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OCR
Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

MATHEMATICS

J560

For first teaching in 2015

J560/03 Summer 2023 series

Version 1

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Contents

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Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from our secure Teach Cambridge site.

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Paper 3 series overview

The cohort of candidates this summer appeared to be less prepared for the examination than in previous years and it was clear that almost all had been entered at the correct level.

Where questions were on a familiar topic, advised candidates on a method to use, or where the context implied a particular skill or knowledge, then the majority of candidates attempted a response and were often at least partially correct (even if they resorted sometimes to inefficient methods).

If the scenario was more complicated, longer, or did not hint at a method to use, then attempts were poorly made, if at all.

Knowledge of correct algebraic processes were conspicuously absent from many candidates, as were efficient methods to answer percentage questions. Even the more able candidates mostly had little or no knowledge of construction techniques and were unable to gain more than a few marks on Question 22.

Written explanations were poorly expressed and there was little annotation within solutions. Candidates tended not to use units in working and rarely stated what the values they were calculating represented.

Core arithmetic processes seemed reasonably secure, but knowledge of techniques to approach relatively standard questions such a pie charts, percentage changes, rearranging equations and statistical analysis were patchy.

Trial and improvement was often seen, but it is time consuming and rarely produced the correct result.

Candidates are advised to practice basic techniques and to write explanations concisely, presenting these for general, constructive criticism.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• showed clear, logical working and deleted incomplete or abandoned methods • scored well on the early short questions and were suitably prepared to apply problem solving techniques to longer questions • used algebraic techniques and applied algebraic rules correctly • used multipliers to find percentages and did not waste time with extended non-calculator methods • made appropriate use of the formulae sheet • were practised in standard mathematical techniques • understood and could interpret mathematical definitions • gave concise reasons, referring to relevant facts or figures • wrote clearly and carefully, formulating letters and numbers legibly.	• gave jotted working and partial methods with no clear route to the answer • did not appear to have read the questions carefully, nor the information contained in them • were not aware of algebraic rules • used lengthy non-calculator techniques to find percentages when the calculator could be used efficiently to save time and avoid errors • didn't answer the question. For example, reducing an original amount by a percentage instead of increasing it • could not identify variables correctly when using formulae from the sheet • did not have a ready knowledge of standard techniques to approach questions • were unsure of mathematical definitions • made a number of errors on the early questions • did not write clearly and legibly.

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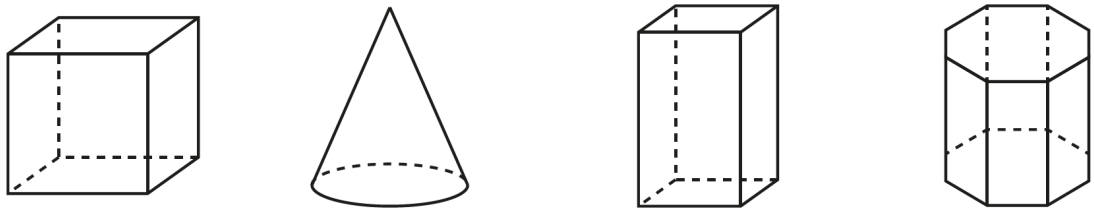
Question 1 (a)

1 (a) These four solids are labelled **A**, **B**, **C** and **D**.



A **B** **C** **D**

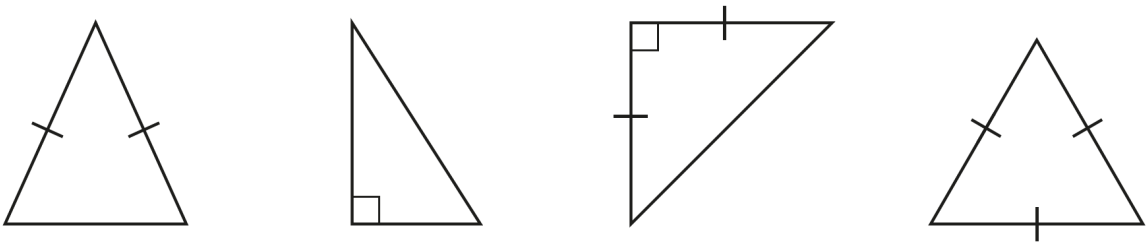
Write down the letter of the solid that is **not** a prism.

(a) ..... **[1]**

Around 60% of candidates could identify the cone. A common wrong answer was A. Some wrote 'Cone' rather than 'B', which was accepted.

Question 1 (b)

(b) These four triangles are labelled **E**, **F**, **G** and **H**.



E **F** **G** **H**

Write down the letter of the right-angled isosceles triangle.

(b) ..... **[1]**

Again, around 60% of candidates could identify the right-angled isosceles triangle. F was the common wrong answer.

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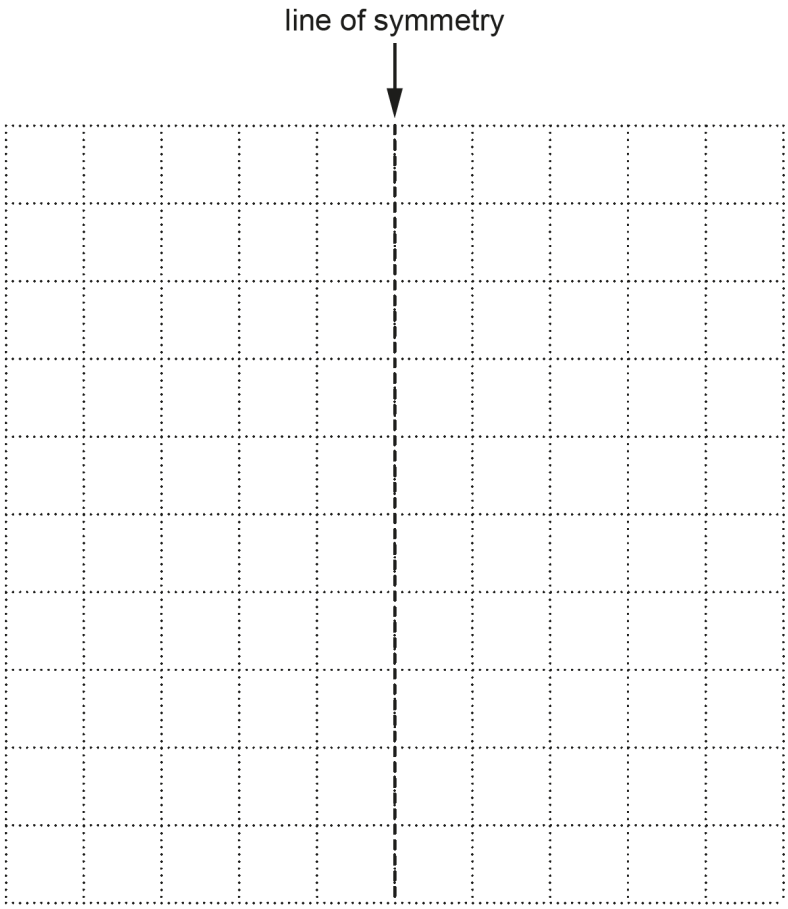
Question 1 (c)

(c) A quadrilateral has

- exactly one line of symmetry
  and
- each angle is either acute or obtuse.

Draw a possible quadrilateral on this grid.
The dashed line must be the line of symmetry.



[2]

Fewer than 20% of candidates answered this question correctly, mostly the more highly performing candidates. Many candidates drew squares, rectangles, or isosceles triangles. Some drew a shape and its reflection, not one shape. Most candidates did use a ruler.

A number of candidates realised that a kite was required but drew one with a right angle to lose 1 mark.

Less able candidates did not do well on Question 1.

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Question 2 (a) (i)

2 The factors of 6 are 1, 2, 3 and 6.
The factors of 9 are 1, 3 and 9.

(a) Use one of the symbols $<$, $>$ or $=$ to make each statement true.

(i) The number of factors of 6 ..... the number of factors of 9. **[1]**

This question was answered well, but weaker responses often used '<' or '='.

Question 2 (a) (ii)

(ii) The lowest factor of 6 ..... the lowest factor of 9. **[1]**

The standard of response was similar to that in part (a)(i).

Question 2 (b)

(b) Write down the highest common factor (HCF) of 6 and 9.

(b) ..... **[1]**

This question was well answered. The common errors were to give the lowest common multiple (i.e. 18) or another multiple of 6 and 9 (such as 54).

Question 3 (a)

3 **(a)** Complete this prime factorisation of 100.
You may not need to use all of the answer lines.

100 = 2 × 2 × .....

.....

..... **[1]**

Less able candidates did not do well on this question. A minority did not attempt the question.

The common errors were 25, $2 \times 2 \times .... \times 2$ (sometimes listing 2 ten times), or 2×10, which suggests that candidates were unsure about prime factors.

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Question 3 (b)

(b) A teacher says that the cube root of their favourite number is 5.

Write down the teacher's favourite number.

(b) ..... **[1]**

Candidates did better with this question and 125 was seen from around half of candidates. Common errors were 5, 25, $\sqrt{125}$ and 625.

Question 3 (c)

(c) Write $\frac{29}{10^2}$ as a percentage.

(c) ..... % **[1]**

This showed a high level of correct responses among all candidates. 0.29% was a common wrong answer.

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Question 4 (a)

4 (a) A recipe for biscuits says

Multiply the number of biscuits by 6.25 to find the number of grams of butter needed.

Darcie uses 125 g of butter.

How many biscuits does Darcie make?

(a) ..... **[2]**

Many candidates did well on this question. The common error was 6.25×125.

Very few candidates attempted non-calculator methods.

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Question 4 (b)

(b) The estimated cost of driving

- an electric car is 68 pence per mile
- a petrol car is 77 pence per mile.

Charlie expects to drive 12 000 miles next year.

Use this information to work out how much money Charlie can expect to save next year if driving an electric car instead of a petrol car.

(b) £ ..... **[3]**

Candidates generally answered this question well, although a number of errors were made. A common mistake was to use incorrect multiples of 10 to arrive at answers such as £10.80 or £108 000, which were awarded 2 marks.

Some candidates incorrectly divided 12 000 by 77 (and/or 68), misunderstanding the question. A very small number of candidates rounded 77 and 68, using 80 and 70 instead, which scored no marks.

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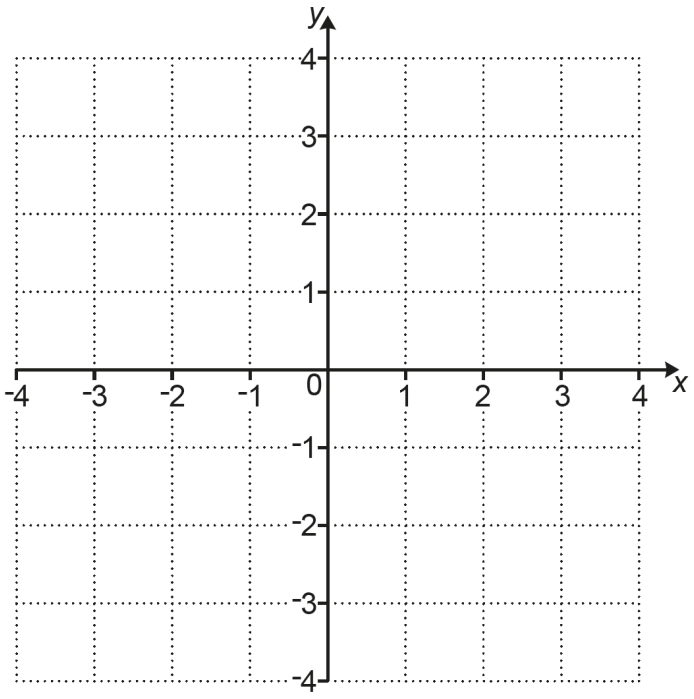
Question 5 (a)

5 This is a one-centimetre square grid.



(a) On the grid, plot point A at (-3, 3). **[1]**

Most candidates plotted their point accurately at (-3, 3), although many did not label it A. A significant number of candidates used 'A' only to mark the plot rather a cross, which is to be discouraged as it is inaccurate.

Some candidates plotted at (3, -3) and a few at other points.

Question 5 (b)

(b) The line AB joins point A to point B.
Point B is at (2, 3).

Find the length of the line AB.

(b) ..... cm **[1]**

Most candidates answered this question correctly. A significant number of answers of 6 cm were seen, suggesting candidates were counting the start of the line as 1. Some measured and gave answers such as 5.2 cm, scoring 0.

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Question 5 (c)

(c) On the grid, draw the line $x = 2$. **[1]**

Around half the candidates scored on this question. A minority gave no answer. The common error was to draw $y = 2$. Most, but not all, used a ruler.

Several candidates drew a rectangle to answer this question. A small number of candidates drew a diagonal line and labelled it $x = 2$. Some candidates did not draw a line long enough to be credited. Some used poor freehand or did not draw on the grid line.

Question 5 (d)

(d) ABCD is a square that fits on the grid.
Point C is on the line $x = 2$.

Find the coordinates of point D.

(d) D is at (..... , ...) **[2]**

Fewer than half the candidates scored marks on this question. A number gained the SC mark for (-3, ...) or (..., -2). Nearly a fifth of candidates did not attempt the question.

Question 6 (a) (i)

6 **(a)** Simplify.

(i) $3a \times 4$

(a)(i) ..... **[1]**

Most candidates gained the mark here. The common error was $7a$, but $3 \times 4 \times a$ was also seen.

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Question 6 (a) (ii)

(ii) $b \times b \times b \times b$

(ii) ..... **[1]**

This was reasonably well answered, but weaker responses often gave 4*b* as the answer.

Question 6 (a) (iii)

(iii) $c^2 \times c^4$

(iii) ..... **[1]**

This part showed a similar pattern of response to part (a)(ii). c^8 was the common error.

Question 6 (b)

(b) Factorise.

$9 - 6y$

(b) ..... **[1]**

Less able candidates did not do well on this question. The common wrong answer was 3*y*, which indicated poor understanding of the topic.

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Question 7

7 A student takes two tests.

In Test 1, the student scores 45 out of 60.
Test 2 is also out of 60.

Work out how many marks the student needs in Test 2 to have a mean of 70% in the two tests.

..... **[3]**

At least four distinct methods were seen to answer this question, however most candidates did not manage to see their method through and only the strongest candidates completed the method to the correct answer. A considerable number of candidates did score a mark though, often for working out that 45 out of 60 was equivalent to 75%, or that 70% of 60 was 42 marks. Others worked out that 84 marks were needed to score 70% overall, but having reached this point, many could not meaningfully continue.

A number of candidates resorted to trial and improvement without success.

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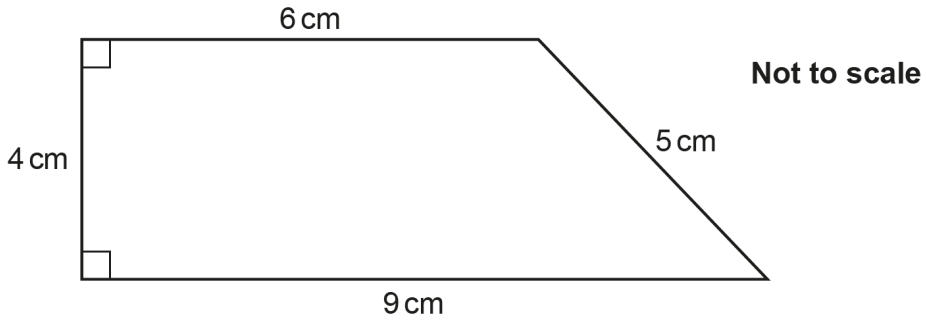
Question 8 (a)

8 **(a)** Work out the area of this trapezium.



(a) ..... cm^2 **[2]**

Most candidates attempted this question. The candidates who used the formula for the area of a trapezium (which was given on the formulae sheet) were generally more successful than those who used another approach.

Some candidates substituted into the formula incorrectly, usually using 5 cm as the height rather than the vertical height.

The most common wrong methods were to find the perimeter (24 was often seen) or to find the product of the lengths. Some divided the shape into a rectangle and a triangle; these could generally find the area of the rectangle, but often not the area of the triangle (once again, 5 was often misused as the height).

The modal mark for the question was 0.

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Question 8 (b)

(b) The circumference of a circle, in terms of π, is 100π cm.

Work out the radius of the circle.

(b) ..... cm **[2]**

This question posed a considerable challenge to many candidates, but around a quarter gave the correct answer.

Sometimes the answer was seen with no working. Where working was seen, it often involved πr^2 or substitution of 3.142.

Candidates who formed an appropriate equation such as $\pi d = 100\pi$, or compared πd or $2\pi r$ with 100π, were usually successful.

Few candidates seemed confident working with π.

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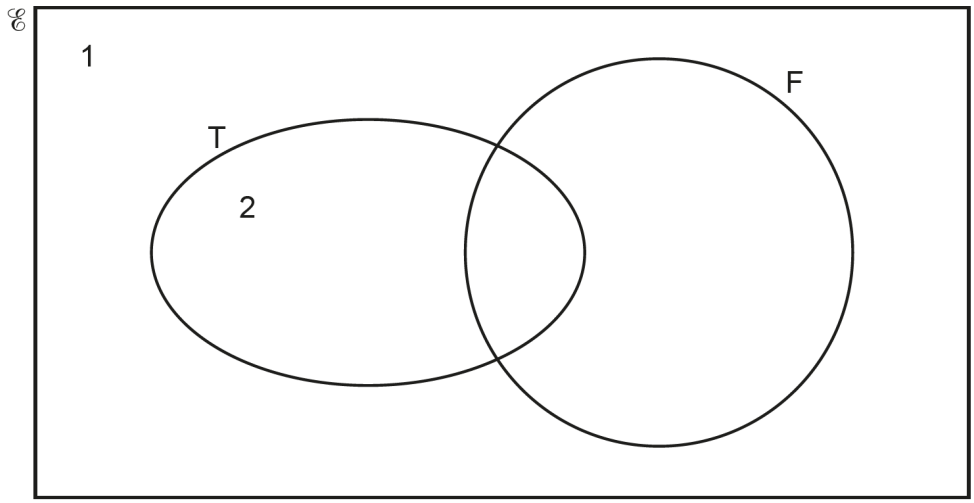
Question 9 (a)

9 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$
$T = \{2, 4, 6, 8, 10, 12\}$
$F = \{5, 10\}$

(a) The elements 1 and 2 have been entered on this Venn diagram.

Complete the Venn diagram to show **all** of the elements.



[2]

Most candidates attempted this question and a range of marks were scored. The correct answer was seen from around a third of candidates.

Some candidates first listed all the elements in the region outside the two sets T and F. They then selected the elements to go in the remaining regions, but often forgot to also delete them from the region outside the sets. These candidates were often able to score the B1, though.

Some candidates correctly placed many of the elements, but placed 10 in two or three regions, often leading to 0 marks. Some candidates left the region outside the two sets blank.

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Question 9 (b)

(b) Finley picks one of the 13 elements in the universal set, $\mathscr{E}$, at random.

Write down the probability that the element is a member of both set T and set F.

(b) ..... **[1]**

The mark scheme enabled candidates to follow through from their sets, however few did so correctly. A little under half gave the correct answer.

The denominator was often incorrect. The question stated that there were 13 elements being picked from, so 13 should have been used as the denominator. A number of candidates appeared to write the probability that the element was a member of set T or set F.

Some weaker responses gave an integer as their answer, indicating misunderstanding of probability.

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Question 9 (c)

(c) Sam picks one of the 13 elements in the universal set, $\mathscr{E}$, at random.

Sam says

The probability the element is in set T is $\frac{6}{13}$.

The probability the element is in set F is $\frac{2}{13}$.

Therefore, the probability the element is in set T or set F is $\frac{6}{13} + \frac{2}{13} = \frac{8}{13}$.

Sam is wrong.

Explain Sam's error and give the correct answer.

Sam's error : .....

..... correct answer : ..... **[2]**

Candidates tended to write at length, but not with clarity. Many skirted around the correct response that the common element (i.e. 10) had been counted twice, but did not actually make that point, writing incomplete statements that focused on a number being in the middle or a number being in both sets, without saying that this had been counted twice. Less able candidates said that Sam should have added the denominators or multiplied the fractions.

In the classroom, candidates should be given the opportunity to present their responses to questions such as this to peers for constructive criticism.

Almost a quarter of candidates did not attempt the question. Very few gained both marks.

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Question 10 (a)

10 (a) Write 18 : 42 as a ratio in its simplest form.

(a) ..... : ..... **[2]**

This straightforward question was answered well and many correct answers were seen.

A significant number gained 1 mark for a partial simplification. Some candidates could not divide 42 by either 2 or 3 correctly.

Question 10 (b)

(b) In a bag of sweets $\frac{1}{5}$ of the sweets are green.

The rest of the sweets are red.

The ratio of the number of green sweets to the number of red sweets can be written in the form 1 : n.

Find the value of n.

(b) n = ... **[2]**

Stronger candidates answered the question well. A number gained 1 mark for finding $\frac{4}{5}$, 0.8 or 80%.

The common wrong answer was 5.

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Question 10 (c)

(c) A factory has a large order for copper pipe.
The factory has many machines that make the copper pipe.

Each machine makes the same length of copper pipe in a day.
3 machines can make the copper pipe for this order in 25 days.

Find the number of machines needed to make this order in 15 days.

(c) ..... **[3]**

This question challenged many candidates and only around a fifth used a valid method and gained full marks.

An answer of 5 was often reached, but in many cases from an incorrect method that could not be credited. Many carried out either 15 ÷ 3 = 5 or 25 ÷ 5 = 5, both of which are wrong methods and scored M0.

Some calculated 25 ÷ 3 = 8.333..., then 15 ÷ 8.333... ≈ 2 followed by 3 + 2 = 5, which also scored 0.

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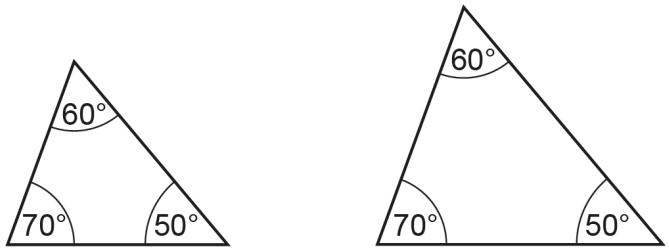
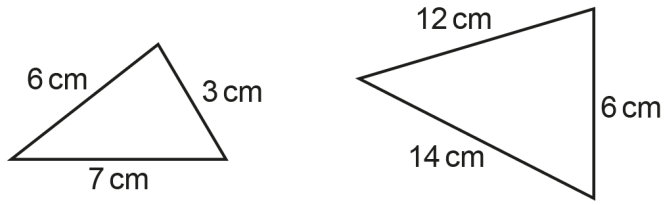
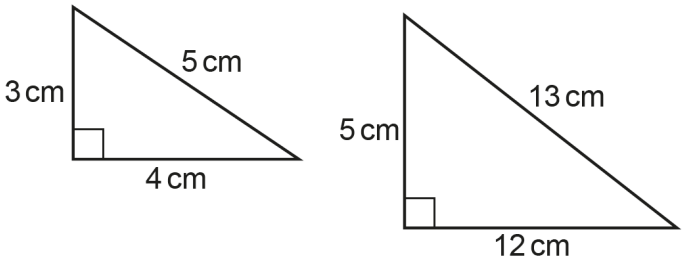
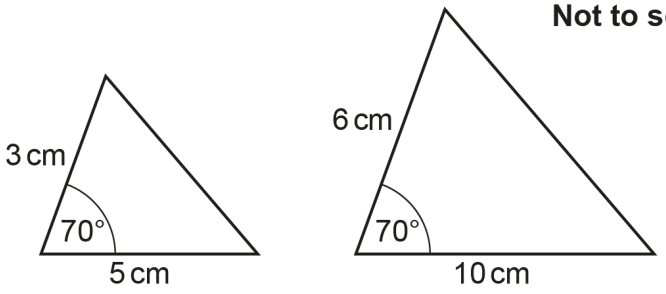
Question 11

11 The table shows four pairs of triangles.

For each pair, decide whether the two triangles are mathematically similar.
Write each answer, yes or no, in the second column of the table.

Triangles	Mathematically similar? (yes/no)
Not to scale 	.....
Not to scale 	.....
Not to scale 	.....
Not to scale 	.....

[2]

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Almost all candidates attempted this question and many candidates gained 1 or 2 marks.

The common mistakes were to give the second set 'No' and the third set 'Yes'. B1 was given for three correct responses, so candidates making both these mistakes scored 0.

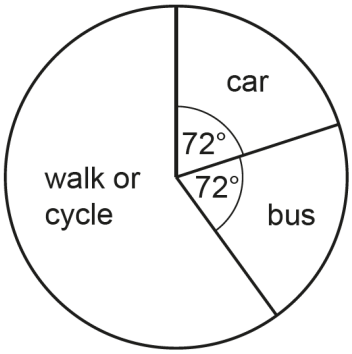
The misconception on the second pair of triangles may have been from jumping too quickly to the conclusion that 6 cm matches 6 cm so the other two pairs of sides don't match, i.e. incorrect use of scale factors.

Question 12 (a)

12 A school has 540 students.

This pie chart shows the way that all 540 students travel to the school.

Each student either walked or cycled or travelled by bus or travelled by car.



(a) Work out how many of the 540 students travel to the school by car.

(a) ..... **[3]**

Some good, efficient responses were seen to reach the correct answer to this question. Around a third of candidates gained all marks.

The common error was to confuse numbers of students with degrees. It was not uncommon to see weaker responses subtracting 144° from 540 students.

The correct answer from incorrect working was seen from some candidates, e.g. (360 – 72 – 72) ÷ 2, again confusing degrees with numbers of students.

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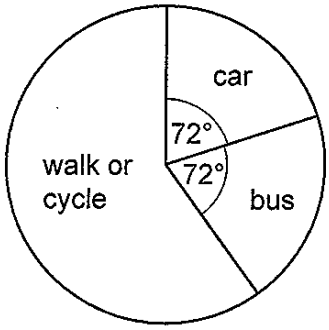
Exemplar 1

12 A school has 540 students.

This pie chart shows the way that all 540 students travel to the school.

Each student either walked or cycled or travelled by bus or travelled by car.



(a) Work out how many of the 540 students travel to the school by car.

540

360

540 - 216 = 324

324 ÷ 2 = 162

72 + 72 = 144

360 - 144 = 216

(a) 162

In this response the candidate has worked out 216 degrees but treats it as 216 students when subtracting it from 540.

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Question 12 (b)

(b) The number of students who walk is three times the number who cycle.

Work out the sector angle for the students who walk to school.
You do **not** need to draw this on the pie chart.

(b) ..... ° **[3]**

This question was answered less well and more than half the candidates scored 0 marks, often showing little understanding of the correct method to be used. Much haphazard working was seen, again often confusing degrees with numbers of students. Many did not attempt to find $\frac{3}{4}$, but divided a number by 3.

Very few candidates annotated their working. If they had then they might have made fewer mistakes.

Question 13 (a)

13 (a) $2a = \sqrt{b}$ where b is a positive integer from 8 to 17.

Given that a is a positive integer, find its value.
You must show your working.

(a) $a =$ ..... **[2]**

Only the strongest candidates scored marks on this question.

For those that didn't make the connection that b was a square number, substitution of values for b from 8 to 17 should have been an achievable way forward, however few did this successfully.

A number of candidates got as far as $\sqrt{16} = 4$, but then concluded that 8 was the value of a. 4 was also a very common wrong answer.

Around 40% of candidates made no attempt to answer the question.

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Question 13 (b)

(b) How would your answer to **part (a)** change if *a* was only described as an integer?

.....

..... **[1]**

Almost all answered this question incorrectly.

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Question 14 (a)

14 (a) Sundip plans to share some money so that

- Mia gets $\frac{1}{2}$
- Sara gets $\frac{2}{5}$
- Nina gets $\frac{1}{7}$.

Will Sundip's plan work?
Give a reason and show working to support your decision.

..... because .....

..... **[2]**

The best responses added the fractions and found the total $\frac{73}{70}$, or 1.04. They then compared this to 1 or said that there was not enough money to share.

Some candidates converted to three fractions with a denominator of 70 (or to decimals or percentages), but then did not show an addition or total. Others took an amount of money and found the fractional values of it, but again did not add these. Without a total, saying that Sundip would not have enough money was incomplete and marks could not be scored.

Candidates need to understand that when asked to explain or show working, then parts of the method cannot be left incomplete. Examiners cannot do the work for candidates and deduce missing figures.

The most common correct answer was to say that Sundip does not have enough money (following, for example, 1.04) rather than comparing their total to a whole.

Almost three quarters of candidates were not able to explain whether the plan could work. Some weaker responses stated that it was unfair as they did not all get the same amount.

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Question 14 (b)

(b) Sundip gives Mia and Sara the fractions of the money that she planned.
Mia gets £320.

Work out how much money Sara gets.

(b) £ ..... **[2]**

This question was a little better answered and around a third of candidates gained 2 marks. Those who worked out the total to be £640 generally did well.

A common error was to find $\frac{2}{5}$ of 320 (rather than 640), which scored M1.

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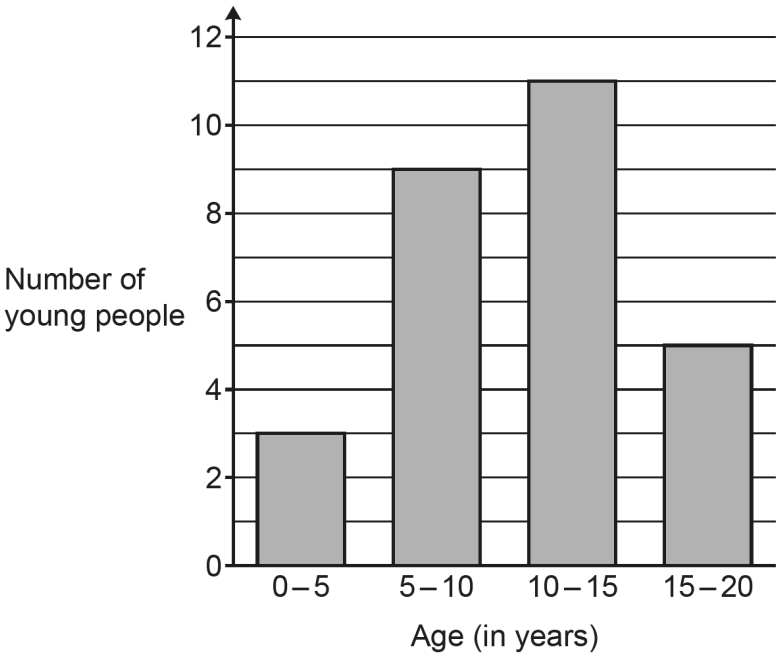
Question 15

15 Alex draws a bar chart to show the age of the young people attending a youth club.



Make **one** criticism of Alex's bar chart.

.....

.....

..... **[1]**

Around a fifth of candidates realised that the groups were inappropriate as common values were in adjacent groups.

Candidates commonly criticised the vertical scale for missing odd numbers, the spacing between the bars, the ages being presented in groups (suggesting that single ages should have been used, with a bar for each) or the size of the diagram. Some candidates stated that there were no headings, or *x* and *y* had been omitted from the axes.

Many candidates gave rambling responses that did not explain the error.

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Exemplar 2

Make **one** criticism of Alex's bar chart.

They have kept the same number for thets years at the begining of eath years it should be 0-5, 6-10, 11-15, 16-20.

The mark is obtained for the example given at the end. The written part of the response is unclear and not sufficiently specific to gain the mark on its own. Candidates should practice writing coherent reasons and review these in peer groups.

Question 16 (a)

16 **(a)** Write these numbers in order, starting with the smallest.

2.4×10^2 1.3×10^3 4.9×10^{-1} 9.5×10^1

(a) ..... , ... , ... , ... **[1]**

smallest

Many correct answers were seen to this question. A common error was to have two of the values in the wrong order, or to go from largest to smallest.

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Question 16 (b)

(b) Work out.

$5 \times 10^2 + 4 \times 10^3$

Give your answer in standard form.

(b) ..... **[2]**

This question was also well done, with two thirds of candidates scoring marks.

The common error was to give the answer 4500 or 45×10^2. Some candidates wrote 500 + 4 + 1000, misusing the second standard form number.

Question 17 (a)

17 The number of people watching a football match is 30 000, correct to the nearest thousand.

(a) Complete the error interval for n, the number of people watching the football match.

(a) ..... $\leqslant n <$ 30 500 **[1]**

This question was not understood by most candidates. Nearly 70% of candidates gave the incorrect answer.

25 000, 29 005 and 30 000 were common incorrect responses.

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Question 17 (b)

(b) The number of people watching a rugby match is 30 500, correct to the nearest hundred.

Show that fewer people could be watching the rugby match than the football match. **[2]**

This part was poorly answered and it seemed clear that many candidates did not understand what was needed. A number of error intervals (often incorrect) were presented that did not answer the question.

Very few candidates annotated their values and examiners were left to guess which might represent football and which rugby.

Question 18

18 Rearrange this formula to make k the subject.

$t = 2k - h$

..... **[2]**

Around a fifth of candidates scored 2 marks in this question and used standard techniques correctly to rearrange the formula. Most candidates did use k as the subject of their rearranged formula.

Many attempted to rearrange the equation in one step, often producing the wrong answer.

Where a first step was seen, $2k = t - h$ was a common error.

Candidates were frequently unsure about how to deal with the constant 2. Answers of $k = 2th$ and $k = \frac{th}{2}$ were sometimes seen, as were $k = \frac{1}{2}t + h$ or $k = \frac{1}{2}t - h$.

Roughly a fifth of candidates did not attempt this question.

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Question 19 (a)

19 A bag contains 150 counters.
The counters are either red or yellow.

(a) Riley picks a counter from the bag, records its colour, and replaces it.
They do this nine times.

Here are Riley's results.

Red	𝍸
Yellow	𝍸

Use Riley's results to work out how many red counters are likely to be in the bag.

(a) ..... red counters **[3]**

This question was well attempted and around one fifth of candidates gained full marks. Some did not realise the answer should be an integer however, scoring 2 marks for the answer 83.3.

The correct fraction of $\frac{5}{9}$ was sometimes identified and used correctly. Some candidates gained 1 mark for 150 ÷ 9. Other candidates tried continuing ever larger quantities in the ratio 5 : 4, but were not successful.

Among the weakest responses, 5 was a very common wrong answer, as was 30 (from dividing 150 by 5).

From this point in the paper, the lower scoring candidates only occasionally gained marks.

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Question 19 (b)

(b) Ling uses the same bag of counters and picks the counters in the same way.

Here are Ling's results.

Red	𝍸 𝍸 II
Yellow	𝍸 III

Use Ling's results to estimate the probability of choosing a red counter from the bag.
Give your answer as a fraction in its simplest form.

(b) ..... **[2]**

This part saw a slightly better response compared to (a), with nearly a quarter of candidates gaining full marks. Many candidates were awarded the B1 for $\frac{12}{20}$, but too often $\frac{12}{8}$, $\frac{8}{12}$, ratios or words such as 'unlikely' appeared.

Question 19 (c)

(c) Explain why Ling's results are likely to give a better estimate of the probability of choosing a red counter from the bag than Riley's results.

.....

..... **[1]**

Many candidates were able to score this mark by referring to the fact that having more trials improves reliability.

A common wrong answer was that Ling picked out more red counters and some said that as Ling picked an even number of counters it was easier to understand.

However, almost a quarter of candidates made no attempt to answer the question.

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Question 20

20 New cars reduce in value once they have been bought.

Zayn buys a new car for £17 000.
They see this table in a magazine.

Year	Loss in value compared to the start of the year
Year 1	15%
Year 2	10%

Zayn says

According to this table, the value of my car will be £12 750 at the end of Year 2.

Show that Zayn is **not** correct. **[4]**

More able candidates often scored marks here. The percentages required were relatively benign, so those candidates who used inefficient non-calculator techniques were often able to get the correct figures (although often wasted time doing so).

A number of candidates added the percentages and suggested that the overall decrease was 25%, scoring no marks.

Some candidates correctly found 10% of 17 000 (1700), then 5% of 17 000 (850) and then reduced 17 000 by the resulting 15% (2550), but then for Year 2 reduced this value by 10% of 17 000 rather than 10% of itself.

Few candidates showed operations when using non-calculator methods, so a slip in arithmetic would mean method marks couldn't be awarded.

Very few candidates wrote 'Year 1 = 17 000 $\times$ 0.85 = £14 450 and Year 2 = 14 450 $\times$ 0.9 = £13 005'.

A number of candidates made transcription errors and wrote values such as 2250 for 2550 and 13 050 for 13 005, leading to loss of accuracy marks.

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Question 21

21 The length of a word is classed as short, medium or long depending on the number of characters in the word.

This table shows the percentage, in terms of x, of each word length found in a book.

Length of word	**Percentage (%)**
Short	$2x + 5$
Medium	$3x - 1$
Long	x

Find the percentage of words in this book which are classed as short words.
You must show your working.

..... % **[5]**

Just less than half of candidates responded to this question. Very few gained part marks.

Some candidates formed a correct expression by adding the given expressions but didn't use this to form an appropriate equation and so didn't proceed constructively with this question. Those candidates who did form an appropriate equation often achieved at least 3 marks by solving this equation accurately, but a small number didn't complete a correct first step when solving their equation. Some candidates reached $x = 16$ as their solution but didn't substitute this value back into the expression for short words.

Some candidates tried trial and improvement and substituted a value for x in one or all the expressions, but often did not give a total for the three expressions. Many could not make the link between the whole book and 100%.

Much poor algebra was seen, such as $2x + 5 = 7x$ and $2x + 5 = 3x - 1$.

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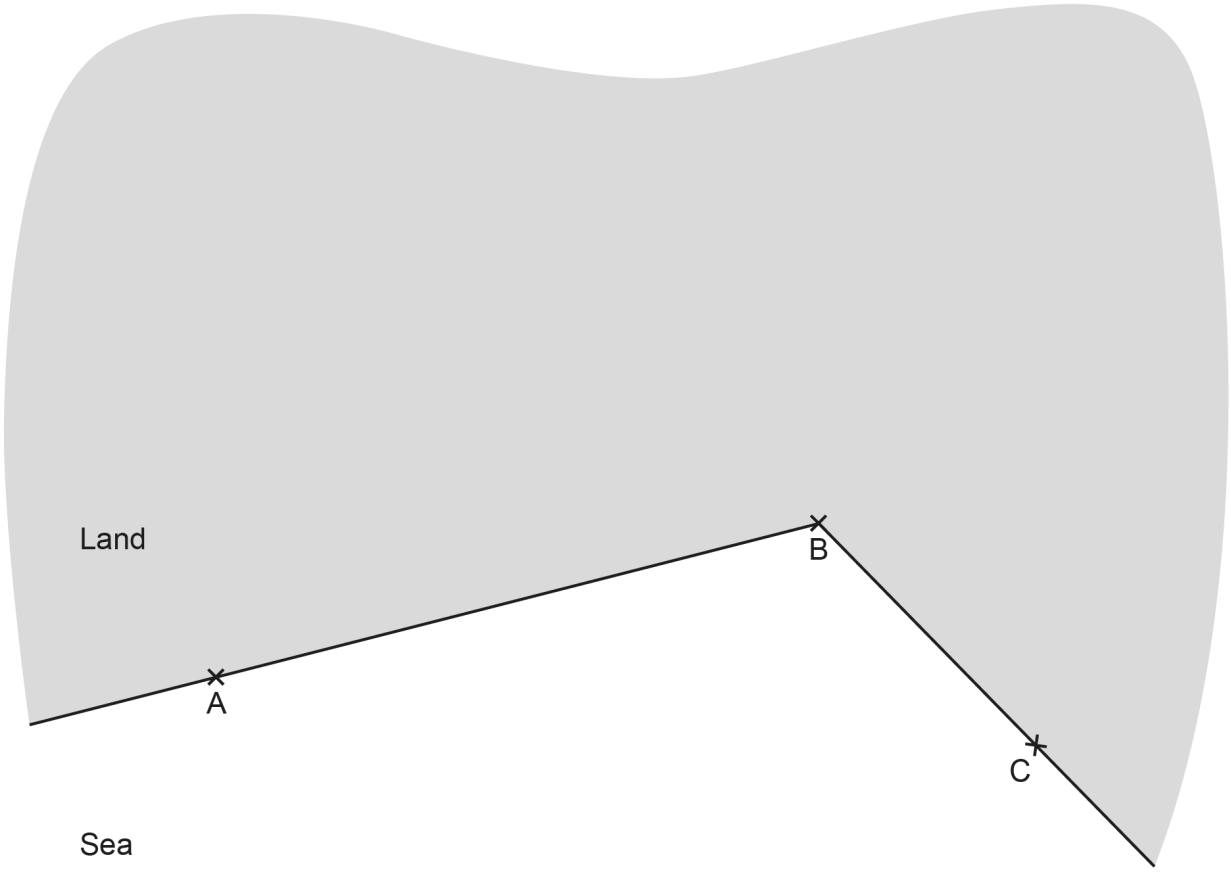
Question 22

22 The diagram represents a coastline.

A, B and C are lighthouses.



A boat is
- the same distance from A and B
- the same distance from AB and BC.

Using a ruler and compasses only, construct the position of the boat.
Label the position of the boat clearly. **[5]**

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Over half of candidates answered this question, though generally only the high performing candidates used compasses to construct the perpendicular bisector of AB. Others drew it with a ruler, but without the benefit of construction arcs. A very small proportion of candidates constructed the bisector of the angle ABC and the favoured response was instead to bisect BC. A number of candidates attempted arcs, but then did not draw a bisector.

A straightforward request to bisect a side and bisect an angle may have yielded a better response, but the Assessment Objectives do require some questions to be set in context and there are many examples of past construction questions in context for candidates to have practised.

A number of candidates placed the boat on dry land and many simply marked a point without any construction.

Some nice drawings of ships were seen.

Question 23 (a)

23 At the end of each year, a driver records how many kilometres they have driven.

In 2021, they drove 18% more kilometres than in **2020**.
In 2022, they drove 25% more kilometres than in **2020**.

In 2022, they drove 3500 km.

(a) Kai says

I can work out how many kilometres were driven in 2020 by reducing 3500 by 25%.
3500 × 0.75 = 2625 km.

Explain why 2625 is **not** the correct number of kilometres driven in 2020.

.....

.....

..... **[1]**

Higher performing candidates realised that the 2022 value was 125% of the 2020 value and so responded by saying that division by 1.25 (or by 125 and multiplying by 100) would yield the correct result.

Candidates often tackled the wrong part of the statement. Instead of saying what Kai should have done, they tried to explain where he went wrong and often without using figures. Many commented that the percentage was 25% so he should have multiplied (or divided) by 0.25 and not 0.75.

A number restricted themselves to saying that he did it wrong and around a quarter of candidates offered no reason.

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Question 23 (b)

(b) Calculate the number of kilometres driven in **2021**.

(b) ..... km **[4]**

This question saw more candidates gain some part marks. Some high performing candidates did gain all 4 marks, but this was only a small minority of candidates.

Because of the misunderstanding demonstrated in part (a), few could find the correct value for 2020. Some candidates worked out the 2020 value to be £2625 (despite (a) telling them that this value was incorrect).

The best candidates showed which year their values represented.

Some candidates gained marks for correctly increasing their 2020 value by 18%. Often however this was though non-calculator methods, finding 10%, 5%, 1% and 3%, then adding the correct terms. As elsewhere, arithmetic slips caused marks to be lost and few operations were shown.

Some candidates worked out a reduction from 2022 to 2020, but then decreased their reduction by 18% rather than the increasing it (this error might have been avoided with the use of some annotation).

Another fairly common error was increasing or decreasing 3500 by 43%.

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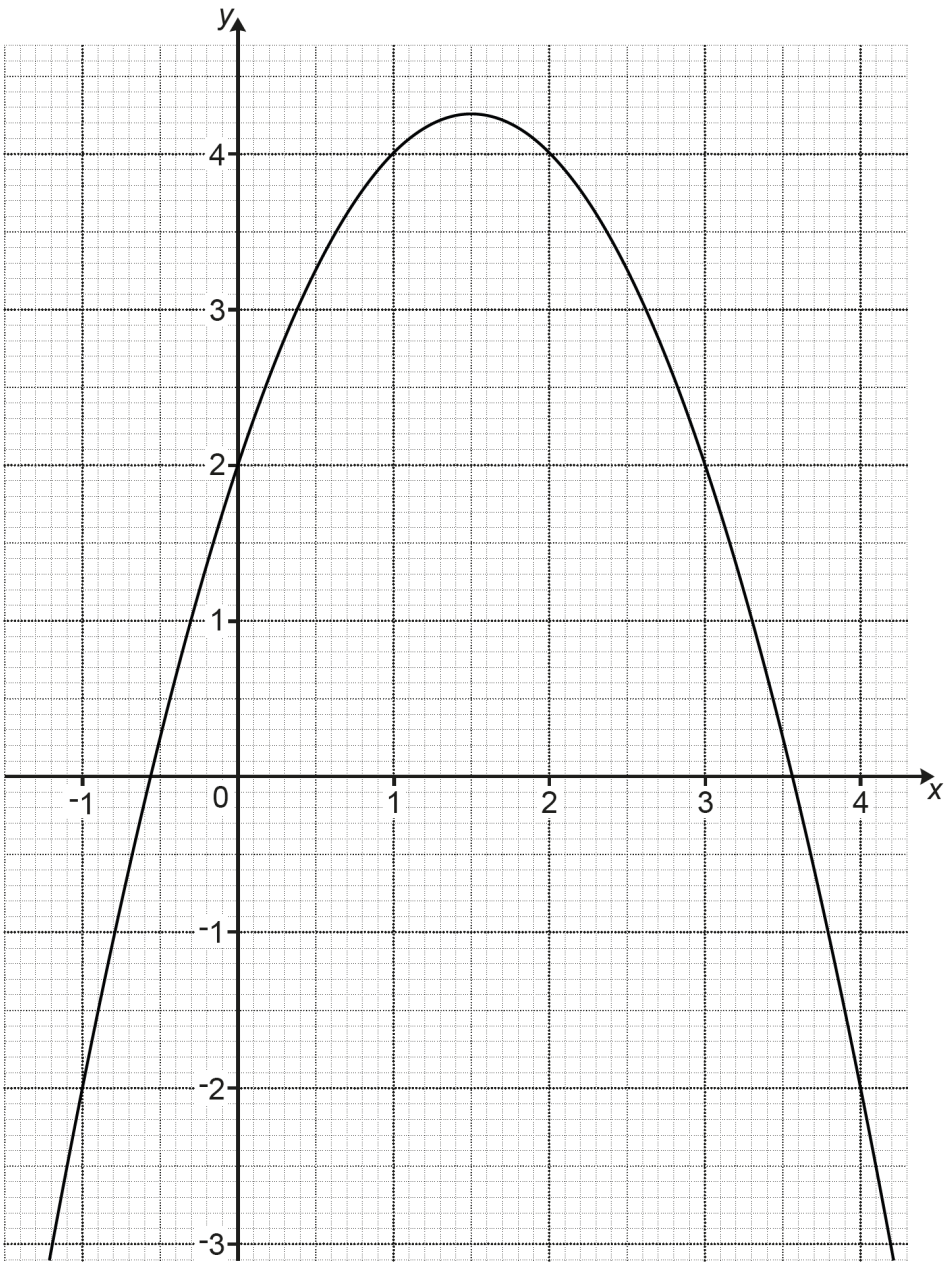
Question 24 (a)

24 The diagram shows the graph of $y = kx - x^2 + 2$, where k is an integer.



(a) Show that $k = 3$. **[2]**

A very small number of candidates worked backwards, substituting 3 for k, then substituting an integer x value and matching it to the resulting y value. This method was capped at 1 mark because the correct method to show that $k = 3$ is not to assume that k **is** 3, but to work towards this as an answer.

Almost two thirds of candidates did not attempt a response.

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Question 24 (b)

(b) Use the graph to solve $3x - x^2 + 2 = 3$.
Give your answers to **1** decimal place.

(b) $x =$ ..... or $x =$ ..... **[2]**

A small number of the strongest candidates realised that the solution was found where the line $y = 3$ intersected the curve. 1 mark was given for drawing this line, but very few could correctly read the scale to find the solutions.

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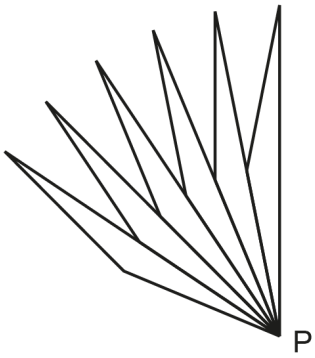
Question 25

25 Taylor designs a logo using isosceles triangles joined at a central point, P.

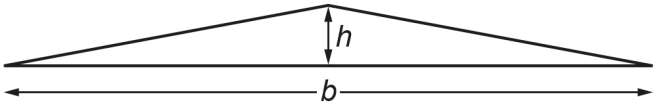
This is the start of Taylor's design.



Not to scale

The completed design will have rotational symmetry, order 60 about point P.

Each triangle has base, b, and height, h, measured in mm.



Not to scale

Calculate h when $b = 40$ mm.
Give your answer correct to **1** decimal place.

..... mm **[4]**

There were few attempts to answer this question. Most candidates could not decode the information given. A number of candidates did work out that the acute angle in the given triangle was 6°, but were unable to make further progress.

Where working was seen, Pythagoras' theorem and $\frac{bh}{2}$ featured prominently and, very rarely, trigonometry with sin/cos/tan of 90°.

A very small number of candidates worked on the full circle with the assumption that h 60 times made the total circumference. It was often not possible to tell if they used the correct 'inner' circle with a radius of 20, or the outer circle with a radius of 40 and mistakenly considered this radius as the diameter.

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