

**GCSE (9–1)**

**Examiners' report**

# **MATHEMATICS**

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**J560**

For first teaching in 2015

**J560/05 Summer 2022 series**

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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 OCR.

### Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our [website](#).

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## Paper 5 series overview

Candidates were generally correctly entered at this tier and all were able to access at least some of the questions. Most candidates earned more marks on the first half of the paper and the later questions proved difficult for most and were effective differentiators. Presentation of working was generally good with a more organised approach adopted by higher scoring candidates. Responses to most questions were clear, concise and straightforward for examiners to follow. Some candidates used several methods when answering questions, in these cases it is important that candidates indicate which method they are choosing.

Topics that appeared to be more secure to candidates were percentage change, standard form, probability, enlargement, proportion and decimal/fraction equivalence.

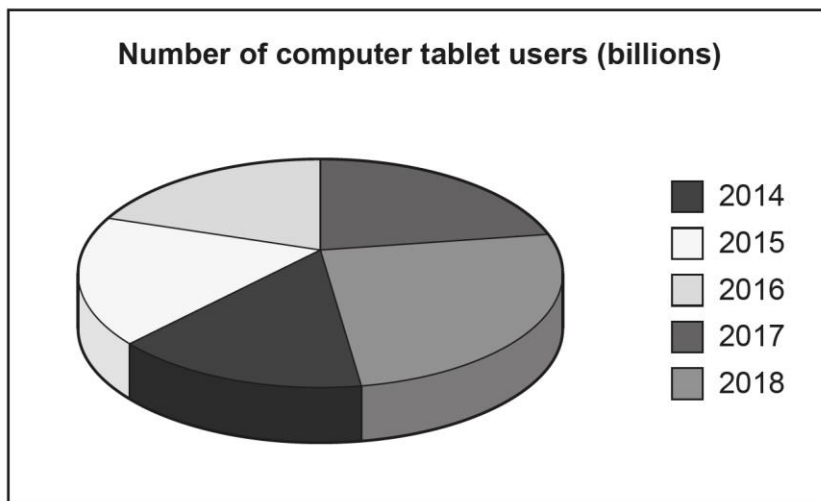
The topics that were less secure were trigonometric reasoning, reasoning with iterative methods, surds, algebraic reasoning in problems, lengths of arcs and equations of tangents.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
<ul style="list-style-type: none"> <li>• performed standard calculations and routines following the required rubric and showed 'number sense' in calculations</li> <li>• showed clear, concise and step by step methodology on multi-mark questions</li> <li>• used appropriate terminology and precision when asked to give reasons for answers</li> <li>• applied knowledge and reasoning to questions set in a novel context using an algebraic approach where appropriate.</li> </ul>	<ul style="list-style-type: none"> <li>• found it difficult to apply what they had learned to unfamiliar situations</li> <li>• did not follow specific instructions within questions</li> <li>• showed a more random approach in the working including trial and improvement on some multi-mark questions</li> <li>• had weaker skills, knowledge and understanding of the specification including the recall of key terminology, formulae and routines</li> <li>• were unable to use algebra effectively to interpret problems.</li> </ul>

### Question 1 (a)

1 Two pupils are given data that shows the estimated number of computer tablet users worldwide from 2014 to 2018.

(a) Li creates this pie chart to show the data.



Write down two reasons why Li's pie chart is not suitable to represent the data.

1 .....

.....

2 .....

.....

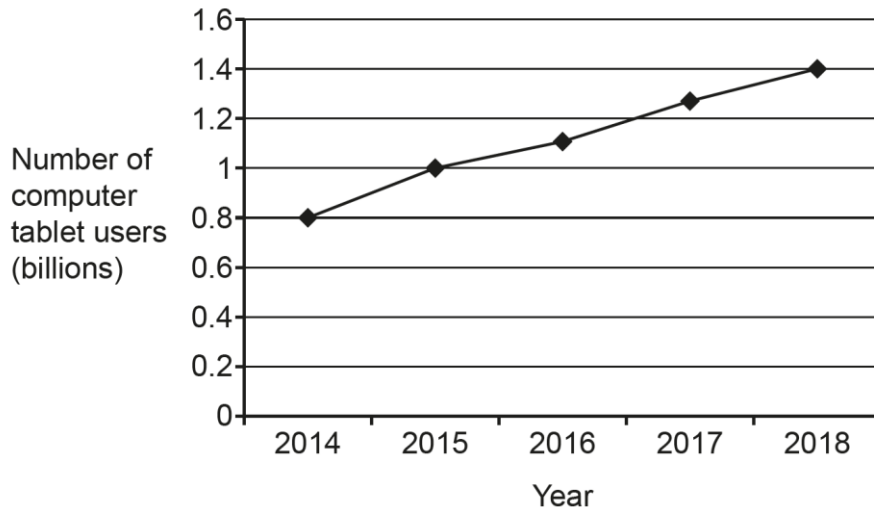
[2]

The majority of candidates gave one correct reason, usually that they needed numbers for the sectors or a total for the pie chart. The 3D aspect was also recognised by some.

Insufficient reasons often mentioned the need for percentages or angles or stating that a bar chart would be a better option without explaining why.

Question 1 (b)

(b) Amaya creates this line graph to show the same data.




Work out the percentage increase in the number of computer tablet users from 2014 to 2018.

(b) ..... % [4]

Many scored full marks here and almost all candidates scored at least 1 mark. The most common error was to use 1.4 as the denominator in their fraction when converting to a percentage. Many others gave the correct fraction and conversion  $\frac{0.6}{0.8} \times 100$  but then used longer division methods with decimals instead of recognising that  $\frac{0.6}{0.8}$  was equivalent to  $\frac{3}{4}$  which would give an easily recognisable conversion to 75%. The longer methods often led to arithmetic errors.

**Misconception**

 When calculating a percentage change, the change is always measured against the original value. So when forming a fraction to convert to a percentage, the original value should always be the denominator.

### Question 2

2 The scale diagram below shows the position of two castles, J and K.

**Scale: 1 cm represents 2 km**



The bearing of a tower from castle J is  $072^\circ$ .  
 The bearing of the tower from castle K is  $116^\circ$ .

Use construction to find the distance from castle J to the tower.  
 Give your answer to the nearest 0.1 km.

..... km **[4]**

Many gave fully correct answers by drawing intersecting lines from J and K and then multiplying the distance from J to the intersection by 2.

There were a number of errors in measuring the bearings including evidence of incorrect positioning of the protractor with the North line, e.g. a bearing of  $18^\circ$  from J rather than  $72^\circ$ . There were also some anticlockwise angles measured. Candidates that indicated the position of the tower on the diagram in some way were given credit for finding their correct scaled distance from J to the tower even when bearings had been incorrectly measured.

Other common errors included: using incorrect equipment, usually compasses; joining the two given points up and measuring the distance between them; and halving their measured distance from J to the tower rather than doubling.

**Misconception**



When measuring bearings with a protractor, always measure clockwise from the North line. In questions requiring intersecting bearings, always draw full lines to represent the bearings from the two points.

**Question 3 (a)**

- 3 Dinosaurs first appeared on Earth  $2.4 \times 10^8$  years ago.  
Dinosaurs became extinct on Earth  $7 \times 10^7$  years ago.

(a) Explain why it is appropriate to use standard form for these numbers.

.....

.....

..... [1]

This was very well answered, with candidates referring to the numbers being large or containing many zeros. A few gave vague answers such as 'it makes the numbers easier to read' without explaining why.

**Question 3 (b)**

- (b) Use the given information to work out how long dinosaurs existed on Earth.  
Give your answer in standard form.

(b) ..... [3]

This was well answered, with many candidates scoring full marks. A common error was to incorrectly convert one or both numbers from standard form before subtracting or having obtained the correct decimal answer, incorrectly converting this back to standard form.



### Question 4 (a)

4 (a) Complete this statement by writing the missing power in the box.

$$784 = 2^{\square} \times 7^2$$

[1]

Answers were mixed to this part. Many gave the correct value of 4 but common errors included 8 and 16.

### Question 4 (b)

(b) Use your answer to part (a) to find the value of  $\sqrt{784}$ .

(b) ..... [2]

Answers were mixed again in this part. There were many correct answers linking the work in part (a) to this part. Many candidates, however, did not make the link between the product of primes in part (a) and the square root here. Many attempted trials of squaring values to make 784 usually without success. Some showed partial understanding using a product of two values, one of which was 7.

### Question 5

5 Recipes measure small quantities in teaspoons and tablespoons.  
3 teaspoons is equivalent to 1 tablespoon.

A cake recipe uses  $\frac{3}{4}$  of a teaspoon of salt and 1 tablespoon of baking powder.

The ratio of salt to baking powder used in the recipe can be written in the form 1 :  $n$ .

Find the value of  $n$ .

$n =$  ..... [3]

Many candidates were able to find equivalent ratios through multiplicative reasoning and scored full marks. For a number, this question revealed a lack of application to forming ratios with different units; some candidates treated the teaspoon to tablespoon ratio and the salt to baking powder ratio separately. This misconception was highlighted frequently as most candidates did not form a ratio of the same unit, therefore demonstrating a limited understanding of proportion. A common error was to multiply  $\frac{3}{4}$  by 3 to give 2.25.

**Assessment for learning**



Centres can help candidates by investigating ratios involving a variety of unit conversions (not limited to common metric and imperial conversions) and thereby practising how to construct equivalent ratios with a consistent unit.

**Question 6 (a)**

- 6** Morgan is playing a computer game.  
 They can score 0, 1, 2 or 3 points on each turn.  
 They record their scores for 100 turns.  
 The table shows the relative frequencies of their scores.

Score	0	1	2	3
Relative frequency	0.08	0.42	0.38	

**(a)** Complete the table.

**[2]**

This question was answered very well. Almost all candidates recognised that the sum of the probabilities should be 1. The only errors seen were arithmetic, and provided the candidates showed the intention to calculate  $1 - (0.08 + 0.42 + 0.38)$  they were given credit for method.

**Question 6 (b)**

**(b)** Morgan says

**I scored more than 160 points in total in my 100 turns.**

Is Morgan correct?  
 Show how you decide.

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

This was very well answered. The majority of candidates were able to calculate that Morgan scored 154 points and gave a correct conclusion. Full follow through marks were available for the few candidates that made errors in part (a). For example, 0.22 in part (a) followed by 184 points in (b) with a correct conclusion was given 4 marks. Many candidates showed the steps of their working so in cases where arithmetic errors were made, credit could be given for method.

## Question 7 (a)

- 7 (a) A car accelerates at  $4.06 \text{ m/s}^2$  for 10.1 seconds from an initial velocity of  $2.93 \text{ m/s}$ .

Harper rounds each value to 1 significant figure.  
Harper uses the rounded values and the formula

$$s = ut + \frac{1}{2}at^2$$

to estimate the distance travelled in the 10.1 seconds.  
Harper's answer is 430 metres.

Using Harper's method, show that their answer is wrong.

[4]

Many were successful in rounding the values to one significant figure and then correctly substituting into the given formula before giving the correct answer 230 m. A number of candidates, having correctly rounded, made errors in substitution, sometimes confusing  $u$  with  $a$ , or giving  $3 \times 10 + 0.5 \times (4 \times 10)^2$ .

Many candidates chose not to round the values and attempted a complex calculation involving 4.06, 10.1 and 2.93. These candidates earned a method mark for a correct substitution only.

## Assessment for learning



Candidates need to carefully read the instructions given within questions. Here they are told to round values to 1 significant figure before attempting an estimation. Many candidates spent time doing a complex calculation that was not needed.

## Exemplar 1

$$\begin{aligned}
 s &= 3 \times 10 + \frac{1}{2} 4 \times 10^2 \\
 s &= 30 + \frac{1}{2} 4 \times 100 \\
 s &= 30 + \frac{1}{2} 400 \\
 s &= 30 + 200 \\
 s &= 230
 \end{aligned}$$

~~Harper~~ Harper didn't  
half the  
values to  
the right of  
the equation

Model response with the rounded values correctly substituted into the formula and then correct evaluation to 230.

### Question 7 (b)

(b) Rearrange this formula to make  $t$  the subject.

$$s = \frac{1}{2}at^2$$

(b) ..... [3]

There were many correct answers given. Candidates were given full credit for answers that were correct but not fully simplified, e.g.  $t = \sqrt{\frac{s}{\frac{1}{2}a}}$ . Some candidates gave a correct expression but omitted ' $t =$ '. The most successful candidates dealt with the rearrangement one step at a time rather than merging several together.

The common errors were in the order of the steps attempted. For example, many candidates in their first step of the rearrangement chose to take the square root. Other errors included not taking the inverse, for example multiplying  $s$  by  $\frac{1}{2}$  rather than multiplying by 2.

### Question 8

8 A bag only contains red marbles, blue marbles and yellow marbles.

- The probability of picking a red marble is  $\frac{2}{5}$ .
- There are nine yellow marbles.
- The probability of picking a blue marble is three times as likely as picking a yellow marble.

Work out the **total** number of marbles in the bag.  
You must show your working.

..... [5]

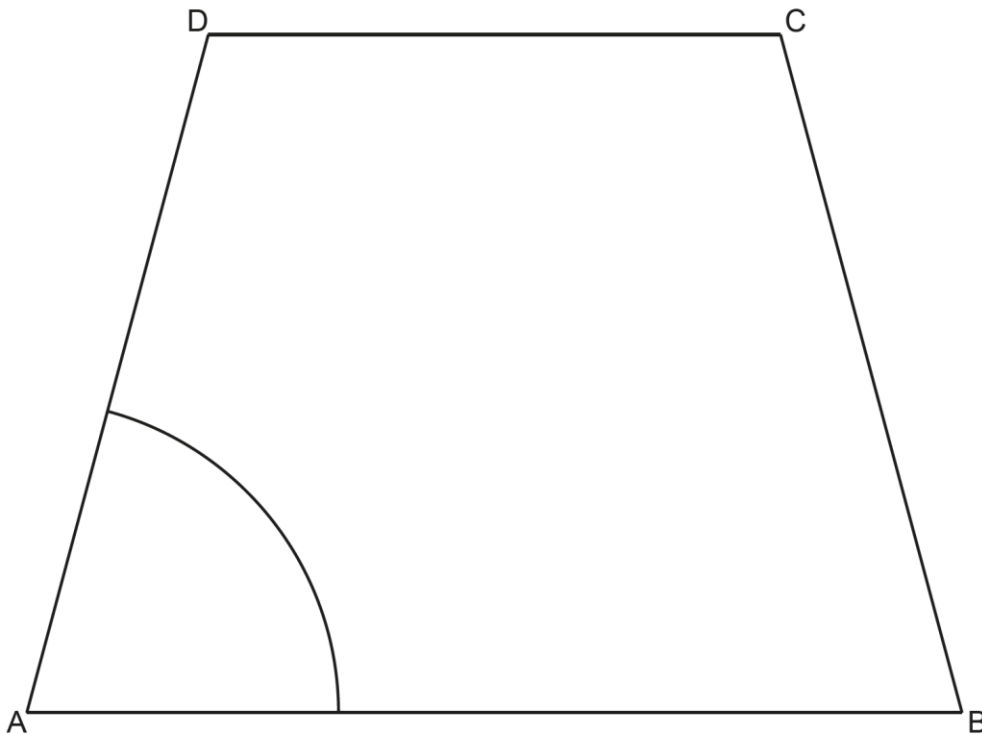
This was well answered overall and the vast majority of candidates made a good attempt. Almost all candidates were able to score at least part marks. The most common approach was to find the total of the blue and yellow marbles as  $27 + 9 = 36$  and then recognise that was  $\frac{3}{5}$  of the total marbles in the bag. A common error was then to divide 36 by 5 and multiply by 3. A few also equated 36 with  $\frac{2}{5}$  at that point.

A few used unsuccessful trial and error approaches with a number of red marbles but usually scored method marks for adding 9 and 27 within their calculation of the total.

### Question 9

- 9 The diagram shows the scale drawing of a sandpit, ABCD. It also shows the arc of all points in the sandpit that are 80 cm from corner A.

**Scale: 1 cm represents 20 cm**



A game is played by throwing a ball into the sandpit. Points may be scored when the ball lands in the sandpit.

- 1 point if the ball lands within 80 cm of corner A,  
and
- 1 point if the ball is closer to side AB than side AD,  
and
- 1 point if the ball is closer to corner A than corner B.

By completing the construction, find and shade the regions where 2 points can be scored. Show all your construction lines.

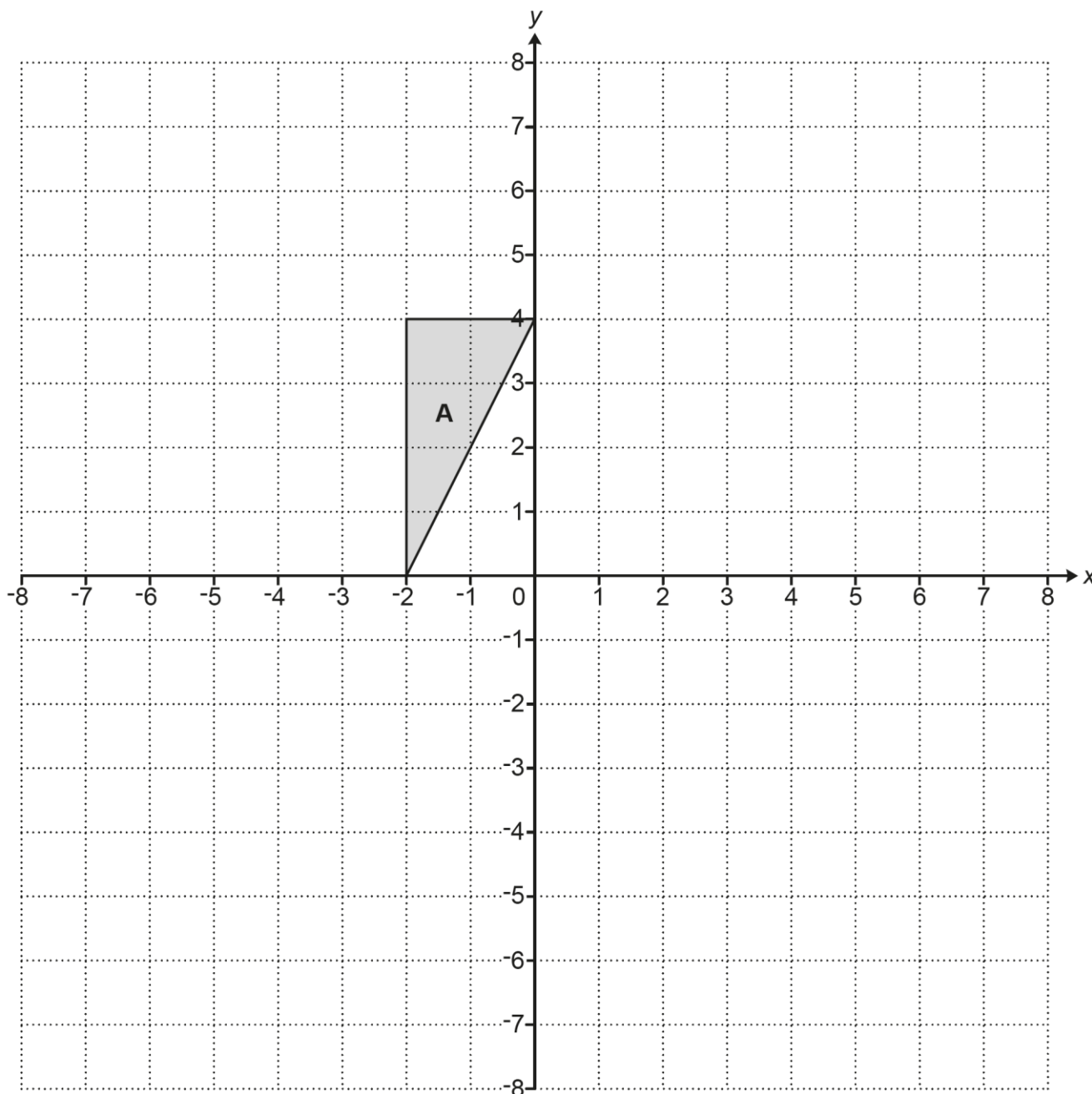
**[6]**

There were a wide range of responses to this question, with most candidates able to score at least part marks. Most candidates understood that a perpendicular bisector was needed and this was often well constructed. Some did not use construction arcs or only used one pair of intersecting arcs. Most understood that the angle bisector was also required and this bisector was quite well done and more were successful with the construction. A few candidates incorrectly joined point A to point C.

The region marks were dependent on a reasonable attempt at both bisectors and there was some variability here. Most common error for those with correct bisectors was to shade the 3 point region in addition to the 2 point regions or to identify just one correct region.

## Question 10 (a)

10 (a) Enlarge triangle **A** with scale factor 1.5 and centre of enlargement  $(-8, 0)$ .



[3]

This was generally well answered. Most candidates could enlarge the triangle by scale factor 1.5 but not always using the correct centre of enlargement. Those that did a correct enlargement from a wrong centre scored 2 marks and this was the most common award. A few used the ray method and were inaccurate with one or more of their plots and a few used the correct centre but enlarged with the wrong scale factor.

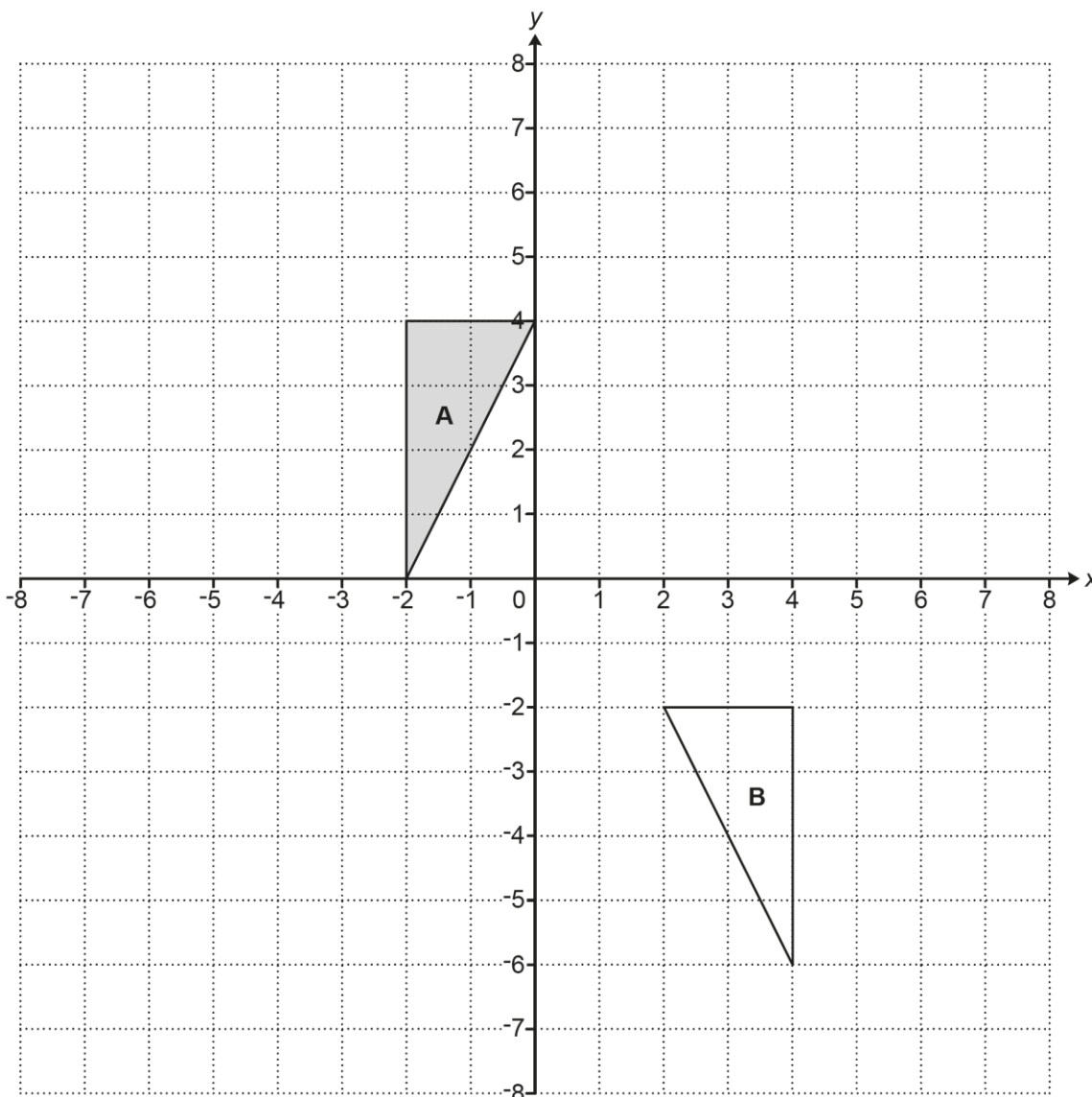
### Assessment for learning



When using the ray method for enlargement, always check accuracy by counting squares from the centre to the image and by checking that the enlarged shape has consistent lengths with the required scale factor.

### Question 10 (b)

(b) Triangle **A** and triangle **B** are shown on the coordinate grid below.



Triangle **A** is mapped onto triangle **B** using a combination of two transformations:

- a transformation **T**, followed by
- a reflection in the **x**-axis.

Describe fully transformation **T**.

.....

..... [4]

The candidates that were most successful here reversed the reflection in the **x**-axis from triangle **B** to draw the image of **A** after the first transformation. To describe the rotation, the centre and angle of rotation was needed and some, having recognised rotation, either made an error or omitted one of these properties. The most common error was to give more than one transformation for the answer, for example, rotate  $180^\circ$  then translate and in these cases 0 marks were given for the description.

Question 11

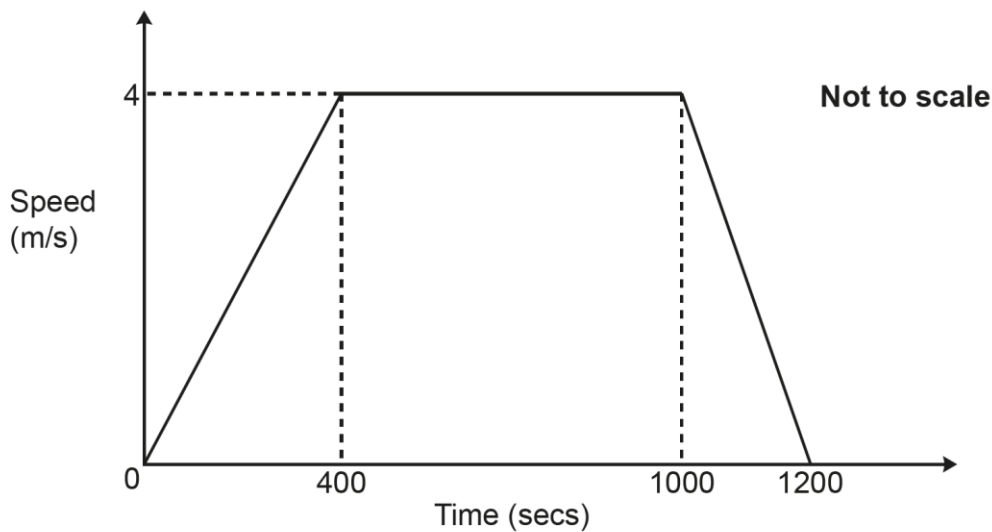
- 11  $y$  is inversely proportional to  $x^2$ .  
 $y = 9$  when  $x = 2$ .

$y = \dots\dots\dots$  [3]

This was generally very well answered. Candidates were able to interpret the proportional relationship in a correct algebraic statement and then usually completed correctly. There were a number of arithmetic errors seen within an otherwise correct method but candidates generally showed their working and so method marks could be given in those cases. The most common error was in missing the 'inverse' element and starting with  $y = kx^2$ .

Question 12 (a)

- 12 An athlete goes for a training run.  
 The graph shows their speed as they run.



- (a) Write down the athlete's acceleration between 400 seconds and 1000 seconds.

(a)  $\dots\dots\dots$  m/s<sup>2</sup> [1]

Some candidates recognised there is no change in speed during the time period specified. Some calculated the difference between the initial and final speed and divided by time correctly, while others deduced the correct answer from the horizontal gradient. Many did not understand acceleration as change in speed over time. Common errors were to give an answer of 4 or attempt an area calculation.



**Question 12 (b)**

- (b)** Work out the athlete's average speed, in m/s, during the 1200 seconds.  
You must show your working.

**(b)** ..... m/s **[5]**

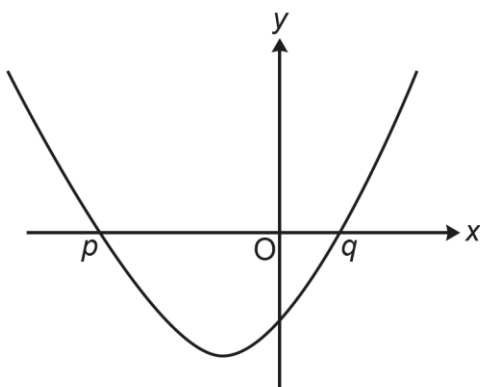
Most candidates scored at least partial marks for this question for working towards finding the correct areas. Most found the three separate areas rather than the area of the trapezium. Of those who scored partial marks, candidates attempting to find the area of the triangles often multiplied the base by the height but did not go on to halve their answer. A common error was to attempt to find the gradients of the sloping lines and then calculate the mean of these combined with the speed at the horizontal section giving an answer 2.66...m/s. A few, however, used this approach alongside a correct proportional argument with the average speeds for each section to arrive at the correct overall average speed and were given full credit. A few ignored the shape of the graph entirely, extending the trapezium to form one rectangle and then found the total distance as 4800m then dividing by the time to reach an answer of 4 m/s.

**Finding an average speed**

Candidates need to consider that an average speed does not involve finding a mean value but is found by finding the overall distance divided by the time taken.

**Question 13 (a) (i)**

- 13** The graph of  $y = x^2 + 6x - 2$  is shown below.  
The roots of the equation  $x^2 + 6x - 2 = 0$  are at  $p$  and  $q$ .



- (a) (i)** Calculate  $y$  when  $x = 1$ .

**(a)(i)**  $y =$  ..... **[1]**

Very well answered. Any errors seen were the result of arithmetic errors when substituting into the formula.

Question 13 (a) (ii)

(ii) Without solving the equation, explain why  $q$  must lie between 0 and 1.

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

Candidates needed to reflect on the values of  $y$  when  $x = 0$  and when  $x = 1$  and then explain on the sign change from negative to positive. A few candidates were able to articulate this well and give a full explanation. Some mentioned sign change without justification and were given partial credit. For the majority, there was little understanding shown.

Exemplar 2

because if  $x=0$   $y$  is negative but  
if  $x=1$   $y$  is positive, so it must lie  
between the sign change. [2]

A correct response where the candidate references the values for the equation when  $x = 0$  and  $x = 1$  and to justify the sign change conclusion.

Question 13 (a) (iii)

(iii) Explain why using a method of iteration is not the most appropriate way of finding a solution to this equation.

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

This was answered better than Question 13 (a) (ii). Many stated that this was either too time consuming or may lead to estimates of solutions. Some stated that there were more efficient specific methods such as completing the square or using the quadratic formula that would give exact answers. There were some vague responses, e.g. 'it is too hard', 'there are better methods' and 'there are two solutions', without giving the detail needed.

Exemplar 3

because completing the square is much  
easier and simpler in this case

An example of a correct response where the candidate refers to specific better methods to solve the equation.

**Question 13 (b)**

(b) The exact value of  $q$  is  $\frac{-6 + \sqrt{44}}{2}$ .

Write  $\frac{-6 + \sqrt{44}}{2}$  in the form  $a + \sqrt{b}$ .

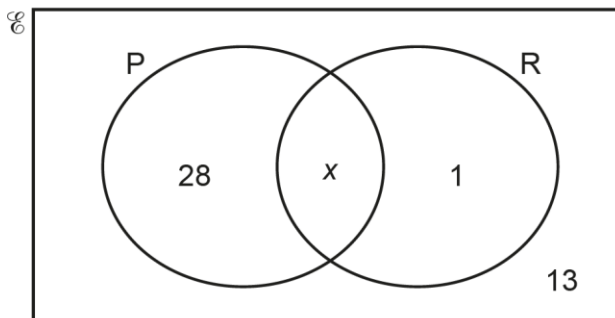
(b) ..... [3]

A minority of candidates gave a correct simplified expression. Many did not attempt to simplify the surd  $\sqrt{44}$  as part of the method and answers such as  $-3 + \sqrt{22}$  were common. Some misinterpreted the division by 2 and multiplied by 2 instead, giving answers such as  $-12 + \sqrt{88}$ .

**Question 14 (a)**

14 In a survey about music, some students were asked whether they like pop (P) and whether they like rap (R).

The Venn diagram shows some of the results.  
 $x$  students liked both types of music.



(a) The ratio of the number of students who liked pop to the number who liked rap was 5 : 2.

Work out the **total** number of students in the survey.

(a) ..... [4]

Candidates found this question challenging and very few were able to combine ratio 5 : 2 to form a correct equation using the information given in the Venn diagram. The most successful responses included an equation equivalent to  $2(x + 28) = 5(x + 1)$  and continued to find the value of  $x$ . A few other candidates were successful in using trial and improvement with values in the ratio 5 : 2 and finding 45 : 18 gave the correct values for set P and set R. Many candidates appeared to be randomly trying values for  $x$ , with little success.

Question 14 (b)

(b) One of the students is selected at random.

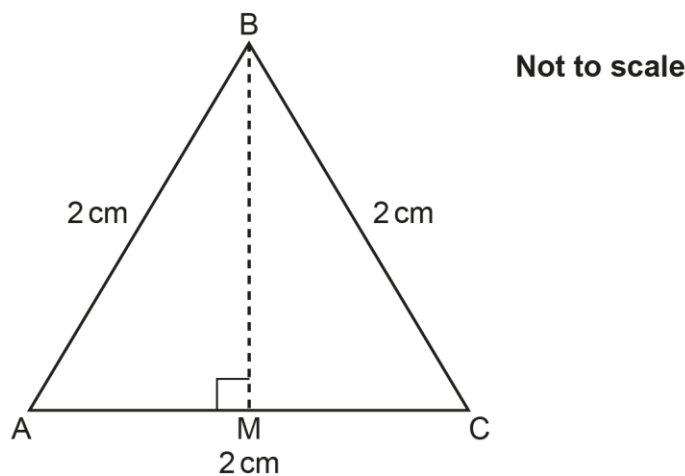
Find the probability that this student does **not** like rap given that they like pop.

(b) ..... [2]

Those who answered part (a) correctly invariably gave the correct probability in this part. Many other candidates were able to score 1 mark for giving a proper fraction with the numerator 28. A follow through was available for 2 marks from an incorrect answer in part (a) but this was rarely awarded.

Question 15

15 ABC is an equilateral triangle of side length 2 cm.  
M is the midpoint of AC.



Using this diagram, show that  $\tan 30^\circ = \frac{1}{\sqrt{3}}$ . [4]

This question proved challenging for most candidates.

The majority of candidates scored at least 1 mark for annotating the diagram correctly with  $30^\circ$  or 1 cm. There was evidence that candidates have 'learned' the ratios for the trig values as tables were seen on the additional sheet and in the working space here. This information did not assist in this question where the trig ratio for  $\tan 30$  had to be established from the diagram. A number of candidates correctly attempted Pythagoras' with 2 and 1 to find BM as  $\sqrt{3}$  and then stated the correct conclusion. Some omitted key steps in the working after stating  $1^2 + BM^2 = 2^2$  and scored only partial method marks as a consequence.

## Misconception



On questions like this that ask candidates to show a particular given answer, candidates need to show every step of their method, using the information in the diagram, with no errors or omissions before stating the given result.

## Question 16

- 16** Work out  $0.\dot{6} \times 0.\dot{5}4$  giving your answer as a fraction in its simplest form.  
You must show your working.

..... [5]

This was the best answered of the questions towards the end of the paper. Many were able to give a correct simplified answer of  $\frac{4}{11}$  with correct supporting working. Others gave a correct unsimplified answer of e.g.  $\frac{324}{891}$  or equivalent but were unable to simplify fully.

Most were able to give at least one correct fraction conversion from the recurring decimals provided.

For some candidates, despite the question asking for a fractional answer, they tried to multiply out the decimal numbers first, always unsuccessfully.

## Assessment for learning

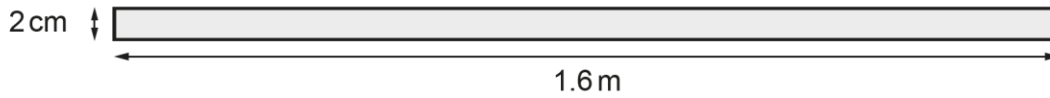


When multiplying fractions to give a simplified answer, candidates that cancel the individual fractions first before multiplying are more likely to arrive at a fully simplified answer, e.g. when multiplying  $\frac{6}{9} \times \frac{54}{99}$ , simplify first  $\frac{2}{3} \times \frac{6}{11} = \frac{12}{33} = \frac{4}{11}$ .

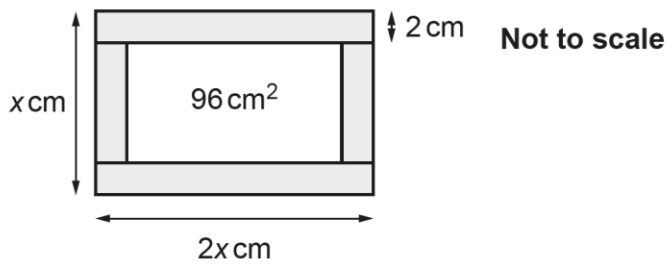
### Question 17

- 17 Charlie is making some wooden frames.  
Charlie has a strip of wood 1.6m long and 2 cm wide.

**Not to scale**



Each frame will be made from four pieces of wood cut from the strip to form a rectangle, as shown below.



The width of each frame is  $x$  cm.  
The length of each frame is  $2x$  cm.  
The area enclosed by each frame must be  $96 \text{ cm}^2$ .

Work out the maximum number of frames Charlie can make from the 1.6 m length of wood.  
You must show your working.

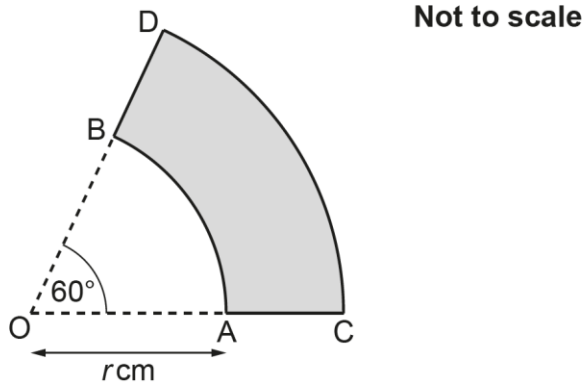
..... [6]

Candidates found this question very challenging. A few were successful in setting up a correct algebraic equation involving the product of  $(x - 4)$  and  $(2x - 4)$  equal to 96 before simplifying to a three-term quadratic equation and then solving to find  $x = 10$ . Those candidates usually went on to correctly find and justify the final answer 3. Others were able to set up a correct product of terms but then made no further progress. Many didn't correctly relate the algebraic measurements on the diagram to the area given, so despite doing some algebraic working, it was not correct in relation to the diagram.

The majority of candidates did not attempt to use algebra and instead, for example, tried to find paired products of 96 usually without further progress. There were a high number of 'no response' to this question.

### Question 18

- 18** The diagram shows a shaded shape made by removing sector OAB from sector OCD. Both sectors have an angle of  $60^\circ$ . The radius, OA, of the smaller sector is  $r$  cm. The ratio of radius OA to radius OC is  $2 : 3$ .



Work out, in terms of  $\pi$  and  $r$ , the **total** length of arc AB and arc CD. Give your answer in its simplest form. You must show your working.

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

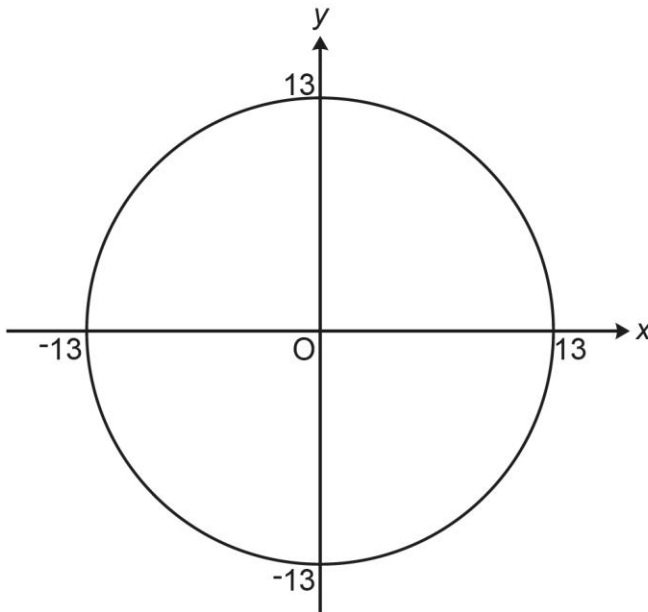
Candidates found this question very challenging and there were a number of 'no response'. Some worked out the area of the sector. Those attempting an arc calculation for AB often preferred to replace  $r$  with a constant value. In those cases, credit was given for the arc CD if the constant used was consistent with the ratio  $2 : 3$  for that used in AB.

A number of candidates gave a correct fraction  $\frac{60}{360}$  for the sector but then evaluated this as 6. In this case, method marks were awarded provided the fraction was shown.

A small number of candidates found correct expressions in terms of  $\pi$  and  $r$  for the two arcs AB and CD and most of these then added correctly and gave a simplified expression. A few misunderstood the demand and gave the full perimeter of the shaded shape ABCD for which they were given partial credit.

## Question 19 (a)

19 The graph below shows a circle with centre  $(0, 0)$  and equation  $x^2 + y^2 = 169$ .



(a) Show that the point  $(-12, 5)$  lies on the circumference of the circle.

[2]

Although a number of candidates omitted this part, many that attempted it were able to earn at least partial credit. As this is a 'show that' question, candidates must communicate correctly and make no errors in their mathematics for full credit.

Many used substitution of  $-12$  and  $5$  into the circle formula but most wrote  $-12^2 + 5^2$  instead of  $(-12)^2 + 5^2$  before giving  $144 + 25$ . In these cases 1 of the 2 marks was awarded only.



## Question 19 (b)

- (b) Find the equation of the tangent to the circle at the point  $(-12, 5)$ , giving your answer in the form  $y = mx + c$ .

(b) ..... [5]

This part of the final question was designed to stretch candidates. There were a small number of excellent answers to this part where candidates worked methodically, first of all finding the gradient of the radius from  $(0, 0)$  to  $(-12, 5)$  before showing a clear understanding that the gradient of the tangent is perpendicular to the radius. These candidates then correctly substituted the point  $(-12, 5)$  into the equation with gradient  $\frac{12}{5}$  to find the constant value before giving the final answer in the required form. A few made errors in the arithmetic when finding the constant after the substitution.

Other candidates were able to earn part credit for showing some understanding of gradients, perpendiculars and substitution within their method. For these candidates the main errors were with incorrect signs in gradients.

For most candidates this question proved very challenging, however, and there were many 'no response' as well as some candidates who did not consider gradients at all within their method.

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