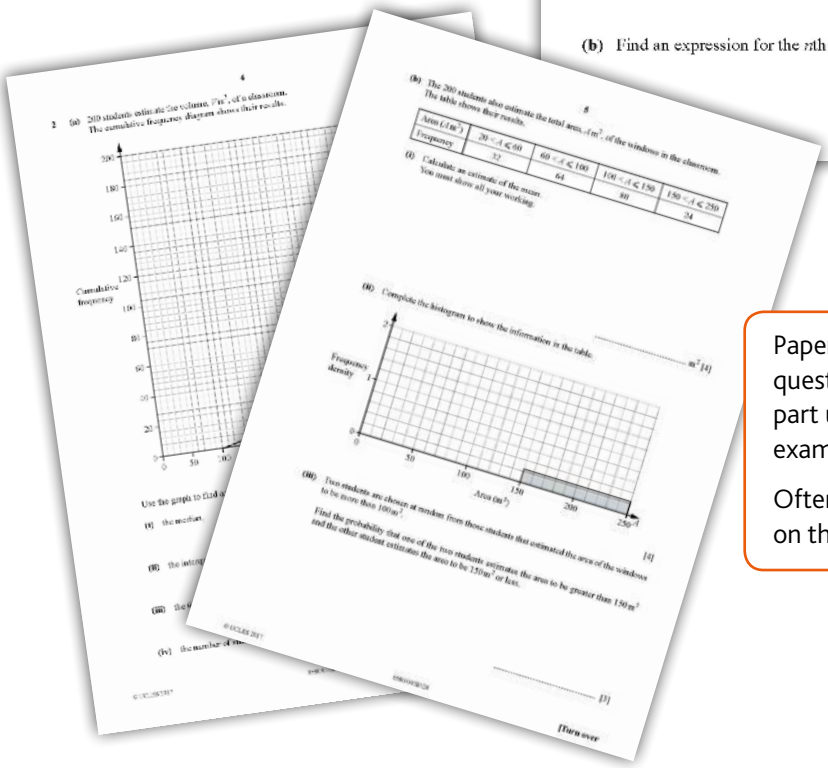
7, 5, 3, 1, −1, ...

(a) Find the next term in this sequence.

..... [1]

(b) Find an expression for the nth term of this sequence.

..... [2]



Paper 4 contains structured questions. Each question is split into many parts, with each part usually being worth 1–6 marks. Here for example, question 2 is split over two pages.

Often the answers to later parts will depend on the answers to earlier parts.

General advice for all Papers

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:

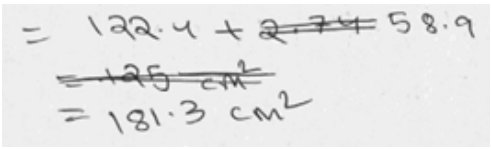
   - give your answer to **three significant figures** 12.3 ✓ 12.298 ✗

   - if the answer is in degrees, then give it to **one decimal place** 23.1° ✓ 23° ✗

3. Include **units** with your answers if they are not given on the paper. For example, 1 kg of apples costs … £1.20 ✓ 1.20 ✗

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

5. If you make a mistake, clearly cross out any working or answers that you do **not** want the examiner to mark.



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. For lengths, areas and volumes, give answers in decimals (not in surds or in terms of π) **unless** you are told to given an exact answer.

Use the value of π from your calculator, or use **3.142**, which is given on the front page of the question paper.

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

If you need more space, ask for extra of paper and clearly indicate where the rest of the answer is written. On the additional paper, make it clear which questions(s) you are answering.

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). There are two AOs for this course.

AO1	AO2
Demonstrate knowledge and understanding of mathematical techniques	**Reason, interpret and communicate mathematically when solving problems**

AO1 Demonstrate knowledge and understanding of mathematical techniques

You need to show that you can recall and apply mathematical knowledge, terminology and definitions to carry out single or multi-step solutions in mathematical and everyday situations.

This means that you need to show that you can:

- organise, process and present information accurately in written, tabular, graphical and diagrammatic forms

  Use tables, graphs and diagrams

- use and interpret mathematical notation correctly
- perform calculations and procedures by suitable methods, including using a calculator
- understand systems of measurement in everyday use and make use of these
- estimate, approximate and work to degrees of accuracy appropriate to the context and convert between equivalent numerical forms

  An example of 'degress of accuracy' include significant figures or decimal places.

  An example of converting between 'equivalent numerical forms' include between fractions, decimals and percentages; or between normal numbers and standard form.

- use geometrical instruments to measure and to draw to an acceptable degree of accuracy

  e.g. a pair of compasses, a protractor and a ruler.

- recognise and use spatial relationships in two and three dimensions.

AO1 is assessed in all papers.

AO2 Reason, interpret and communicate mathematically when solving problems

You need to demonstrate that you can analyse a problem, select a suitable strategy and apply appropriate techniques to obtain a solution.

This means that you need to show that you can:

- make logical deductions, make inferences and draw conclusions from given mathematical data
- recognise patterns and structures in a variety of situations, and form generalisations
- present arguments and chains of reasoning in a logical and structured way
- interprete and communicate information accurately and change from one form of presentation to another
- assesses the validity of an argument and critically evaluate a given way of presenting information
- solve unstructured problems by putting them into a structured form involving a series of processes
- apply combinations of mathematical skills and techniques using connections between different areas of mathematics in problem solving
- interprete results in the context of a given problem and evaluate the methods used and solutions obtained.

Recognise and extent patterns

Take information and organise it to answer a problem.

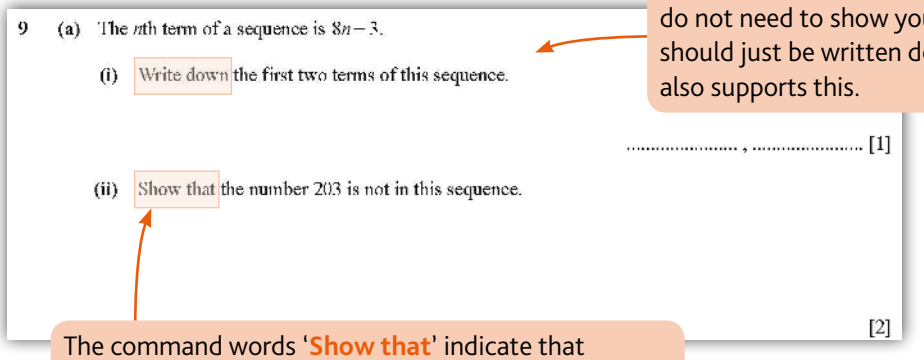
AO2 is assessed in all papers.

Section 4: Command words

A **command word** is the part of the question that tells you what you need to do with your knowledge. For example, you might need to describe something, explain something, argue a point of view or list what you know. The table below includes command words used in the assessment for this syllabus. The use of the command word(s) within an question will relate to the context.

Command word	What it means
Calculate	work out from given facts, figures or information, generally using a calculator
Construct	make an accurate drawing
Describe	state the points of a topic/give characteristics and main features
Determine	establish with certainty
Explain	set out purposes or reasons/ make the relationships between things evident/ provide why and/or how and support with relevant evidence
Give	produce an answer from a given source or recall/memory
Plot	mark point(s) on a graph
Show (that)	provide structured evidence that leads to a given result
Sketch	make a simple freehand drawing showing the key features
Work out	calculate from given facts, figures or information with or without the use of a calculator
Write	give an answer in a specific form
Write down	give an answer without significant working

The question below is taken from Paper 4 and illustrates the use of two command words.



The command words '**Write down**' indicates that you do not need to show your working, and the answer should just be written down. The mark allocation [1] also supports this.

The command words '**Show that**' indicate that you need to provide evidence in the form of a clear mathematical explanation, to demonstrate that you know how to obtain the given result. In other words, you need to show a method that leads to the result.

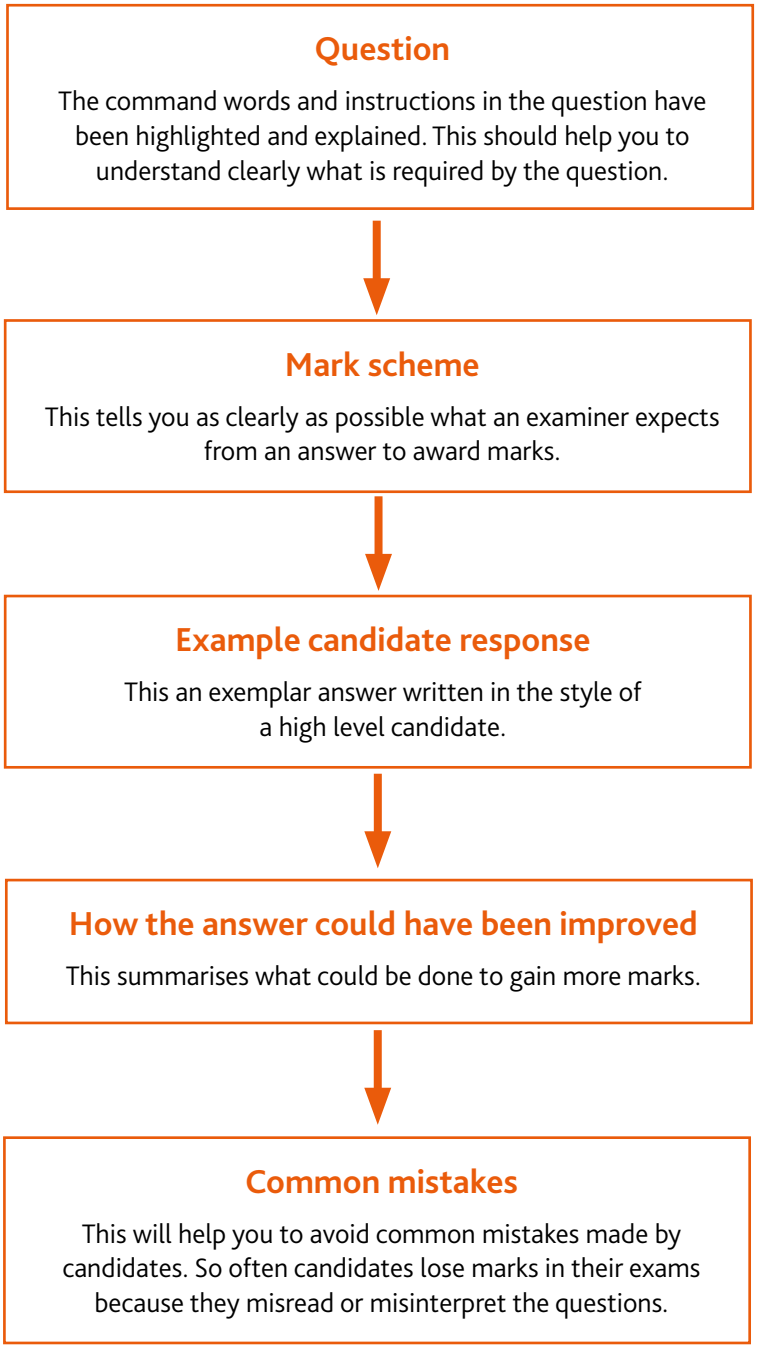
The answer space in this case does not contain a dotted answer line as there is no single 'answer' to be found. Your working that leads to the given result should be written in the blank working space.

Section 5: Example candidate response

This section takes you through an example question and learner response from one of the 2020 specimen papers for this course. It will help you to identify the command words and other key instructions within questions and to understand what is required in your response.

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.

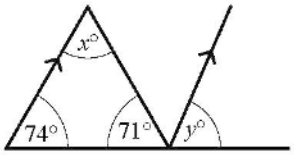
This section is structured as follows:



Question

The question used in this example is from Specimen 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.

8 **(a)**



NOT TO SCALE

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

Work out the value of

(i) x,

$x =$ ..... [1]

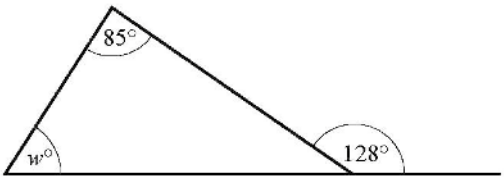
(ii) y.

$y =$ .....

Work out indicates that the answer should be calculated from the given information; so measurement will **not** score marks.

The allocation of 1 mark indicates that the answer can be obtained with minimum working.

(b)



NOT TO SCALE

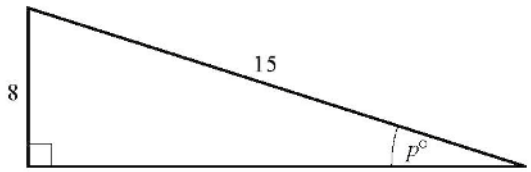
Work out the value of w.
Give reasons for your answer.

Give reasons for your answer indicates that your answer should be supported with reasons using the correct mathematical terminology. You must justify your answer.

$w =$ ..... because .....

..... [3]

(c)

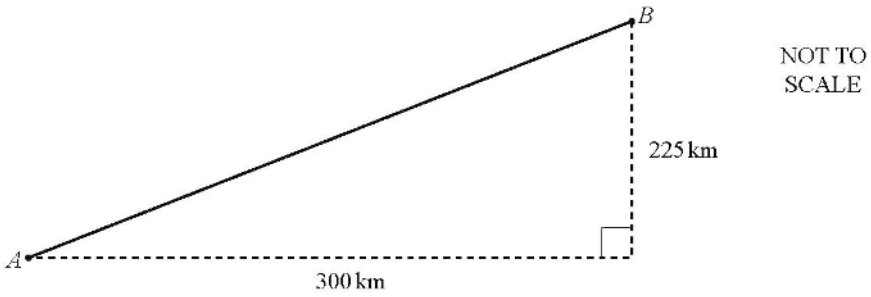


NOT TO SCALE

Use trigonometry to calculate the value of p.

Use trigonometry to calculate indicates that you should use this method with the given information to find the answer, and that a calculator is needed to solve the problem. If you did not use trigonometry, you would not be awarded any marks.

(d) The diagram shows the path of a plane from airport A to airport B.



(i) Show that the distance between A and B is 375 km.

Show that indicates the answer is given and you need to write down all of the steps in a method that leads to the given answer. You need to provide evidence that you understand and know how the answer is reached.

[2]

(ii) The plane flies at an average speed of 450 km/h.
It leaves A at 1445 and flies directly to B.

Work out the time the plane arrives at B.

Work out indicates that you should calculate the answer from the given information. The mark allocation of 4 marks suggests that you will need to include several steps of working in order to get to the answer.

..... [4]

Mark scheme

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

Final answer: This value is what the examiner expects to see. The answer has to be exactly as given in the mark scheme, unless there are acceptable alternatives. The mark scheme will always make it clear if there are acceptable alternative answers.

Method marks: Sometimes method marks are awarded for lines of working, as well as for the final answer. This means that you could get the final answer incorrect but still get some marks if you include the correct working. The mark scheme does not include all possible methods, so if you use a method not included in the mark scheme but it is accurate and relevant, then the examiner will still award marks for the appropriate parts of the working – unless the questions asks you to use a specific method.

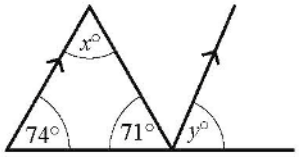
Answer	Mark	Notes
(a)(i) 35 example of a final answer	1	This is the only acceptable answer for this part of the question.
(a)(ii) 74	1	This is the only acceptable answer for this part of the question.
(b) 43° and correct mathematical reasons	3	Two marks are awarded for the final answer of 43°. The third mark is awarded for a fully correct reason, for example, 'angles on a straight line add up to 180° and 'angles in a triangle add up to 180°'. There are other correct reasons that could be also be used. If 43° is not obtained, one method mark can be awarded if the following calculation is seen in the working: 180 – 128 or 128 – 85
(c) 32.2 or 32.23…	2	This is the only acceptable answer for this part of the question. The answer has to be rounded correct to three significant figures, or can be given with more figures in the answer. Those that did not get this answer can score one method mark for showing the following in their working: sin = 8 ÷ 15
(d)(i) $\sqrt{300^2 + 225^2}$	2	This does not have to be shown in one step, as long as the method shown is the same as this overall. Those that do not show this can have one method mark for showing the following in their working: 300° + 225° ← example of a method mark
(d)(ii) 15 35	4	The answer 3 35pm is also acceptable for 4 marks. If the correct answer is not found, one method mark is available for showing 375 ÷ 450 in their working; and a second method mark can be awarded for sight of them multiplying their answer to this by 60 to change it to hours. A third method mark can be awarded for adding their answer in hours to 14 45 – this shows the correct method, so only one mark is lost for an incorrect final answers.

Example candidate response

Now let's look at the sample candidate's response to question 8. The examiner's comments are in the orange boxes. The candidate was awarded **8** marks out of 13.

14

8 (a)



Work out the value of

(i) x,

180 − 74 + 71 = 177

x = 177 [1]

0 out of 1

The candidate's working suggests they understand that the angle sum of a triangle is 180° but they did not include brackets around '74 + 71'. The answer 177° is not sensible for this question.

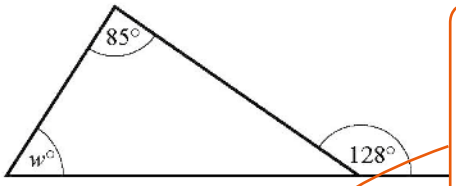
(ii) y.

y = 74 [1]

1 out of 1

The candidate recognises that there are parallel lines, and that angle y is a corresponding angle to angle 74°.

(b)



Work out the value of w.
Give reasons for your answer.

180 − 128 = 52

180 − 85 − 52 = 43

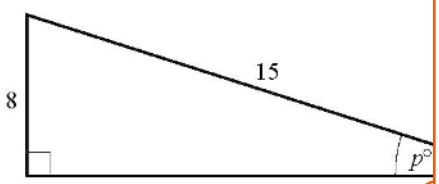
w = 43 because angles on a straight line add up to 180°

[3]

2 out of 3

The candidate has given a correct answer for w and shown correct working in two steps. They have given a correct reason for 52° using correct mathematical languge. But they have not provided a reason to explain the angle 43°. They lose a mark for not **also** stating 'angle sum of a triangle is 180°'.

(c)



Use trigonometry to calculate the value of p.

sin p = 8 ÷ 15 = 0.53

$p = \sin^{-1}(0.53)$

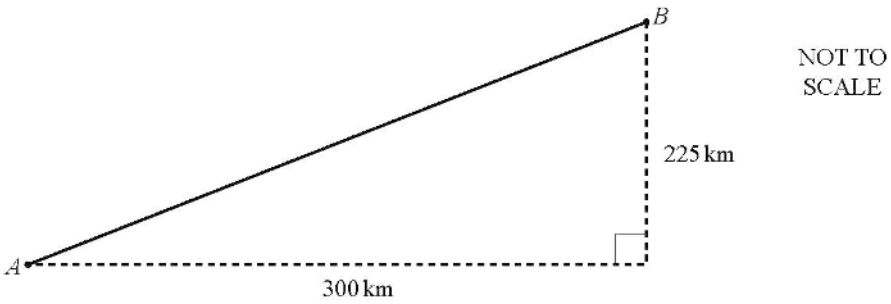
p = 32.005

p = 32.0 [2]

1 out of 2

The candidate has correctly used trigonometry in their method. They are awarded one method mark for the first line of working. However, they have rounded 0.5333333… (the result of 8 ÷ 15) to 0.52, and then calculated the inverse sin of 0.52 rather than 0.5333333 … This has resulted in an inaccurate final answer. This is called 'premature approximation' and it is a very common error to make.

(d) The diagram shows the path of a plane from airport A to airport B.



(i) Show that the distance between A and B is 375 km.

$AB^2 = 300^2 + 225^2$

$= 140625$

$AB = 375$

1 out of 2

The candidate has recognised the right-angled triangle and correctly used Pythagoras' theorem in the first line of working. However, they have missed out an important step by not showing that you need to take the square root of 140625 to get 375. As this is a 'show that' question and they missed a key step in the method, they cannot be awarded full marks as the complete working is not shown. One method mark is earned for the first line.

[2]

(ii) The plane flies at an average speed of 450 km/h.
It leaves A at 14 45 and flies directly to B.

Work out the time the plane arrives at B.

$T = \frac{D}{S} = \frac{375}{450} = 0.8333333...$

0.8333333 hours = 0.8333333 × 60 minutes = 50 minutes

arrives at 14 45 + 50 mins = 3 35

3 out of 4

The candidate has found the time by correctly dividing the distance by the speed, and recognised that this is in hours. When converting the answer to a decimal, they have not rounded the decimal but left its full value on the calculator to get 50 mins; which is the correct approach. Unfortunately, after converting the time from 24 hour clock to 12 hour clock, they did not include 'pm' to indicate that the time is in the afternoon, and so the final answer is not quite right. So, 3 marks are awarded for all of a correct method, but a mark is lost due to the accuracy of the final answer.

3 35 ..... [4]

20

[Turn over

How the answer could have been improved

This answer could have been improved by

- In part (a)(i) the answer of 177° was not sensible given the diagram in the question. If the candidate had checked their answer for sense they would have realised they had made a mistake. It is always a good idea to check that your answer seems sensible before you move on to another question.

- In part (b) the candidate did all the correct steps but failed to provide both reasons. There were two steps to the method, which should have indicated to the candidate that there were two steps to justify and therefore two reasons should have been provided. The mark allocation for the question [3] also indicates that more than one reason would be required: one mark for the value of 43°, leaving two marks, one mark for each of two reasons. The candidate should have read the question carefully and again, checked their response seemed reasonable.

- In part (c) the candidate rounded an intermediate answer, which affected the accuracy of the final answer. This caused them to lose a mark despite using a correct method. You should only ever round the final answer, do **not** round intermediate values. If you can, store the intermediate values in your calculator and so that you can use the full value in your calcuations. If you're not able to do this, and you have to round the intermediate values, do **not** round them to **less than** three significant figures.

- In part (d)(i) the candidate missed out a step in the method. As this was a 'show that' question, they needed to show all the steps in the method. It's important to show all steps, even if they seem obvious.

- In part (d)(ii) the candidate made a silly error by not stating that the time was 'pm'. When working with time, answers are accepted in either 24 clock or 12 clock time but if you give your answer in the 12 hour clock then it must include am or pm as well.

Common mistakes

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

- **Accuracy of answers**

In parts (c) and (d)(ii), a common error was premature rounding – rounding intermediate values in the method before the final answer, which resulted in their final answer not being accurate. Other candidates gave the final answer to less than three significant figures, ignoring the instruction on the front of the paper to round to three significant figures.

- **Using incorrect terminology when giving reasons**

In part (b), the most common error was to not give full reasons to support the answer. Another common error was to provide a reason that did not use the correct mathematical language, such as 'They add up to 180°', and 'It is a straight line', which could not be awarded marks.

- **Lack of knowledge**

In part (c), a number of candidates had limited knowledge of trigonometry and did not choose the correct trig ratio, which was the sine ratio. This is why good revision is important.

- **Not checking answers**

In part (a)(i), even though the diagram is drawn NOT TO SCALE, it is possible to see that the angle is an acute angle and should therefore not be bigger than 90°. This should alert candidate that if their answer is over 90° it is not a sensible answer and they should go back and check their working.

- **Inefficient method shown**

In part (c), the 'Show that' question, a number of candidates omitted an important step from the method; this is often common in 'Show that' questions where every step must be shown no matter how obvious them seem.

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
- understand what all the key terms and command words in the question mean
- read the questions carefully and consider what you need to do before you do it
- only round the final answer, not intermediate values
- show all steps in your working, and show them clearly
- round to the correct degree of accuracy
- use the correct mathematical terminology
- check your answers seem reasonable given the context or details of the question.

Section 6: 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. The advice in this section will help you revise and prepare for the examinations. It is divided into general advice for all papers.

Use the tick boxes ☐ to keep a record of what you have done, what you plan to do or what you understand.

For more advice on revision, see the Cambridge Learner Revision Guide on our website.

Before the examination

- ☐ Find out when the examinations are and plan your revision so you have time to revise. Create a revision timetable and divide it into sections to cover each topic.
- ☐ Spend most of your time focussing on specific skills, knowledge or issues that you have found more difficult when practicing them either during revision or earlier in the course.
- ☐ Write a summary of all the key information for a topic – use the checklists at the end of this section.
- ☐ Know the meaning of the command words used in questions and how to apply them to the information given. Look at past examination papers and highlight the command words and check what they mean.
- ☐ Make revision notes and work on practice questions. Reading alone does not work, you need to be active and practice your maths.
- ☐ Work for shorter periods then have a break. Revise small sections of the syllabus at a time but do this regularly.
- ☐ Test yourself by trying out some past exam questions. Use the mark schemes to assess yourself and to be familiar with how marks are awarded for different questions.
- ☐ Be organised in advance with your notes, texts, exercise books, revision guides and revision websites so you do not waste valuable revision time trying to find things.
- ☐ Make notes of key mathematical words that you should use in questions that ask you to 'describe' or give 'geometrical reasons for', e.g. in describing transformations or giving reasons in circle theorem questions. Look at the mark schemes for these types of questions from past papers to see how marks are awarded.
- ☐ Make sure you have all of the correct mathematical equipment ready for the exam, particularly your calculator. Make sure you are familiar with the all of the important functions on your calculator.
- ☐ Practice the areas you can do well not just those that you find more difficult
- ☐ Take breaks and do things to relax when you take your breaks, this will help you to be more productive when you are revising

During the examination

- [ ] Plan your time according to the marks for each question. For example, a question worth one mark requires less time than a question one worth 4 marks. If a question has several parts, then the parts with more marks will need more time.

- [ ] Read each question very carefully.
  - [ ] Identify the command words – you could underline or highlight them.
  - [ ] Identify the other key words and information and perhaps underline them too particularly where questions require reasoning or problem solving.

- [ ] Read the questions careully and make you have answered the question that is being asked.

- [ ] 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, and it makes it easier for the examiner to mark your work; try to write it in a logical order in the answer space.

- [ ] Write answers clearly; if you want to change an answer then you should cross the answer out and write a replacement; if your answer is on the answer line, cross it out and write the replacement answer above it, do not try to change numbers on the answer line as this 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 intermediate values part way through your calculation; only round the final 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.

- [ ] Use the mark allocation given with the questions/parts of questions to try to judge how much work is needed to answer each part.

- ☐ On graph questions, straight lines should be ruled and curves should be drawn freehand with a smooth curve.

- ☐ Don't spend too long on any one part of a question. If you are really stuck on a question, then move on and come back to the question later if you have time. As a rough guide, each mark on the paper should take about one minute.

Top tips for revision of Cambridge IGCSE 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. Concept maps

Concept maps are a great way to revise the links between different factors or to explore a larger topic. They can also be used to collect together 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 concept map outwards using lines called 'branches'.

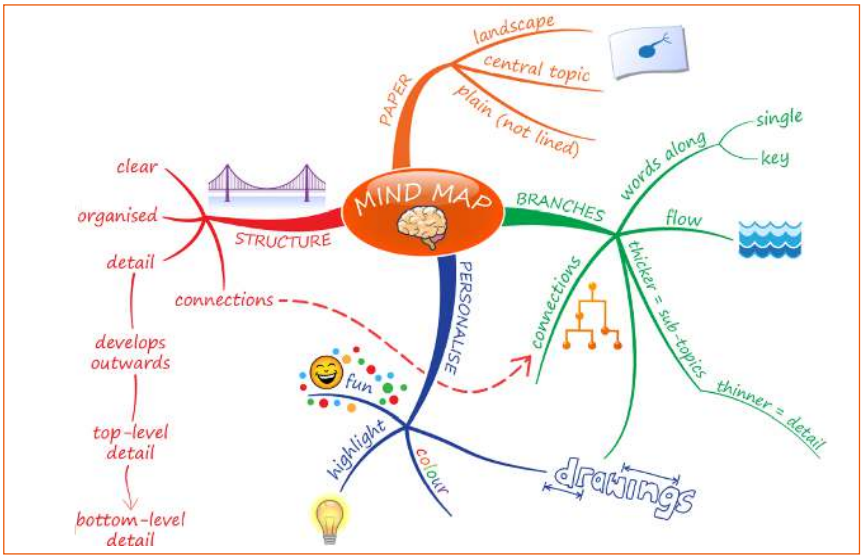
- The first branches are from the central topic to sub-topics; draw these as thick lines.
- Add new branches from the sub-topics to include more detail; draw these as thinner lines.
- Add even more detail to a point by adding more branches.

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 rehearses 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-0580/past-papers/

Other useful revision advice for Cambridge IGCSE 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.

Revision checklists for Cambridge IGCSE Mathematics

The tables on the following pages can be used as a revision checklist. **They do not 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, 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
- include a list of formulae or notation
- 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.

There is a set of checklist for the Core syllabus and a different set for the Extended syllabus.

Core syllabus content

Core: Number

Category	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 and cube numbers	☐	☐	☐	
	• common factors and highest common factor of two numbers	☐	☐	☐	
	• common multiples and lowest common multiple of two numbers	☐	☐	☐	
	• rational numbers	☐	☐	☐	
	• irrational numbers (e.g. π, $\sqrt{2}$)	☐	☐	☐	
	• real numbers	☐	☐	☐	
	• reciprocals	☐	☐	☐	

Core: Number

Question type	You should be able to	R	A	G	Comments
Sets and Venn diagrams	Understand notation of Venn diagrams Definition of sets e.g. $A = \{x : x \text{ is a natural number}\}$ $B = \{a,b,c\ldots\}$ Notation Number of elements in set A $n(A)$ Universal set $\mathscr{E}$ Union of A and B $A \cup B$ Intersection of A and B $A \cap B$	☐	☐	☐	
Squares, square roots, cubes and cube roots	Calculate: • squares and cubes of numbers • square roots and 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	☐	☐	☐	
Fractions, decimals and percentages	Use the language and notation of simple, vulgar and decimal fractions and percentages	☐	☐	☐	
	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)	Evaluate indices, e.g. 2^5, 5^{-2}, 100^0, $64^{½}$, $8^{-2/3}$	☐	☐	☐	
	Use the rules of indices for:	☐	☐	☐	
	• multiplication of indices, e.g. $4^{-3} \times 4^5$	☐	☐	☐	
	• division of indices, e.g. $5^7 \div 5^3$	☐	☐	☐	
	• index numbers raised to an index, e.g. $(2^3)^2$, $(4^3)^2$	☐	☐	☐	
	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	☐	☐	☐	

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) 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 (formulae for other rates, e.g. density and pressure will be given in the question) 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 times 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: • earnings • simple interest • compound interest (you will 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	☐	☐	☐	
	Rearrange 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. $(x + 3)(x - 7)$	☐	☐	☐	
	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	Derive and solve simple linear equations in one unknown	☐	☐	☐	
	Derive and 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 *Mensuration*)	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: • $ax + b$ (linear) • $\pm x^2 + ax + b$ (quadratic) • $\frac{a}{x}$ $(x \neq 0)$ (reciprocal) where a and b are integer constants	☐	☐	☐	
	Draw and interpret such graphs	☐	☐	☐	
	Solve linear and quadratic equations approximately by graphical methods	☐	☐	☐	
	Recognise and sketch the graphs of linear and quadratic functions	☐	☐	☐	

Core: Co-ordinate geometry

Question type	You should be able to	R	A	G	Comments
Co-ordinates	Work with co-ordinates in two dimensions	☐	☐	☐	
Gradients	Find the gradient of a straight line graph	☐	☐	☐	
Equation of straight line	Interpret and obtain the equation of a straight line graph in the form $y = mx + c$ where the graph is given	☐	☐	☐	
Parallel lines	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: 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 and draw lines and angles	☐	☐	☐	
	Construct a triangle given the three sides, using a ruler and a pair of compasses only	☐	☐	☐	
Scale drawings	Read and make scale drawings	☐	☐	☐	
Similar figures	Calculate lengths of similar figures	☐	☐	☐	
Congruent	Recognise congruent shapes	☐	☐	☐	
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, explaining the properties that you are using in geometrical language, for angles:				
	• angles at a point	☐	☐	☐	
	• angles on a straight line and intersecting straight lines	☐	☐	☐	
	• angles within parallel lines	☐	☐	☐	
	• angles in triangles	☐	☐	☐	
	• angles in quadrilaterals	☐	☐	☐	
	• angles in regular polygons	☐	☐	☐	
	• angle in a semi-circle	☐	☐	☐	
	• angle between tangent and radius of a circle	☐	☐	☐	

Core: Mensuration

Question type	You should be able to	R	A	G	Comments
Measures	• Use current units of:				
	• mass	☐	☐	☐	
	• length	☐	☐	☐	
	• area	☐	☐	☐	
	• volume	☐	☐	☐	
	• capacity	☐	☐	☐	
	Express quantities in terms of smaller or larger units, including units of area and volume	☐	☐	☐	
	Convert between units, including units of area and volume	☐	☐	☐	
Perimiter	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 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 simple problems involving the arc length and sector area of a circle where the sector angle is a factor of 360°.	☐	☐	☐	
Surface area and volume	Carry out calculations involving: • surface area and volume of a cuboid, prism and cylinder (no formulae will be given for these shapes)	☐	☐	☐	
	• surface area and volume of a sphere, pyramid and cone (formulae will be given for these shapes)	☐	☐	☐	
Areas and volumes of compound shapes	Carry out calculations involving the areas and volumes of compound shapes made from combinations of the shapes in 'Perimeter' or 'Surface area and volume'.	☐	☐	☐	

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 in right-angled triangles	☐ ☐	☐ ☐	☐ ☐	

Core: Vectors 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 $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$ or $\mathbf{a}$	☐	☐	☐	
	Add and subtract vectors	☐	☐	☐	
	Multiply a vector by a scalar	☐	☐	☐	
Transformations	Reflect simple shapes in horizontal or vertical lines	☐	☐	☐	
	Rotate simple shapes through multiples of 90° about:				
	• the origin	☐	☐	☐	
	• their vertices	☐	☐	☐	
	• the midpoints of their sides	☐	☐	☐	
	Construct translations of simple shapes	☐	☐	☐	
	Construct enlargements of simple shapes (positive and fractional scale factors)	☐	☐	☐	
	Recognise and describe using the correct language:				
	• reflections	☐	☐	☐	
	• rotations	☐	☐	☐	
	• translations	☐	☐	☐	
	• enlargements (positive and fractional scale factors)	☐	☐	☐	

Core: Probability

Question type	You should be able to	R	A	G	Comments
Single events	Calculate the probability of a single event as a fraction, decimal or percentage (not a ratio)	☐	☐	☐	
Probability scale	Understand and use the probability scale from 0 to 1	☐	☐	☐	
Sum to 1	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 Work out expected frequencies using relative frequency	☐	☐	☐	
Combined events	Calculate the probability of simple combined events using: • tree diagrams • possibility diagrams (points on a grid) • Venn diagrams (2 sets only)	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	

Core: Statistics

Question type	What I need to do	R	A	G	Comments
Classify	Collect, classify and tabulate data	☐	☐	☐	
Interpret and compare	Read, interpret and draw simple inferences from tables and statistical diagrams	☐	☐	☐	
	Compare sets of data using				
	• tables	☐	☐	☐	
	• graphs	☐	☐	☐	
	• statistical measures.	☐	☐	☐	
	Be aware of restrictions when making conclusions from data.	☐	☐	☐	
Charts	Construct and use:				
	• bar charts	☐	☐	☐	
	• pie charts	☐	☐	☐	
	• pictograms	☐	☐	☐	
	• stem-and-leaf diagrams	☐	☐	☐	
	• frequency distributions	☐	☐	☐	
	• histograms with equal intervals	☐	☐	☐	
	• scatter diagrams	☐	☐	☐	

Question type	What I need to do	R	A	G	Comments
Averages	Calculate, for individual and discrete data • mean • median • mode • range and distinguish between their use	☐	☐	☐	
Correlation	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram	☐	☐	☐	
Line of best fit	Draw, interpret and use a ruled 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 and cube numbers	☐	☐	☐	
	• common factors and highest common factor of two or more numbers	☐	☐	☐	
	• common multiples and lowest common multiple of two or more numbers	☐	☐	☐	
	• rational numbers	☐	☐	☐	
	• irrational numbers (e.g. π, $\sqrt{2}$)	☐	☐	☐	
	• real numbers	☐	☐	☐	
	• reciprocals	☐	☐	☐	

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 as follows:	☐	☐	☐	
	Definition of sets, e.g.				
	$A = \{x: x \text{ is a natural number}\}$	☐	☐	☐	
	$B = \{(x,y): y = mx + c\}$	☐	☐	☐	
	$C = \{x: a \leqslant x \leqslant b\}$	☐	☐	☐	
	$D = \{a, b, c, \ldots\}$	☐	☐	☐	
	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'	☐	☐	☐	
	the empty set $\emptyset$	☐	☐	☐	
	the universal set $\mathscr{E}$	☐	☐	☐	
	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	☐	☐	☐	
	• other powers and roots of numbers	☐	☐	☐	
Directed numbers	Use directed numbers in practical situations, for example temperature changes	☐	☐	☐	
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 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*)	Evaluate indices, including fractional negative and zero e.g. 2^5, 5^{-2}, 100^0, $100^{1/2}$, $8^{-2/3}$ Use the rules of indices for: • multiplication of indices, e.g. $4^3 \times 4^5$ • division 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 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) 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 to a specified accuracy, e.g. the lower and upper bounds for the area of a rectangle	☐	☐	☐	
Ratio, proportion, rate (links to *Direct and inverse proportion*)	Understand ratio	☐	☐	☐	
	Divide quantities in a given ratio	☐	☐	☐	
	Increase and decrease a quantity by a given ratio	☐	☐	☐	
	Understand numerical problems involving direct and inverse proportion	☐	☐	☐	
	Use ratio and scales in practical situations	☐	☐	☐	
	Use common measures of rate (formulae for other rates, e.g. density and pressure will be given in the question)	☐	☐	☐	
	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: • earnings • simple interest • compound interest – you must **know** the compound interest formula • discount • profit and loss Extract data from tables and charts	☐	☐	☐	
Exponential growth and decay	Use exponential growth and decay in 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 complicated formulae	☐	☐	☐	
	Construct and rearrange complicated formulae, e.g. where the subject appears twice	☐	☐	☐	
Algebraic manipulation	Manipulate directed numbers	☐	☐	☐	
	Use brackets:				
	• expand a single bracket e.g. expand $3x(2x - 4y)$	☐	☐	☐	
	• expand a pair of brackets e.g. $(x - 4)(x + 7)$	☐	☐	☐	
	• expand products of more than two brackets, e.g. $(x + 4)(x - 7)(2x + 1)$	☐	☐	☐	
	Extract common factors, e.g. factorise $9x^2 + 15xy$	☐	☐	☐	
	Factorise 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 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 to simplify algebra, e.g. $3x^{-4} \times \frac{2}{3}x^{\frac{1}{2}}$ $\frac{2}{5}x^{\frac{1}{2}} \div 2x^{-2}$ $\left(\frac{2x^5}{3}\right)^3$	☐	☐	☐	

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Equations and inequalities	• Derive and solve simple linear equations in one unknown	☐	☐	☐	
	• Derive and solve simultaneous linear equations in two unknowns	☐	☐	☐	
	• Derive and solve simultaneous equations involving one linear and one quadratic	☐	☐	☐	
	Solve quadratic equations by:				
	• factorisation	☐	☐	☐	
	• completing the square	☐	☐	☐	
	• using the formula	☐	☐	☐	
	Derive and solve simple linear inequalities, including representing solutions on a number line	☐	☐	☐	
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 different sequences	☐	☐	☐	
	Find the *n*th term of sequences of:				
	• linear sequences	☐	☐	☐	
	• quadratic sequences	☐	☐	☐	
	• cubic sequences	☐	☐	☐	
	• exponential sequences	☐	☐	☐	
	and simple combinations of these	☐	☐	☐	
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 simple kinematics involving: • distance–time graphs • speed–time graphs • acceleration and deceleration This may involve estimation and interpretation of the gradient of a tangent at a point Calculate distance travelled as an area under a linear speed–time graph	☐	☐	☐	

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
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 • $ab^x + c$ where a and c are rational constants and b is a positive integer Solve associated equations approximately by graphical methods, including finding and interpreting roots and finding turning points of quadratics by completing the square Draw and interpret graphs representing exponential growth and decay problems Recognise, sketch and interpret graphs of: • linear • quadratic • cubic • reciprocal • exponential (knowledge of turning points and asymtotes is required)	☐	☐	☐	
Tangents	Estimate gradients of curves by drawing tangents	☐	☐	☐	

Extended: Algebra and graphs

Question type	You should be able to	R	A	G	Comments
Functions	Use function notation, e.g. $f(x) = 3x - 5$, $f : x \alpha 3x - 5$ to describe simple functions	☐	☐	☐	
	Find inverse functions $f^{-1}(x)$	☐	☐	☐	
	Form composite functions as defined by $gf(x) = g(f(x))$	☐	☐	☐	
Derivatives	Understand the idea of a derived function	☐	☐	☐	
	Use derivatives of the form ax^n and simple sums of not more than three of these (a is a rational constant and n is a positive integer or 0)	☐	☐	☐	
	Apply differentiation to gradients and turning points (stationary points)	☐	☐	☐	
	Use any method to explain whether the turning point is a maximum or a minimum, e.g. second derivative or gradient of function on either side of turning point	☐	☐	☐	

Extended: Co-ordinate geometry

Question type	You should be able to	R	A	G	Comments
Straight line graphs	Work with co-ordinates in two dimensions	☐	☐	☐	
Gradient	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 segment from the co-ordinates of its end points	☐	☐	☐	
Equation of line	Interpret and obtain the equation of a straight line graph	☐	☐	☐	
Parallel lines	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 $(0, -3)$.	☐	☐	☐	
Perpendicular 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 $(-2, -9)$.	☐ ☐	☐ ☐	☐ ☐	

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 and draw lines and angles	☐	☐	☐	
	Construct a triangle given the three sides, using a ruler and a pair of compasses only	☐	☐	☐	
Scale drawings	Read and make scale drawings	☐	☐	☐	
Similar figures	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	☐	☐	☐	
Congruent triangles	Use the congruence criteria for triangles (SSS, ASA, SAS, RHS)	☐	☐	☐	
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, cylinder, cone and pyramid	☐	☐	☐	

Extended: Geometry

Question type	You should be able to	R	A	G	Comments
Angle properties	Calculate unknown angles, explaining the properties that you are using in geometrical language, for the following geometrical properties:				
	• 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; cyclic quadrilaterals	☐	☐	☐	
	• alternate segment theorem	☐	☐	☐	

Extended: Mensuration

Question type	What I need to do	R	A	G	Comments
Measures	Use current units of: • mass • length • area • volume • capacity Express quantities in terms of smaller or larger units, including units of area and volume	☐	☐	☐	
Perimeter	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	☐	☐	☐	

Extended: 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	☐	☐	☐	
Surface area and volume	Carry out calculations involving: • surface area and volume of a cuboid, prism and cylinder (no formulae will be given for these shapes)	☐	☐	☐	
	• surface area and volume of a sphere, pyramid and cone (formulae will be given for these shapes)	☐	☐	☐	
Compound shapes	Carry out calculations involving: • area of a shape made by combining cuboids, prisms and/or cylinders	☐	☐	☐	
	• volume of a shape made by combining cuboids, prisms and/or cylinders	☐	☐	☐	

Extended: 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 in right-angled triangles	☐	☐	☐	
	Solve problems in two dimensions involving angles of elevation and depression	☐	☐	☐	
	Know that the perpendicular distance from a point to a line is the shortest distance to the line	☐	☐	☐	
Trig graphs and equations	Recognise, sketch and interpret graphs of simple trigonometric functions	☐	☐	☐	
	Graph and know the properties of trigonometric functions	☐	☐	☐	
	Solve simple trigonometric equations for values between 0° and 360°, e.g. Solve $\sin x = \frac{\sqrt{3}}{2}$ for values of x between 0° and 360°	☐	☐	☐	
General trig	Solve problems using sine and cosine rules for any triangle	☐	☐	☐	
	Find the area of any triangle using $\frac{1}{2}ab\sin C$	☐	☐	☐	
Trig in 3D	Solve simple trigonometrical problems in three dimensions including angle between a line and a plane	☐	☐	☐	

Extended: Vectors 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: $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$ or $\mathbf{a}$	☐	☐	☐	
	Add and subtract vectors	☐	☐	☐	
	Multiply a vector by a scalar	☐	☐	☐	
Transformations	Reflect simple shapes in horizontal or vertical lines	☐	☐	☐	
	Rotate simple shapes through multiples of 90° about any point	☐	☐	☐	
	Construct translations of simple shapes	☐	☐	☐	
	Construct enlargements of simple shapes (positive, fractional and negative scale factors)	☐	☐	☐	
	Recognise and describe:				
	• reflections	☐	☐	☐	
	• rotations	☐	☐	☐	
	• translations	☐	☐	☐	
	• enlargements (positive, fractional and negative scale factors)	☐	☐	☐	

Extended: Vectors and transformations

Question type	You should be able to	R	A	G	Comments
Harder vectors	Calculate the magnitude of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$ as $\sqrt{x^2 + y^2}$ and understand that magnitude is denoted by modulus signs $\lvert\overrightarrow{AB}\rvert$ or $\lvert\mathbf{a}\rvert$	☐	☐	☐	
	Represent vectors by directed line segments	☐	☐	☐	
	Use the sum and difference of two vectors	☐	☐	☐	
	Use position vectors	☐	☐	☐	

Extended: 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 (not a ratio)	☐	☐	☐	
Probability scale	Understand and use the probability scale from 0 to 1	☐	☐	☐	
Sum to 1	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 Work out expected frequencies using relative frequency	☐ ☐	☐ ☐	☐ ☐	
Combined events	Calculate the probability of combined events using: • tree diagrams • possibility diagrams • tables	 ☐ ☐ ☐	 ☐ ☐ ☐	 ☐ ☐ ☐	

Extended: Statistics

Question type	You should be able to	R	A	G	Comments
Classify	Collect, classify and tabulate data	☐	☐	☐	
Interpret and compare	Read, interpret and draw simple inferences from tables and statistical diagrams	☐	☐	☐	
	Compare sets of data using				
	• tables	☐	☐	☐	
	• graphs	☐	☐	☐	
	• statistical measures	☐	☐	☐	
	Be aware of restrictions when making conclusions from data	☐	☐	☐	
Charts	Construct and use				
	• bar charts	☐	☐	☐	
	• pie charts	☐	☐	☐	
	• pictograms	☐	☐	☐	
	• stem – and – leaf diagrams	☐	☐	☐	
	• frequency distributions	☐	☐	☐	
	• histograms with equal and unequal intervals	☐	☐	☐	
	• scatter diagrams	☐	☐	☐	

Extended: Statistics

Question type	You should be able to	R	A	G	Comments
Averages	Calculate, for individual and discrete data • mean • median • mode • range and distinguish between their use	☐	☐	☐	
Estimated mean	Calculate an estimate of the mean for grouped and continuous data Identify the modal class from a grouped frequency distribution	☐	☐	☐	
Cumulative frequency	Construct and use cumulative frequency diagrams to estimate and interpret • the median • percentiles • quartiles • inter-quartile range Construct and interpret box-and-whisker plots	☐	☐	☐	
Correlation	Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram	☐	☐	☐	
Lines of best fit	Draw, interpret and use a ruled line of best fit by eye	☐	☐	☐	

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