OCR
Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

MATHEMATICS

J560

For first teaching in 2015

J560/01 November 2023 series

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 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 Teach Cambridge.

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Paper 1 series overview

This paper is the first of three papers for the GCSE (9-1) Mathematics Foundation tier. This paper expects candidates to use a calculator; of those who did, many only rarely made arithmetic errors on simple calculations. Responses that required a written statement to justify or explain situations often were not given marks due to a lack of understanding of the question or language skills. There was a poor response on some basic knowledge, e.g. few candidates could draw a quadrilateral where the diagonals are not at right angles to each other (Q1(c)). Candidates who may have taken the higher tier previously should be reminded of the grade 1 to 3 topics and practise these. Handwriting was generally legible, but on occasion some answers were difficult to read. Challenging topics included pie charts and trigonometry. Many candidates did not attempt Question 20 onwards.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• attempted all questions • highlighted key words, phrases and values in the question • read questions carefully and followed instructions • provided working in 'show your working' questions • used and understood correct mathematical language such as prime numbers, square numbers and factors • checked their working and made alterations where necessary • demonstrated some knowledge of algebraic techniques and the ability to make time conversions • demonstrated good calculator skills.	• did not read questions carefully • did not check work or consider whether a response made sense in context • did not understand or use correct mathematical language, such as names of polygons and descriptions, factors, volume • did not always use a calculator; instead, they often used inefficient non-calculator methods leading to arithmetic errors • showed little or no working • sometimes presented more than one attempt at a question; working was often unclear • rounded values too soon while working through a method leading to a lack of accuracy in final responses.

Question 1 (a)

1   (a)   Write down the mathematical name of this solid.
         Choose from the list of names in the box.
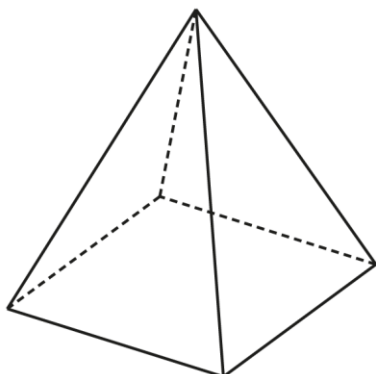
cone	cube	cuboid	cylinder
	prism	pyramid	sphere

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

Many candidates gave the correct response. The most common incorrect response was prism.

Question 1 (b)

(b)   Write down the mathematical name of this polygon.
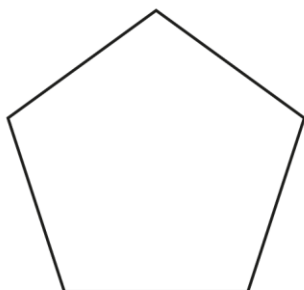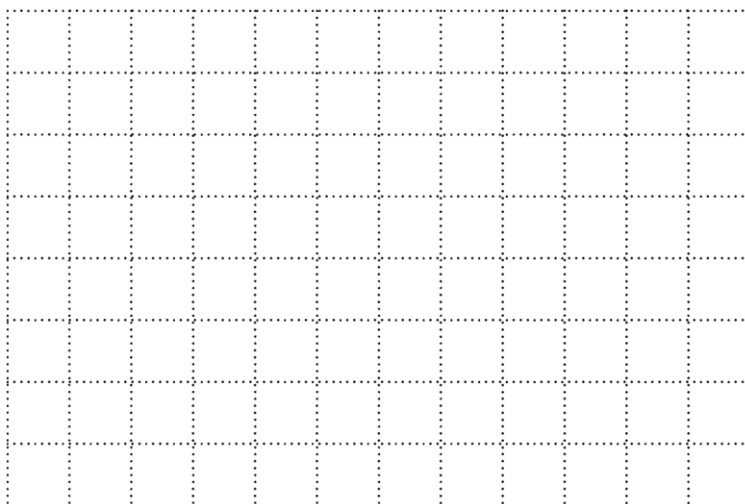

                                                    (b)   .... **[1]**

Although many gave the correct response, the incorrect response of hexagon was often seen.

Question 1 (c)

(c) On the grid below, sketch a quadrilateral with these properties.

- All angles are equal

and

- the diagonals are **not** at right angles to each other.

[1]

This question was not well answered. Several candidates did not draw a quadrilateral. Of those who did, squares and parallelograms were the most common responses (neither of which is correct).

Question 2 (a)

2   **(a)**   Round 3648 to the **nearest hundred**.

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

There were many correct responses, with the most common incorrect responses being 600 and 365.

Question 2 (b)

(b) Round £3.2875 to the **nearest penny**.

(b)   £ .... **[1]**

As with part (a), many correct responses were seen. The most common incorrect response was 3.3(0).

Question 3 (a)

3   (a) What fraction of this shape is shaded?

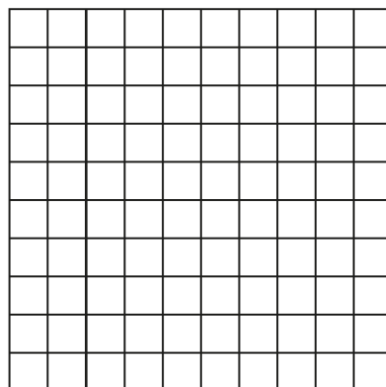**(a)**   .... **[1]**

This was generally well answered. A small number of candidates wrote $\frac{2}{5}$ or $\frac{2}{3}$.

Question 3 (b)

(b) The diagram below is made up of 100 small squares.

Shade 3% of the diagram.   **[1]**

This question was less successfully answered than the previous part, however many candidates still answered correctly. The most common incorrect response was to shade 30 squares (30%), usually in three rows. A few candidates did not attempt the question.

Question 4 (a)

4   (a)   Write down the **three** factors of 25.

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

Many candidates gave the correct three answers. Some candidates listed '5' twice, which resulted in them then missing another factor (usually 1). Some candidates gave multiples of 25.

Question 4 (b)

(b)   Write down a square number between 40 and 70.

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

Most candidates correctly identified one or both of the square numbers.

Question 5

5   Find the number that is halfway between 4.2 and 6.

.... **[2]**

Many candidates gave the correct response. The most common methods involved the use of number lines or using the difference between 6 and 4.2 to calculate the answer. Those attempting calculations often left them incomplete; many found 6 – 4.2 or (6 – 4.2) ÷ 2, but omitted the final step(s) and often gave a final answer of 0.9. Candidates checking their response to make sure it is reasonable should have identified that this was incorrect. Those using number lines often made errors when identifying the middle value, mainly due to missing values in the sequence. Others drew a number line, but then did no further work to identify the answer.

Question 6

6   Four lines meet at a point.

Not to scale
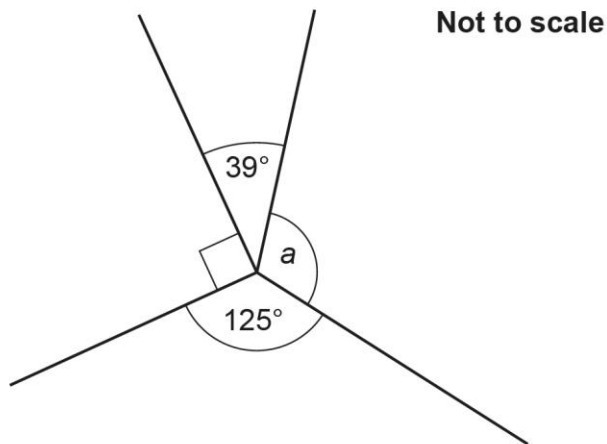
Work out the size of angle *a*.

a = ...° **[2]**

Many correct responses were given by candidates. The most common error was to omit the angle of 90° from the subtraction.

Question 7

7   A painter mixes red paint and yellow paint in the ratio 2 : 3.
   They make a total of 1.5 litres of paint.

     Work out how much red paint they use.
     Give your answer in millilitres.

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

Many candidates showed some understanding of ratio and shared the given total into 5 parts. A common error was instead to either multiply or divide the given total by both 2 and 3, producing two values that were then stated to be the quantities of red and yellow paint. Several candidates made errors when converting between ml and litres, for example using 100 ml in a litre, while others omitted the conversion entirely. Successful candidates mostly first divided by 5 (✗ 2) and then multiplied by 1000.

Question 8

8 The diagram shows a cuboid with dimensions 12 cm, 5 cm and x cm.

12 cm

Not to scale

5 cm

x cm
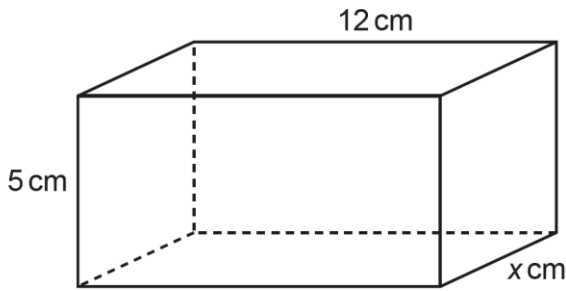
The volume of the cuboid is 240 cm^3.

Find the value of x.

$x =$ .... **[3]**

The correct response was often provided by candidates, usually with working. A common error was to add the dimensions rather than multiply them. Some wrote 5 × 12 = 60, but were unable to make further progress.

Question 9

9 Heidi and Yoshi compete in the same car race.
Heidi completes the race in 6 hours.
Heidi's average speed was 50 miles per hour.
Yoshi's average speed was 48 miles per hour.

Calculate how long it took Yoshi to complete the race.
Give your answer in hours and minutes.

.... hours .... minutes **[4]**

Misconception

?   0.25 hours is not equivalent to 25 minutes.

Few candidates were able to give the correct response. Several gained 3 marks for 6 hours 25 minutes, or responding with 6.25 hours without converting the .25 of an hour into 15 minutes. Others calculated 50 × 6 = 300, but were unable to make further progress.

Question 10 (a)

10   Alex and Emma use this recipe to make scones.
The recipe shows the ingredients needed to make **16** scones.

Ingredients to make 16 scones	
400 g	flour
50 g	sugar
100 g	butter
80 g	sultanas
70 ml	milk
2	eggs

(a)   Alex makes **24** scones.

He uses a tablespoon to measure the amount of milk he needs.
The size of a tablespoon is 15 ml.

How many tablespoons of milk should Alex use to make **24** scones?

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

Candidates used a variety of methods on this question. A common, successful method was to halve the amount for 16 and add it on to find the total amount of milk. Some candidates then went on to divide by 15, although others gave the final answer as 105. Premature rounding in the calculation led to an inaccurate final response.

Question 10 (b)

(b) Emma has 1 kg of flour and 240 g of sultanas.
She has lots of all of the other ingredients.

Work out the maximum number of scones that Emma can make.
You must show your working.

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

Many candidates had considered both flour and sultanas and were able to be given full marks. A few candidates stated 1 kg = 100 g.

Question 11 (a), (b) (i) and (ii)

11 140 people are asked if they have a bicycle (B) or a car (C).

- 22 people only have a bicycle.
- 72 people only have a car.
- 29 people have both a bicycle and a car.

(a) Show this information on the Venn diagram.
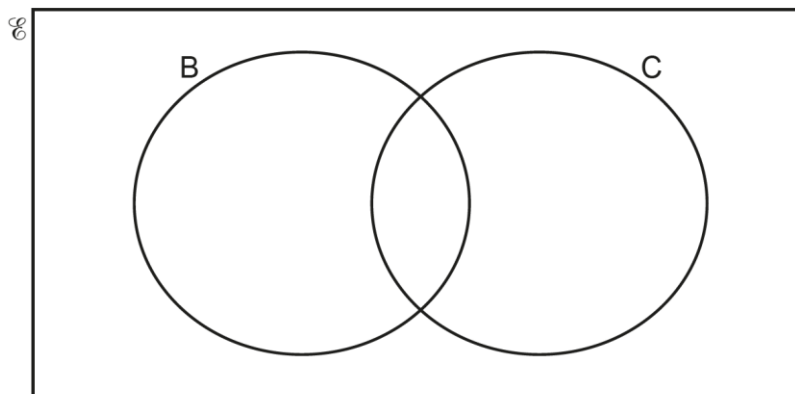
[1]

(b) (i) How many people do not have a bicycle or a car?

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

(ii) Write your answer in the correct place on the Venn diagram. **[1]**

The correct response was usually seen in parts (a), (b) (i) and (b) (ii). Almost all candidates who gave the answer 17 in part (b) (i) were able to successfully place this on their Venn diagram. Of those who arrived at an incorrect response for (b) (i), most were given the mark in (b) (ii) for correctly placing their value on the diagram.

Question 11 (c)

(c) One of the 140 people is chosen at random.

Work out the probability they have a car.

(c) .... **[2]**

This question proved more challenging for some candidates. A common error was $\frac{72}{140}$, from considering those who owned only a car. Of those who added 72 and 29 there were very few errors, although occasionally just 101 was given as their final response.

Question 12

12 The costs to hire a motorhome are shown below.

Motorhome hire	
First day	£130
Each extra day	£ 90
Each mile travelled	60p

Finley hired a motorhome and travelled 560 miles.
The total cost of hiring the motorhome was £916.

Calculate how many days Finley hired the motorhome for.
You must show your working.

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

Assessment for learning

On a calculator paper, candidates should be encouraged to use their calculators for division, rather repeated division.

A significant number of candidates showed complete and well-presented correct methods, scoring all 5 marks. Some showed correct working, but omitted to add 1 at the end for the first day and gave an answer of 5, scoring 4 marks (as shown in the exemplar below). Others were successful using trials. Several candidates were given the first mark.

Exemplar 1

$$560 \div 60$$

$$\begin{array}{r} 916 \\ - 336 \\ 130 \\ \hline 456 \end{array}$$

1
2
3
4
5

$$0.60 \times 560 = £336$$

for miles travled

$$450 - 90 - 90 - 90 - 90 - 90$$

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

Question 13

13 A climber is in a competition.

Here are their scores after two events.

Event	Score	
1	24	out of 30 points
2	32	out of 38 points
3		out of 52 points

Event 3 is out of 52 points.

The climber's overall score is found by adding the three scores together.

Find the score the climber needs in event 3 to achieve 85% of the total points.

.... **[4]**

This question was answered reasonably well, with most candidates who reached the correct answer of 46 showing clear and well-organised methods. Candidates should be encouraged to use their calculator to work out percentages. Many candidates used non-calculator methods to calculate 85% of 120 that were often incomplete or contained errors. Several candidates found 46 from an incorrect method.

Question 14

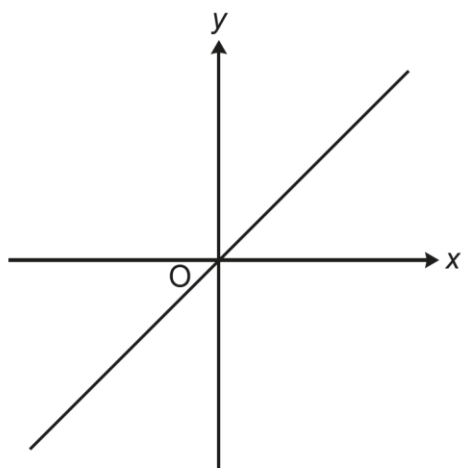**14** For each graph below, select its possible equation from this list.

A $y = {}^-3$	**B** $y = x$	**C** $y = x + 1$
D $y = x^2$	**E** $x = {}^-3$	**F** $y = x^3$

Write the letter of the equation beneath each graph.

....
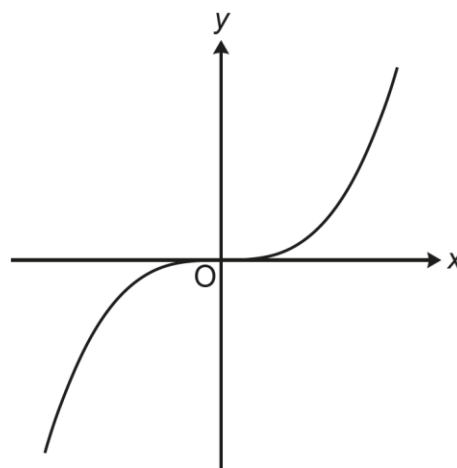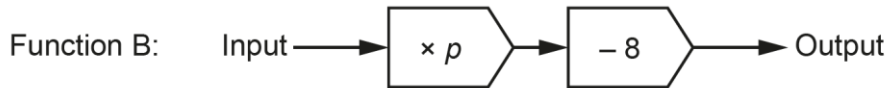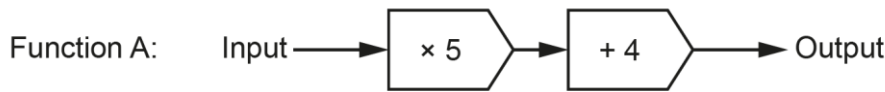
[2]

Most correctly identified the first diagram as B, or in some cases as *y = x*. Few candidates correctly identified the second diagram.

Question 14

Question 15

15 Here are two functions.

Function A: Input ⟶ [× 5] ⟶ [+ 4] ⟶ Output

Function B: Input ⟶ [× p] ⟶ [− 8] ⟶ Output

When the input of each function is 6, the output of Function A is equal to the output of Function B.

Work out the value of p in Function B.

$p =$ .... **[4]**

Many candidates reached the correct answer. Of those who did not, almost all were able to complete the first step of finding the output for function A of 34. Few candidates made errors when working back from this value with function B, although a common error was to subtract 8 from 34 rather than adding it. Few candidates resorted to using trials to find the value of p that gave the output 34; for those that did, it proved to be an inefficient method, although often successful.

Question 16 (a)

16 (a) Multiply out.

$5a(2 - a)$

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

Many candidates were given both marks here. Those that received 1 mark usually received it for having 10a in their final response.

Question 16 (b)

(b) Solve.

$5x + 9 > 12$

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

Fewer candidates were given 2 marks on this part compared to part (a). There was some confusion combining terms, for example reaching $14x > 12$, as well as muddled inequalities containing an equals sign.

Question 16 (c)

(c) Solve by factorising.

$x^2 + 7x + 12 = 0$

(c) $x =$ .... or $x =$ .... **[3]**

Few candidates were able to correctly factorise the quadratic, but those who did often gave the correct response. A common error following a correct factorisation was to give 3 and 4 rather than ⁻3 and ⁻4.

Question 17 (a)

17 A prime number is a whole number that has exactly two factors.

(a) Explain why 1 is not a prime number.

....

.... **[1]**

Some candidates gave a correct definition, but many found it difficult to express themselves, often either confusing multiples and factors, or just repeating the question.

Question 17 (b)

(b) *a* and *b* are prime numbers.

Write down the **6** factors of $a^2 b$.

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

Only a few candidates were given marks on this question. Many candidates simply wrote a list of 6 prime numbers, seemingly through not realising that algebraic expressions could represent prime numbers.

Question 18 (a)

18   **(a)**   The table shows the results for a sports club's 'A' team.

Result	Frequency
Win	18
Draw	10
Lose	12
Total	40

Complete a labelled pie chart to show these results.
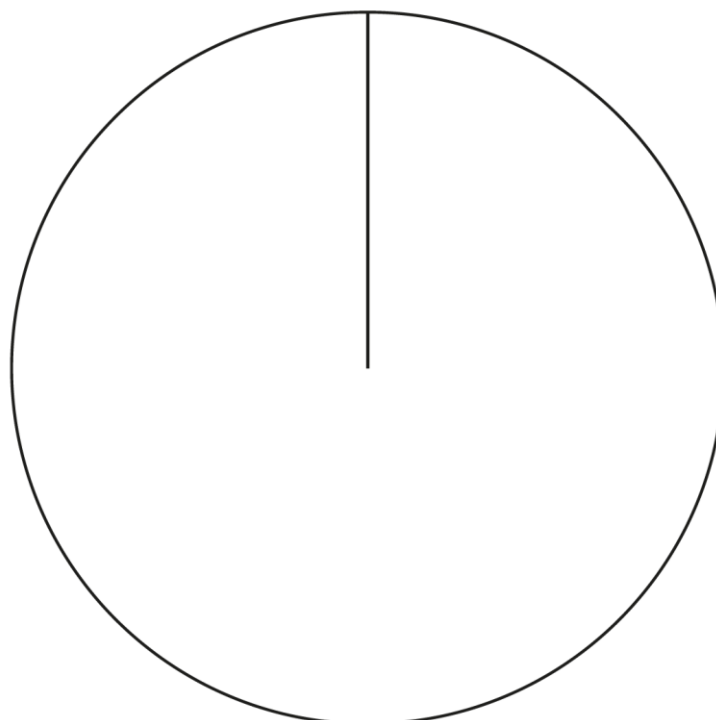
[4]

Some candidates were able to draw and label a fully correct pie chart, receiving 4 marks. Few showed any attempt to work out the angles and the most common mark given was for one correct sector, usually 90°. Some candidates drew pie charts with more than four sectors.

Question 18 (b)

(b) Here are the results for the sports club's 'B' team and 'C' team.

'B' team   'C' team
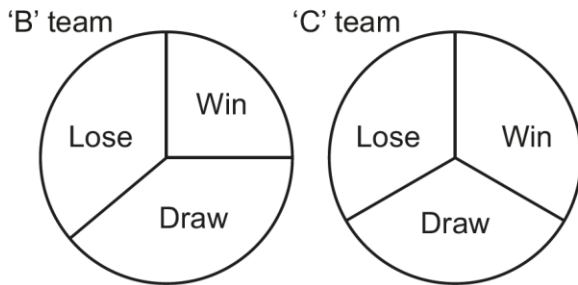
The 'C' team manager says

The pie charts show that the 'C' team won more games than the 'B' team.

Referring to the pie charts, explain why the 'C' team manager may not be correct.

....

.... **[1]**

Assessment for learning

Candidates need to understand that pie charts represent proportion and the total is needed to be able to directly compare sectors on different charts.

Successful candidates knew to refer to the fact that the number of games played were required. Many commented on just one team. Few candidates referred to the chart being incorrect or said the manager was correct.

Question 19 (a)

19 The graph shows Taylor's journey from home to an airport.
During the journey Taylor stops for petrol.
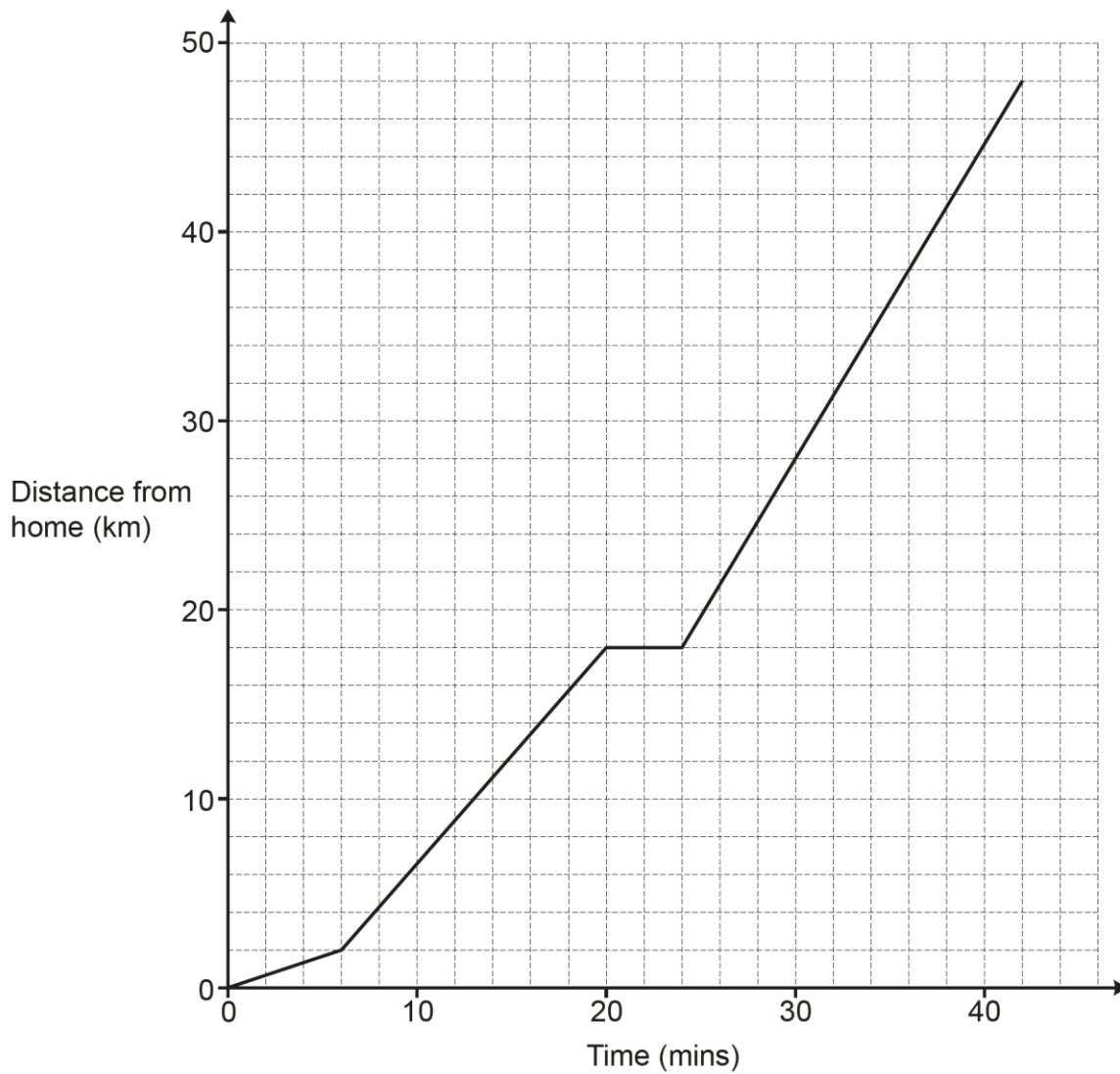
(a) For how long did Taylor stop for petrol?

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

Many candidates gave the correct response. Common incorrect responses were 24 or 5.

Question 19 (b)

(b) Taylor drives the same route back home from the airport at an average speed of 45 km/h. Taylor leaves the airport at 22:00.

Work out the time when Taylor arrives home.

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

This question part was answered less well than (a). Some candidates reached $\frac{48}{45}$ for 2 marks, but were then unable to convert their answer to a time. Many did not understand how they needed use 45 km/h and common incorrect answers were 22:40 and 22:42 from adding 40 or 42 minutes.

Question 20 (a)

20 (a) Write an expression for the weight, in grams, of an object weighing x kilograms.

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

Correct responses were rarely given here. Many candidates did not attempt this question.

Question 20 (b)

(b) Write an expression for the area, in m^2, of a garden of area y cm^2.

(b) .... m^2 **[1]**

As with (a), correct responses were rarely given and many candidates did not attempt this.

Question 21 (a)

21 (a) A student is using trigonometry to work out an angle, B, in a right-angled triangle.

They tell the teacher that $\sin B = \dfrac{5}{4}$.
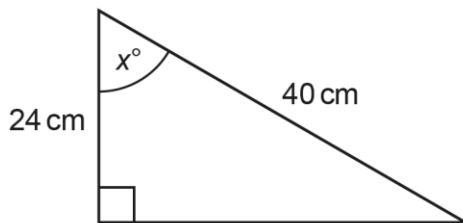
Explain why this student must be wrong.

....

....

.... **[1]**

Many candidates did not respond, but a few candidates showed understanding that the fraction needed to be less than one and gave a correct explanation. A common error was stating it should say sin *A* not sin *B*.

Question 21 (b)

(b) Here is a right-angled triangle.

Not to scale

Work out the value of x.

$x = $ .... **[3]**

As with part (a), many did not attempt this question. Of those who did, few realised the need to use trigonometry. Some wrote a list of trigonometric formulae (which were included on the formulae sheet given to candidates this series), but few were able to select and use the correct one. More opted to use sine than cosine, however those who did correctly identify cosine were frequently unable to substitute the given values correctly.

Question 22 (a)

22 On a bus route there is a set of traffic lights and a level crossing.
The probability that the bus stops at the traffic lights is 0.7.
The probability that the bus stops at the level crossing is 0.2.

(a) Use the information to complete the tree diagram.

Traffic lights   **Level crossing**

.... Stops

0.7 Stops

....

....

....

.... Does not stop

....
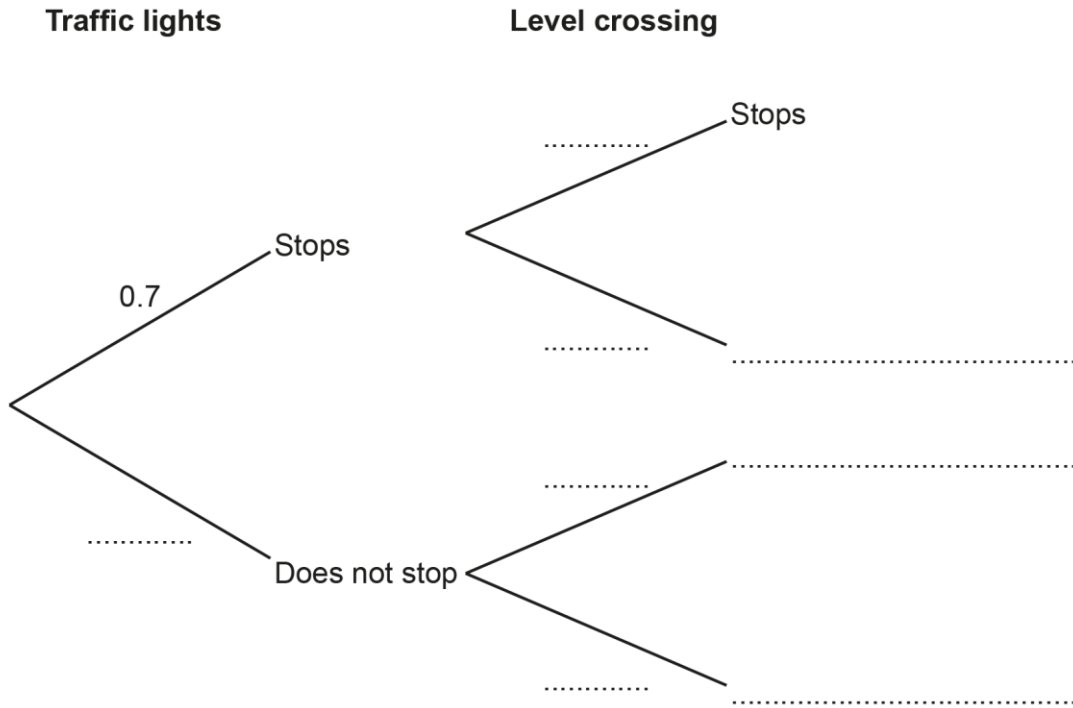
[3]

A significant number of candidates gave a fully correct diagram to gain all 3 marks. Many were given 1 mark for 0.3 on the first branch. A variety of numbers were used on the second branches. Some candidates correctly added 0.2 and 0.8 to the top second pair of branches, but did not complete the bottom second pair of branches. Some candidates were able to complete the labels, but many left this blank or used numerical values.

Question 22 (b)

(b) Find the probability that the bus stops at either the traffic lights or at the level crossing but not both.

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

Few marks were given on this question. Some gained 1 for one correct product. Of those who attempted to use probabilities, many added the values rather than multiplying them, with some then giving a response greater than one.

Question 23 (a)

23 (a) The measurements, in centimetres, of two triangles are shown in the table.

	Side 1	Side 2	Side 3
Triangle 1	2.5	3.2	4
Triangle 2	7	8.96	11.2

Are the two triangles mathematically similar?
Show how you decide.

.... because ....

.... **[3]**

From those who made an attempt at this question, complete and correct responses were quite rare. Those who made a meaningful attempt usually found the scale factor of 2.8 and realised its significance. It was common to see little or no working with an answer yes or no and a sentence about the sides adding up to different lengths. Many candidates attempted to draw the triangles.

Question 23 (b)

(b) Are these two triangles definitely congruent?
Give a reason.

Not to scale
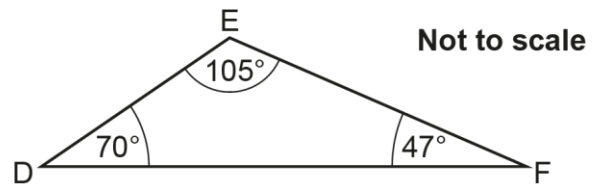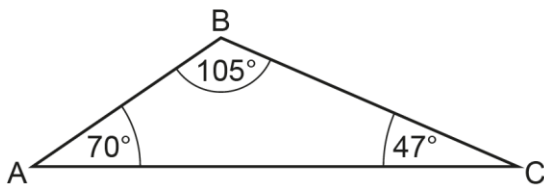
.... because ....

.... **[1]**

The following post-exam correction was issued to centres and published to Teach Cambridge:

Turn to page 19 of the question paper and look at the three angles in each of the triangles in question 23(b).

In both triangles, cross out the number '70' and replace with '28'.

The angles in the two triangles should now be 28°, 105° and 47°.

The error here that the triangles have an angle sum greater than 180° had little effect on candidate responses. Those who stated 'no' with a justifiable mathematical reason were given the mark. Most responses were 'yes', with the reason that the angles are the same.

Question 24

24 2 kg of carrots and 5 kg of potatoes cost £6.36.
3 kg of carrots and 2 kg of potatoes cost £5.25.

Find the cost of 1 kg of carrots and the cost of 1 kg of potatoes.
You must show your working.

1 kg of carrots cost £ ....

1 kg of potatoes cost £ ....

[5]

Many candidates did not attempt this question. Of those who did, few were given marks. Some simply copied out the question rather than writing equations. Several candidates attempted to find values that fitted the equations, but usually unsuccessfully. Few made any attempt to eliminate one variable.

Question 25

25 Riley and Sam are conducting surveys.
They are both given the same list of 12 463 people from which to select their sample.

Riley selects every 56th person.
Sam selects every 64th person.
They both start counting from the first name in the list.

Work out how many people will be selected to be in both surveys.
You must show your working.

.... **[5]**

This question proved to be very challenging and very few candidates reached the correct response. Some listed multiples of 56 and 64, but gave up after realising how long their lists would be. A few candidates reached 448 as the lowest common multiple, but most of these did not then go on to divide 12 463 by 448 to reach the final answer. The majority opted to use the 'alternative method' shown in the guidance column of the mark scheme; most of these completed the first steps by calculating 12 463 ÷ 56 and 12 463 ÷ 64, but many then added the results of their divisions rather than subtracting them. Rounding to a whole number of people before the final calculation led to inaccurate responses.

Question 26

26 XOY is a sector of a circle, centre O.
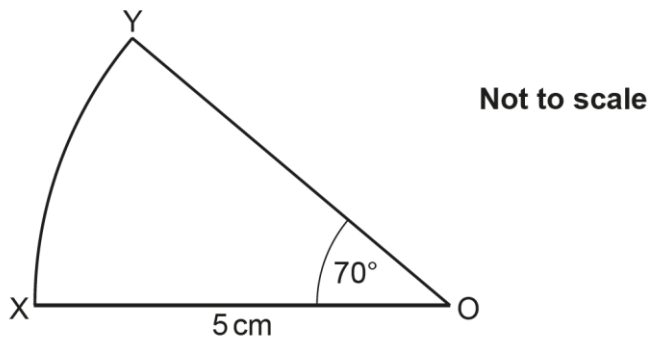
Show that the area of the sector is 15.3 cm^2, correct to **3** significant figures.   **[3]**

Very few candidates made any attempt to respond to this question. Of those who did, a few showed some knowledge of circles, but not sectors.

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