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# Examiners' report

## GCSE

# MATHEMATICS

## OCR Level 1/Level 2 GCSE (9-1) in Mathematics

**J560**

For first teaching in 2015

## J560/04 Summer 2025 series

Version 1

ocr.org.uk/maths

# Contents

# 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/where performance could be improved. A selection of candidate responses is also provided. The reports will also explain aspects that 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 Teach Cambridge.

# Paper 4 series overview

Candidates should be aware that even on a calculator paper, not every single question will require them to use their calculator. Candidates should consider how and where is best to use a calculator. Those who attempted to use a calculator in places such as Questions 10 and 19 found themselves working with much more challenging values than intended and put themselves at a disadvantage as they were unable to demonstrate the skills and knowledge actually being tested. In questions where the use of a calculator was being tested, candidates sometimes over-used their calculator, such as Question 1 where the answer was requested to 3 significant figures yet some instead gave the full answer from their calculator screen.

Many candidates truncated figures in their working, which often led to an inaccurate answer. In some problem-solving questions, some candidates attempted to use trials, which rarely led to success and no credit was given unless the values tested with their results were clearly shown.

In this paper, the most common problem was the lack of use of brackets to show the order of operations and, particularly in Question 11. This would lead to incorrect expressions from which solutions were attempted. Algebra was usually not clearly set out and rarely flowed easily, with 'jumps' to other parts of the page. Errors would easily creep in, work was not checked carefully or signs would be changed by crossing out or over-writing.

It was also common to see a correct attempt at a question crossed out and replaced with a completely wrong attempt. It is a good strategy to go with the first thought as it is almost always correct. Some candidates did not answer the question, either by finding information not required or requested or by not giving the answer to the question in the form requested. Questions with 'Show that' in them require working to be shown and statements of fact alone are unlikely to be accepted, for example the interior angle sum of a pentagon in Question 7 (a) had to be calculated and not just stated.

| Candidates who did well on this paper generally: | Candidates who did less well on this paper generally: |
|---|---|
| • read the question carefully, used all the information given and gave the answer in the form requested<br>• used brackets effectively to clearly show the order of operations<br>• would keep good accuracy in multiple calculations<br>• read figures from graphs and scales accurately<br>• could form equations describing proportionality. | • did not use all the information given and did not give the answer as requested in the question<br>• did not use brackets correctly (or at all) and often processed expressions in the wrong order<br>• would round or truncate numbers to very few figures, which they would carry into further calculations<br>• did not draw lines on graphs that were vertical or horizontal, leading to inaccurate readings<br>• could not form equations describing proportionality, often leading to an expression with the proportionality symbol still present. |

## Question 1

**1** Calculate.

$$\frac{4.5^3}{1.8} + \frac{3.6}{2.4^2}$$

Give your answer correct to **3** significant figures.

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

This question was answered well, with 51.25 shown in the working and 51.3 as the answer. Some candidates did not give their answer to 3 significant figures as requested and a few gave a fractional answer. Many did not show any working and just wrote down their answer.

An incorrect method seen a few times was $4.5^3 + 3.6$ rounded to 95, $1.8 + 2.4^2$ rounded to 8 and then finally $95 \div 8 = 11.875$, which was rounded to 11.9.

## Question 2

**2** The ratio 40 grams to 1 kilogram can be written in the form 1 : $n$.

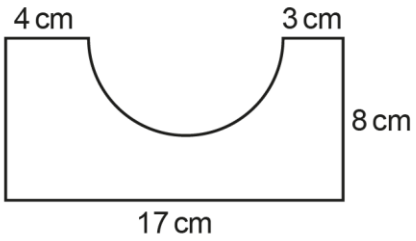
Find the value of $n$.

$n =$ ..... **[2]**

The correct method here was to write the ratio 40 : 1000 and then simplify it, giving the value of $n$ as the answer. Many candidates did not note the different units so 0.025 was a common answer and many did not recognise that we wanted just the value of $n$, so 1 : 25 was also a common answer. Some candidates left the units in their working and in their answer.

## Question 3

**3** The diagram shows a shape formed from a rectangle measuring 8 cm by 17 cm with a semicircle removed from one side.




**Not to scale**

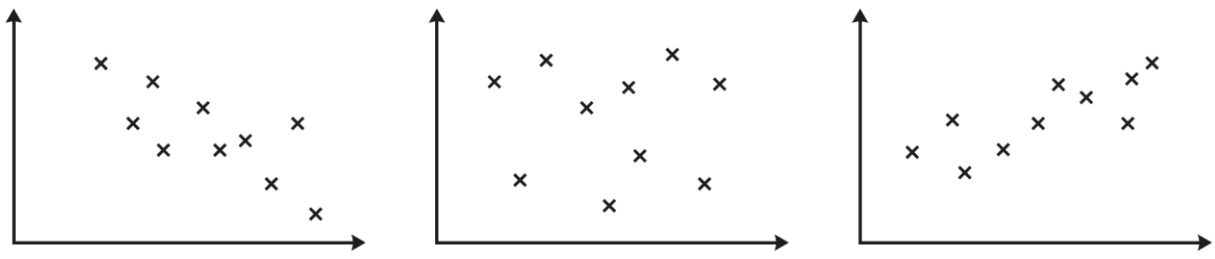
Calculate the perimeter of the shape.

..... cm **[4]**

Most candidates calculated the diameter of the semicircle as 10 cm and some showed it on the diagram, which they seemed to find useful. The best solution was to work out $17 + 8 + 8 + 4 + 3 + 5\pi$; some candidates left out the second side of 8 cm and some used the full circumference of the circle $10\pi$ instead of $5\pi$. Another common incorrect method was $17 + 17 + 8 + 8 + 4 + 3 - 5\pi$. A few gave 50 cm, the perimeter of the rectangle. Some calculated the area of the shape rather than the perimeter.

## Question 4 (a)

**4** **(a)** Describe the correlation shown in each of these scatter diagrams.



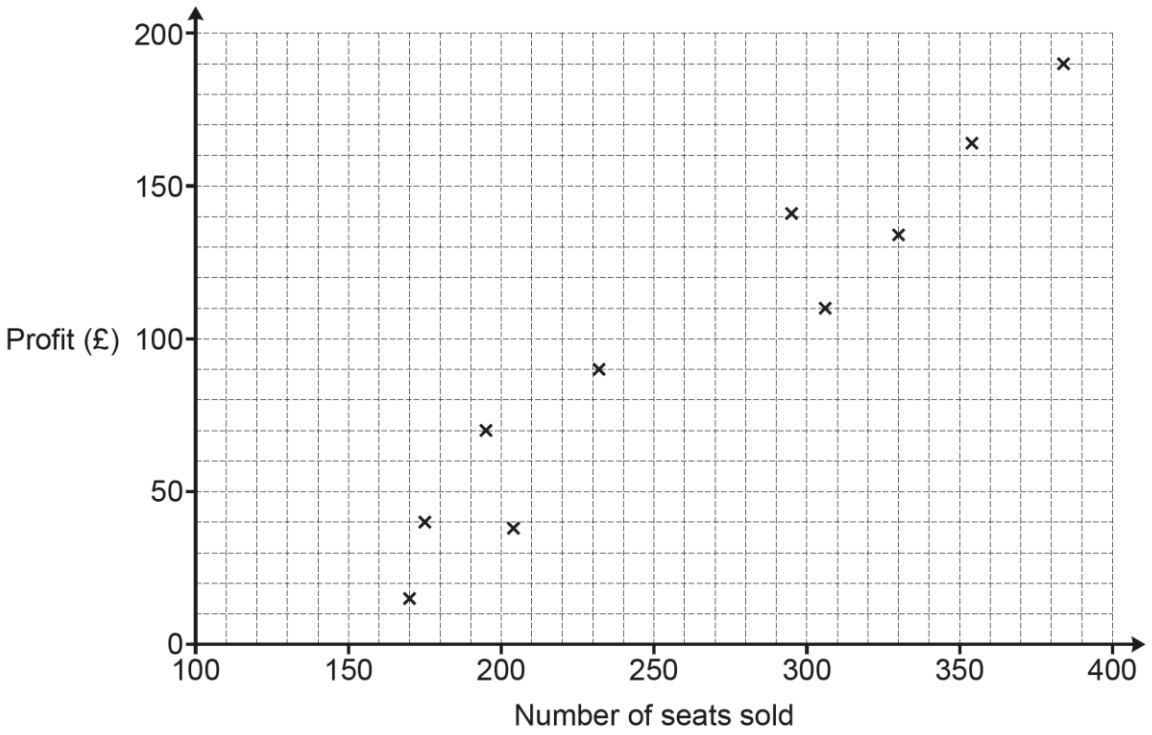
..... ..... .....

**[2]**

Responses for the first and third diagram were usually correct. The middle diagram had a variety of incorrect answers such as random, scattered, positive, weak and mixed.

## Question 4 (b)

**(b)** A theatre records the number of seats sold and the profit made for 10 performances. The scatter diagram shows these results.




By drawing a line of best fit, estimate the profit made when 250 seats are sold.

**(b)** £ ..... **[2]**

Most candidates drew an acceptable ruled line of best fit, but a few were too steep and went outside the end points. It is a good guide to have the same number of points on both sides of the line of best fit. Most readings from their line were accurate, but some clearly at 80 were given as 90.

## Question 5 (a)

**5** **(a)** For each of the algebraic statements below decide whether it is an equation or an identity.

$(x-1)(x-2)=12$ is an .....

$(x-1)(x-2)=x^2-3x+2$ is an .....

$x^2=3x+10$ is an .....

**[1]**

Many candidates struggled with this question. Most stated that the first and last statements were identities, which is incorrect.

## Question 5 (b)

**(b)** A straight line is parallel to $y=3x$ and passes through the point (2, 11).

Find the equation of the line in the form $y=mx+c$.

**(b)** ..... **[3]**

Many candidates did not know how to find the gradient of a parallel line, and a few were confused with the rule for perpendicular lines. The most successful method was to substitute in to get $11 = 3 \times 2 + c$. Some candidates substituted incorrectly and put $c = 11$, meaning that $y = 3x + 11$ was a common answer. Others thought the gradient was 2, so $y = 2x + 11$ was another common answer.

## Question 6

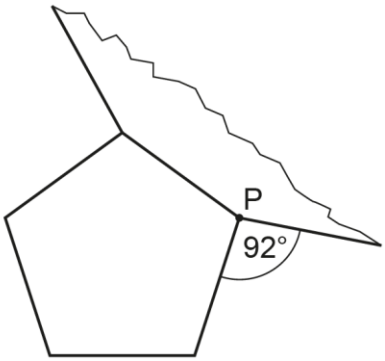
**6** The distance of a car race is 420 km.
A car completes the first 210 km at an average speed of 150 km/h.
The same car completes the final 210 km at an average speed of 100 km/h.

Show that the average speed of the car for the whole race is less than 125 km/h. **[5]**

Usually, candidates would either get the entire question fully correct, or they would struggle to gain part marks. The important move was to calculate the time by doing 210 ÷ 150 = 1.4 and so on. There was no requirement to change the decimals to minutes and those who felt compelled to do so often made errors. Those who worked in minutes should have arrived at the calculation 420 ÷ 210, which can be done without a calculator, but the step should still be shown as this is a 'Show that…' question. Another common error was to use the wrong calculation for time, such as 150 ÷ 210.

## Question 7 (a)

**7** The diagram shows a regular pentagon and part of another regular polygon meeting at point P.
One of the angles at point P is 92°.




**Not to scale**

**(a)** Show that the size of one interior angle of a regular pentagon is 108°. **[2]**

Some candidates started with 108°, so could not gain any credit from this question at all. There were a number of ways of showing this value; the common two correct methods were $180° - \frac{360°}{5}$ and $\frac{180° (5 - 2)}{5}$. Some stated that the sum of the interior angles was 540° without showing it, but they were still able to get the second mark if they divided this by 5.

## Question 7 (b)

**(b)** Find the number of sides of the other regular polygon.

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

The most common and successful method was to find the internal angle at P, using 360° – 92° – 108° to reach 160°, then find the external angle from 180° – 160° to reach 20° and finally the number of sides from $\frac{360°}{20°}$. There was also a quick method to find 20° by doing 92 − $\frac{360°}{5}$. Some candidates did find 160° and then tried to use $\frac{180° (n - 2)}{n}$, but they usually did not formulate the correct equation and very often this method led to some attempt at trials.

## Question 8

**8** A town council are going to do a survey on how people travel to work or school and for how long they travel.

One day their interviewer stands outside the town railway station and chooses 20 people at random to form their sample.

Make **three different** criticisms or suggestions for improving the council's method for selecting their sample.

1 .....

.....

2 .....

.....

3 .....

.....

**[3]**

This type of question is being answered more successfully now. Many candidates mentioned the sample size and the choice of the location. The third reason was more varied, and some candidates repeated one of their previous two statements in a slightly different way. Other responses suggested multiple interviewers or using an online or postal survey, but most cases made no mention of how the council would select their sample. To support examiners and teachers, the list of exemplar responses in the mark scheme's appendix has been extended.

## Question 9 (a)

**9 (a)** Write 0.0037 in standard form.

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

This part was answered well. The two common errors were $3.7 \times 10^3$ and $3.7 \times 10^{-4}$.

## Question 9 (b)

**(b)** A country consists of a south island and a north island.
The table below shows the population and area of each island in June 2023.

| | Population | Area ($km^2$) |
|---|---|---|
| **South island** | $1.2 \times 10^6$ | $1.5 \times 10^5$ |
| **North island** | $4.0 \times 10^6$ | $1.1 \times 10^5$ |

Work out the overall population density of the country in June 2023.

**(b)** ..... people per $km^2$ **[4]**

This part question was also answered well. Many candidates added the populations together and then the areas together and finally divided them. If the final answer was incorrect, credit was given for the two correct totals. Some candidates divided the population by the area of each island separately and then added them, i.e. $\frac{1.2 \times 10^6}{1.5 \times 10^5} + \frac{4.0 \times 10^6}{1.1 \times 10^5}$ and gave an answer of 44 or 45. A few candidates multiplied the population by the area of each island, then added them.

## Question 10

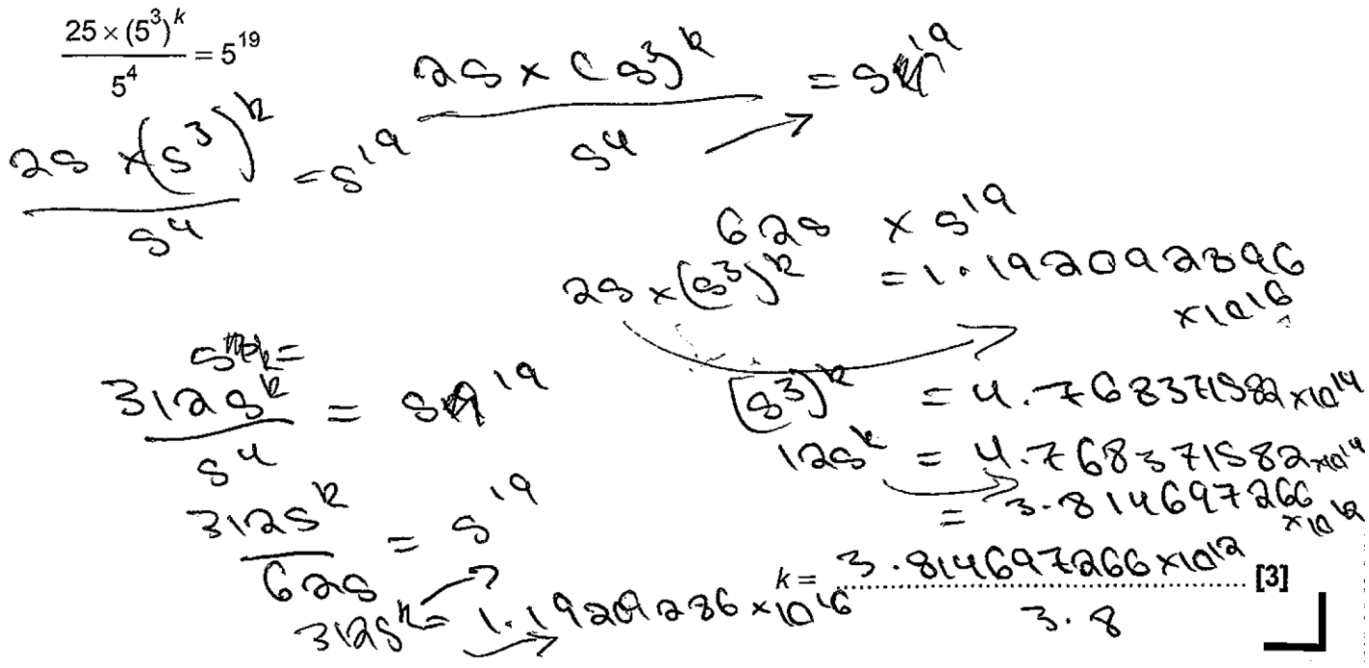
**10** Find the value of $k$.

$$\frac{25 \times (5^3)^k}{5^4} = 5^{19}$$

$k =$ ..... **[3]**

The best method was to convert 25 to $5^2$ and then put the known powers of 5 on the right-hand side as $5^{19+4-2}$ or $5^{21}$, leading to $5^{3k} = 5^{21}$. Many candidates did not write 25 as a power of 5. Errors in combining powers, such as $5^{19} \times 5^4 = 25^{23}$, were not uncommon. Some used their calculator to calculate the values (as shown in the exemplar below) and almost all that attempted this did not get to the correct answer. If using a calculator, the best method is to work out the result of $5^{19+4-2}$ as 476,837,158,203,125. This is equal to $5^{3k}$ (as can be seen in the exemplar below on the right-hand side). The only realistic way at this level to solve this is to use inverse operations, so taking the cube root gives $5^k = 78{,}125$ and then repeatedly dividing 78,125 by 5 to identify that $k = 7$, which very few were able to do.

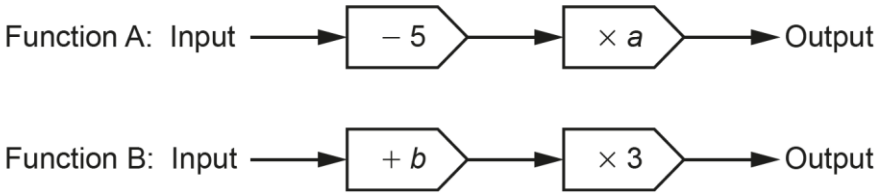
## Exemplar 1




In this question we were testing the rules of indices. The use of calculators, as in this exemplar, rarely led to anything meaningful and eventually to an equation that is not in the specification (although it can be solved using methods on the specification, please see above, but very few candidates worked out how to do it).

## Question 11

**11** Function A and function B are shown below.




When the input for both machines is 11, the output of Function A is equal to the output of Function B.
When the input for both machines is 29, the output of Function A is twice the output of Function B.

Find the value of $a$ and the value of $b$.

$a =$ .....

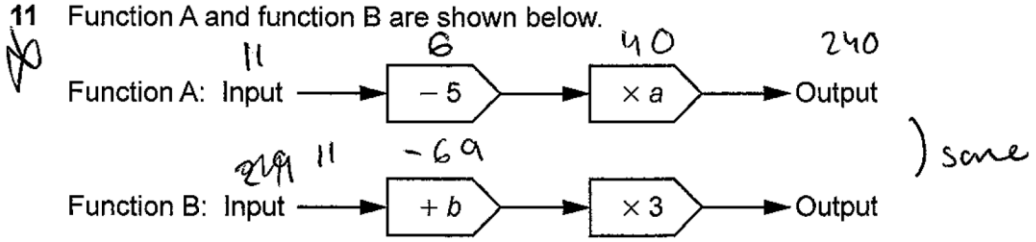
$b =$ .....

**[5]**

The most successful solutions correctly had the functions as two linear equations, for example $6a = 33 + 3b$ and $24a = 174 + 6b$, then solved to find the two required values. Many candidates wrote the first equation correctly, but the second equation was often either $24a = 87 + 3b$ or $48a = 87 + 3b$; the first led to the neat solution of $a = 3$ and $b = -5$ and the second to the less neat solution of $a = \frac{9}{7}$ and $b = -8\frac{3}{7}$. Some wrote multiple expressions, of which usually 2 or 3 were correct. Many wrote $11 – 5a$ and $29 – 5a$ and did not simplify these nor did they write these expressions with brackets. Some attempted to use trials, but very few candidates made any progress using this method.

## Exemplar 2

**11** Function A and function B are shown below.




When the input for both machines is 11, the output of Function A is equal to the output of Function B.
When the input for both machines is 29, the output of Function A is twice the output of Function B.

Find the value of *a* and the value of *b*.

$11 - 5 \times a$

$11 + b \times 3$

$29 - 5 \times a$

$29 + b \times 3$

$a = 2 \times b$

$b = a \div 2$

$11 - 5 \times a$

$+ \quad 29 - 5 \times a$

$40 \times a \qquad 40a$

$29 - 5 \times a$

$29$

$29 \quad 5$

$= 24 \times 40 = 960$

$29 - 69 = -40 \times 5 = 120$

$11 + b \times 3 = 0$

$29 + b \times 3 = 0$

$11 = 0 \div 3 - b$

$b$

$29 = 0 \div 3 - b$

$18 = 3 - b$

$+3 \quad 21 = -b$

$29 + 7 \times 3 = 108$

$11 + 7 \times 3 = 32$

$32 \div a - 5$

$32 \div 6 =$

*a* = 5.3

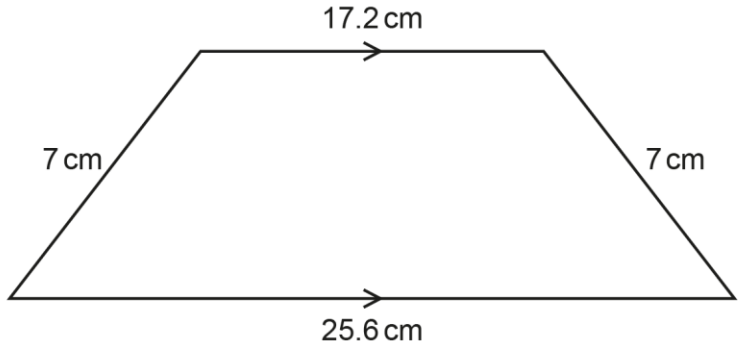
*b* = 7

**[5]**

This exemplar shows how not using brackets hinders progress in this question. Many candidates also did not simplify 11 – 5 and 29 – 5 earlier as they should have and just left them in their working.

## Question 12

**12** The diagram shows a trapezium.




**Not to scale**

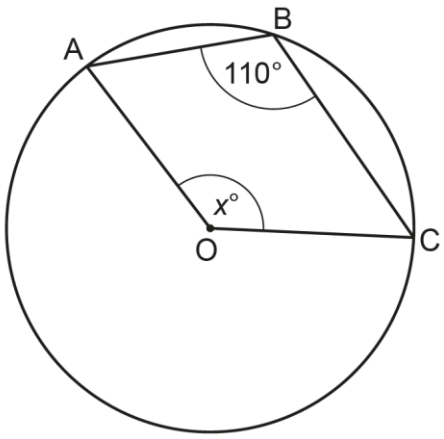
Calculate the area of the trapezium.
You must show your working.

..... $cm^2$ **[5]**

Candidates needed to find the perpendicular height, which most did attempt. The base of one of the right-angled triangles is $\frac{25.6 - 17.2}{2}$, however some did not divide by 2 and gave the base as 8.4 cm. This made it more challenging to find the perpendicular height using Pythagoras' theorem. Many candidates used 7 cm as the perpendicular height. Some used trigonometry, including the sine rule, to find the height of the trapezium instead of Pythagoras' theorem, but they usually rounded their figures too much and too early. Many had the perpendicular height greater than 7 cm, which, on inspection, should be recognised as an error. A few attempted to find the perimeter.

## Question 13 (a)

**13** A, B, and C are points on a circle, centre O.




**Not to scale**

**(a)** Explain why OABC is **not** a cyclic quadrilateral.

.....

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

Most candidates recognised that all four vertices of a cyclic quadrilateral must touch the circumference of the circle. However, there was varied precision in the language used and a range of misconceptions regarding properties of cyclic quadrilaterals. Words such as 'edge', 'outside', 'side of the circle' or just 'circle' were seen often. Some candidates also referred to sides of the quadrilateral, rather than vertices or corners. Some mentioned parallel sides and opposite angles being supplementary without any proof.

### Assessment for learning

Reinforce accurate mathematical vocabulary and the specific properties of cyclic quadrilaterals. Use diagrams to help students visually identify when a quadrilateral is not fully inscribed (i.e. its four corners do not touch the circumference of the circle) and therefore cannot exhibit properties such as opposite angles summing to 180°.

## Question 13 (b)

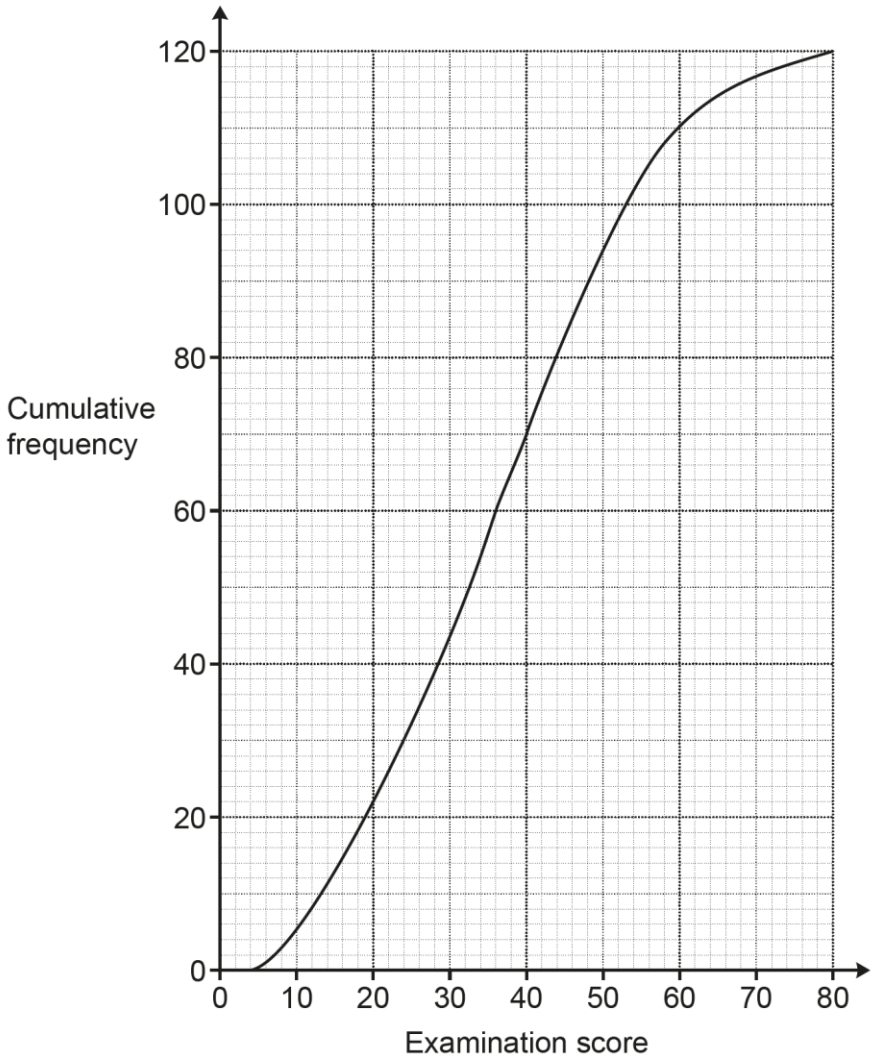
**(b)** Work out the value of $x$.

$x =$ ..... **[2]**

The main correct method was to mark the reflex angle AOC as 2 × 110° = 220°, then $x$ = 360° – 220°. This part question was found to be difficult; the common incorrect answers were 70°, 110° and 220°. Sometimes angles were calculated, but then either not labelled or incorrectly labelled.

## Question 14 (a)

**14** The cumulative frequency graph shows the distribution of the examination scores for 120 students.




**(a)** A student says that they had an examination score of 34 and so were in the top half of the 120 students.

Is the student correct?
Give a reason for your decision.

..... because .....

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

The best methods were finding the median of 36 and stating that 34 was less than 36 so it was in the lower half or finding the cumulative frequency for 34 (which was 54) and stating that this was less than 60. Many candidates looked up a figure but did not make a comparison or give the figure that they were comparing it to (for example, saying that 54 is in the bottom half is not sufficient without comparing it to 60).

## Question 14 (b)

**(b)** The top 10% of the 120 students are awarded a commendation.

Find the minimum mark required for a commendation.

**(b)** ..... **[3]**

This was answered well, and most candidates gave the correct answer of 58. A few found 10% of 120 as 12 but then subtracted that from 100 instead of 120 and so looked at a cumulative frequency of 88. Another common error was to find 10% of 80, leading to them looking at a cumulative frequency of 72 instead of 108.

## Question 15

**15** $y$ is inversely proportional to the square of $x$.
$y = 5$ when $x = 6$.

Find a formula linking $x$ and $y$.

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

Responses to this question depended on the initial equation written down. The phrase 'square of $x$' was misunderstood by some and a variety of equations such as $y = \frac{k}{x}$, $y = \frac{k}{\sqrt{x}}$ and $y = kx^2$ were seen. Some candidates wrote a correct equation and found the correct value of $k$ but then did not write out the answer as a formula (usually leaving the proportional symbol in).

**Misconception**

There were two misconceptions here. Some candidates approached the question using direct proportionality, for example writing $y = kx^2$. Others used the square root of $x$ rather than the square of $x$ and wrote $y = \frac{k}{\sqrt{x}}$.

## Question 16 (a)

**16** The population of fish, $P$, in a pond is predicted by the formula

$P = 640 \times 1.025^n$

where $n$ is the number of years after 1st January 2020.

**(a)** Write down the population of fish on 1st January 2020.

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

Most candidates answered this correctly. A common incorrect answer was 656.

## Question 16 (b)

**(b)** Write down the percentage increase per year used in the formula.

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

Again, most students gave the correct answer here. The main errors were 1.025 or 25.

## Question 16 (c) (i)

**(c) (i)** Show that the formula predicts that the population of fish will reach 1000 between 1st January 2038 and 1st January 2039. **[3]**

This was also answered well. Some candidates additionally used values of $n$ between 18 and 19 instead of just 18 and 19, which was extra work that was not required. A few used 38 and 39 instead of 18 and 19. Some candidates did not state that 1000 lay between their two values, but this was not a requirement.

## Question 16 (c) (ii)

**(ii)** Give **one** reason why this might not happen.

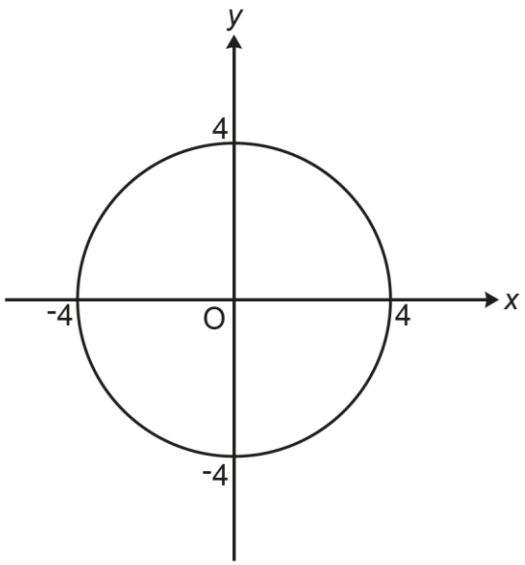
.....

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

This was answered well. Candidates need to acknowledge that the rate of 2.5 percent may not continue, or to give a reason why it will not, such as a catastrophe. Answers such as 'fish may die' were common and was not sufficient (as fish would die and be replaced by young fish).

## Question 17 (a)

**17** The diagram shows a circle, centre (0, 0).




**(a)** Write down the equation of the circle.

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

Many candidates knew the equation $x^2 + y^2 = r^2$, but often could not substitute in the appropriate value of 4 for $r$. The common errors were $x^2 + y^2 = 4$ and $x^2 + y^2 = 32$.

Some candidates tried to use $y = mx + c$, but many seemed to find this topic beyond their knowledge.

## Question 17 (b)

**(b)** Point A has coordinates (2.3, 3.3).

Show that point A does **not** lie on the circle and state, with a reason, whether it lies inside the circle or outside the circle.

Point A lies ..... the circle because .....

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

There were a lot of correct answers here, which is encouraging. Some candidates attempted to find the equation of the line through point A and (0, 0). Many found the length OA, but a few were confused between the radius and the radius squared so they compared 16.18 with 4. Some just compared 2.3 and 3.3 with 4 and incorrectly stated that it was inside the circle.

## Question 18 (a)

**18 (a)** A sequence is defined by

$u_{n+1} = ku_n - 2$, $u_2 = 7$ and $u_3 = 29.5$.

Find the value of $k$.

**(a)** $k =$ ..... **[3]**

Most candidates found this question difficult. Some tried to use trials, but only those who produced the equation $29.5 = k \times 7 - 2$ found the correct answer. Some wrote down this equation, but then manipulated it incorrectly, a common error being $29.5 - 2$ rather than $29.5 + 2$ and some divided 29.5 by 7 then added 2.

## Question 18 (b) (i)

**(b)** Another sequence is defined by $u_{n+1} = 6u_n - 7$.

**(i)** Find the value of $u_1$ in the case when $u_2 = 2 \times u_1$.

**(b)(i)** $u_1 =$ ..... **[2]**

Many candidates were very close to the equation of $2u_1 = 6u_1 - 7$, but they did not have the same variable in both parts. Some candidates doubled the right-hand side instead of the left-hand side. A few wrote the correct equation but did not manipulate it correctly.

## Question 18 (b) (ii)

**(ii)** Explain what happens to the sequence $u_{n+1} = 6u_n - 7$ when $u_1 = 1.4$.

.....

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

A variety of answers were given, including 'increasing' and 'decreasing', but many candidates did give the correct answer. It was not sufficient to say the next term was 1.4, because the question asked what happens to the sequence.

## Question 19

**19** Multiply out and simplify.

$(\sqrt{5}+1)(\sqrt{15}-\sqrt{3})$

Give your answer in the form $a\sqrt{b}$, where $a$ and $b$ are integers.

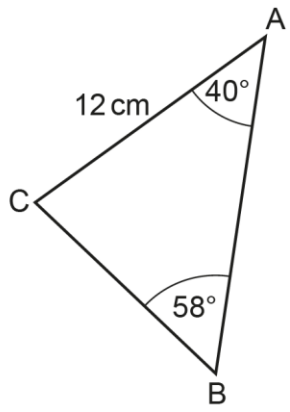
You must show each step in your working.

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

Some candidates just wrote down the answer from their calculator without any working. The key to this question was to realise that $\sqrt{5} \times \sqrt{15} = \sqrt{5} \times \sqrt{5}\sqrt{3} = 5\sqrt{3}$. Many were able to write out the expansion correctly, but fewer were able to simplify it. Some seemed unaware that $\sqrt{5} \times -\sqrt{3} = -\sqrt{15}$. Some responses did not contain good notation, for example writing $\sqrt[4]{3}$ rather than $4\sqrt{3}$.

## Question 20

**20** The diagram shows triangle ABC.




**Not to scale**

AC = 12 cm, angle CAB = 40° and angle ABC = 58°.

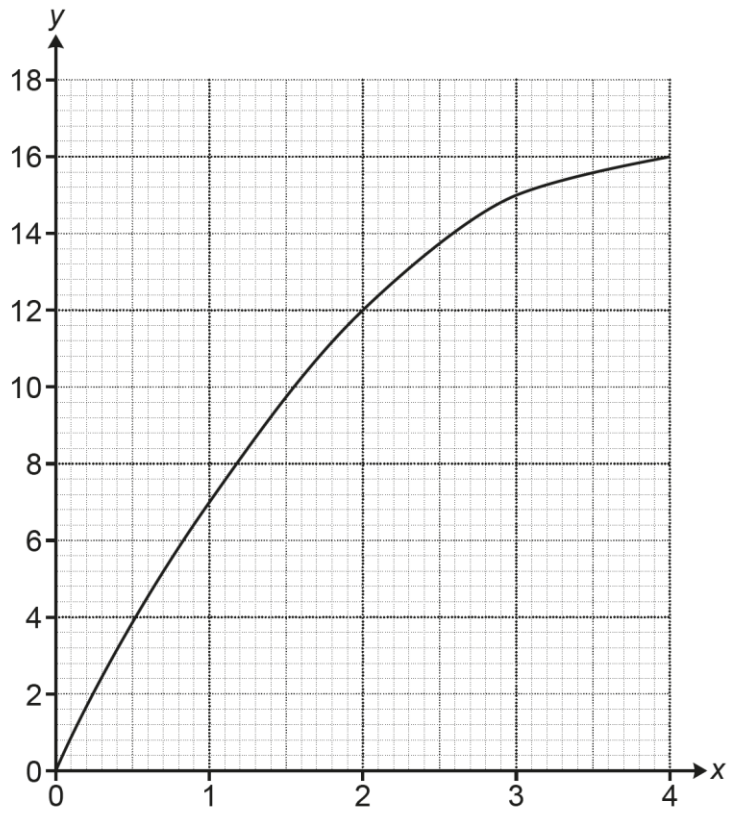
Calculate length BC.

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

Many candidates realised that the sine rule was required, and most were able to find the correct answer. A few rounded their answer a bit too much and gave the answer as 9. Some found the angle at C, but this was not required. A few attempted to use the cosine rule, but they needed another side (usually AB). Others found side AB and gave it as their answer. Some tried to use simple trigonometry, but ABC is not a right-angled triangle.

## Question 21 (a)

**21** The graph of a function is drawn on the grid for $0 \leqslant x \leqslant 4$.




**(a)** Work out the average rate of change of the function between $x = 1$ and $x = 3$.

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

The most efficient method involved taking readings at 1 and at 3, leading to this calculation $\frac{\textit{their}\,15 - \textit{their}\,7}{3-1}$. There was a small tolerance on these readings. Some candidates drew the chord from (1, 7) to (3, 15) and then used two other points on the line, which is acceptable but unusual, and created more work. Two points taken too close together generally led to an inaccurate result. Many candidates did not divide by the difference in $x$ (i.e. 3 – 1) so just gave an answer of 8. Using a tangent at $x = 2$ did give a similar value to the answer, but it was not the correct method here as it gives the instantaneous rate of change at $x = 2$ rather than the average rate of change between these two points.

## Question 21 (b)

**(b)** Use the graph to estimate the gradient of the function at $x = 2.5$.
You must show working to support your estimate.

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

To estimate the gradient at 2.5, candidates were required to draw a tangent at that point. This was compromised for some as they had drawn a tangent at 2 in part (a). Many did not draw a tangent, so they were unable to be credited in this part. Some tangents crossed the curve, while some did not touch the curve at all. When selecting two points, candidates should select them as far apart as possible to improve the accuracy. Some selected two points on gridlines, which made reading values easier. There were some problems reading the scales accurately, but most candidates who drew a tangent usually calculated the gradient correctly by dividing the difference in *y* by the difference in *x*.

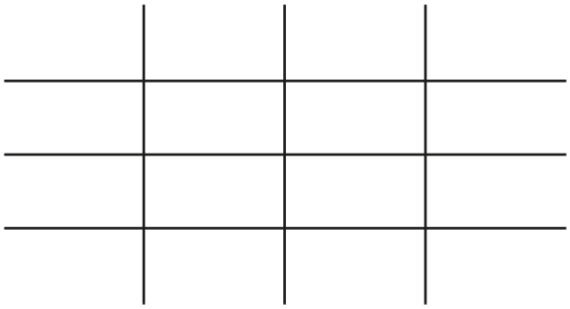
## Question 22

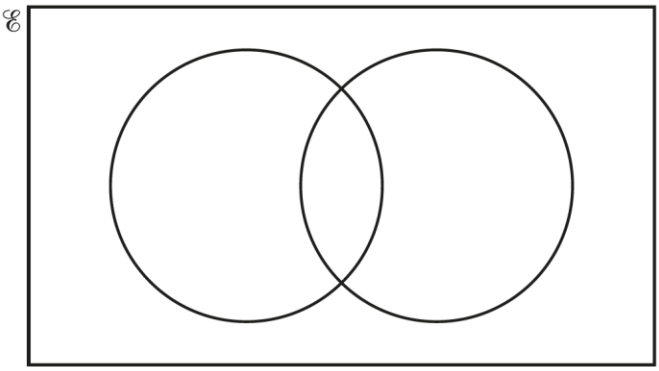
**22** A school has 90 students in Year 11.

- 50 of the students study French.
- 59 of the students study Spanish.
- 4 of the students do not study either of these languages.

One the students is chosen at random.

Find the probability that the student studies French given that they study Spanish.
You may use the grid **or** the Venn diagram to help present your working if you wish.






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

Very few candidates used the table; most opted to use the Venn diagram and very successfully too.
Many got as far as finding the intersection as 23, but then gave an incorrect final answer, often $\frac{23}{90}$ or $\frac{23}{86}$.
The common incorrect intersection given was 19, which meant that the total in French and Spanish was 90, but they left out the 4 who studied neither. Some candidates showed no method for finding the intersection. The best method to find the intersection was to calculate 50 + 59 + 4 – 90 (i.e. add up all the numbers from 'French', 'Spanish' and those studying neither, then subtract the total number of students); the extra are those studying both French and Spanish.

## Question 23 (a)

**23 (a)** Write this expression in its simplest factorised form.

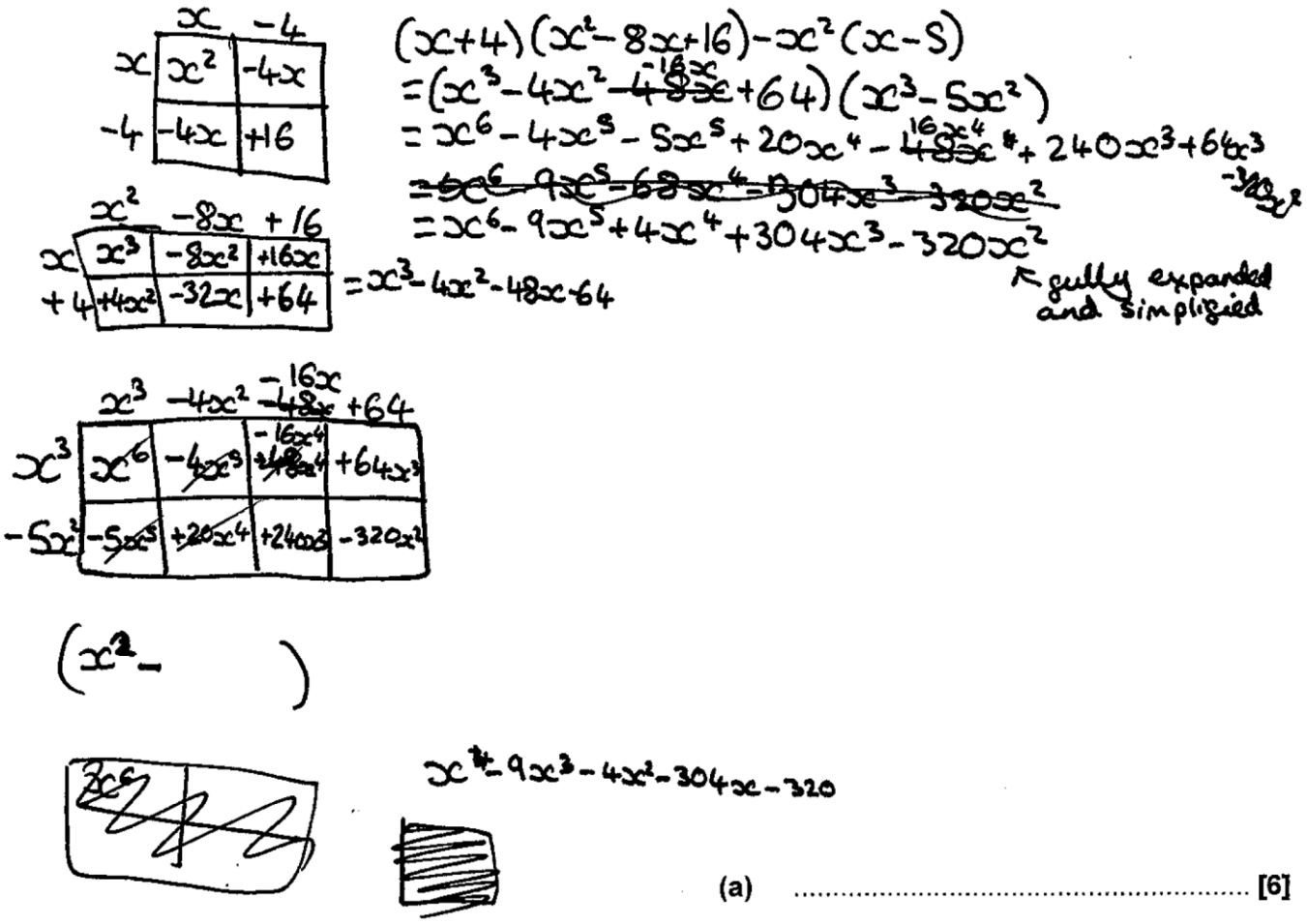
$(x+4)(x-4)^2 - x^2(x-5)$

You must show your working.

**(a)** ..... **[6]**

Most candidates were able to expand one pair of brackets from the triple term, either $(x-4)^2$ or $(x+4)(x-4)$, the latter being more successful. Fewer were able to expand the triple bracket as errors crept in, some had $-64$ on the end, others had $+4x^2$. In expanding the final bracket, many produced $-x^3-5x^2$ or even $+x^3-5x^2$, but few had the final term as $+5x^2$. The most accurate algebra appeared to be produced by those using the grid or table method rather than 'FOIL', which often led to errors with signs. Some then multiplied the result of the triple bracket by the single bracket, making the question even more challenging. The work was often haphazardly laid out on the page and lacked a logical flow. Some attempted the triple bracket in one go, which was usually unsuccessful.

## Exemplar 3




This exemplar uses the final term of $-x^3 + 5x^2$ incorrectly and multiplies the triple bracket by this instead of collecting like terms. This was done by many.

## Question 23 (b)

**(b)** Use your answer to part **(a)** to write down the value of $x$ which gives the smallest value of this expression.

**(b)** $x =$ ..... **[1]**

Many candidates were unable to answer this question because they had expressions with powers of $x$ of 3 or more. There were follow through marks available from quadratic expressions, but if candidates did not factorise to a square term, it was difficult to find the value of $x$ required. Most of those who answered part (a) correctly also answered this part correctly too. Some attempted to solve their expression equal to 0 using the quadratic formula or by factors.

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