Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE MATHEMATICS

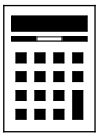
H

Higher Tier Paper 2 Calculator

Thursday 8 June 2017 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a calculator
- mathematical instruments.



Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26–27	
TOTAL	

Please note that these worked solutions have neither been provided nor approved by AQA and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

.CG Maths.

Answer **all** questions in the spaces provided

1 Circle the decimal that is closest in value to $\frac{39}{800}$

Type into calculator and press the SD button to convert to a decimal

[1 mark]

0.04 0.048 0.049 0.05

Work out how far away they are by working out the difference, largest subtract smallest. The one with the smallest difference is the closest

2 Circle the area that is equal to 36 mm^2

[1 mark]

360 cm^2 3600 cm^2 3.6 cm^2 0.36 cm^2

There are 10mm in 1cm. Area is a squared unit so when converting the effect will be squared compared to converting mm to cm

3 *A* is (2, 12) and *B* is (8, 2)

Circle the midpoint of *AB*.

[1 mark]

(3, 5) (4, 6) (5, 7) (6, 10)

The midpoint will be in the middle of the x-coordinates and the y-coordinates. Finding the mean is a quick way of finding the middle value.

4 Here is a sequence.

90 82 74 66 58

Circle the expression for the nth term of the sequence.

[1 mark]

$n - 8$ $98 - 8n$ $8n + 82$ $8n - 98$

The sequence goes down by 8 each time so the coefficient of n must be -8

Turn over for the next question

4

5 A code has 4 digits.

Each digit is a number from 0 to 9

Digits may be repeated.

The code starts 5 4 1

5	4	1	

5 (a) Amy knows the last digit is odd but **not** 7

She chooses a different odd number at random.

What is the probability that she chooses the correct number?

[1 mark]

Consider how many digits there are which are odd but not 7.

$$\frac{\text{Correct outcomes}}{\text{Possible outcomes}}$$

Answer _____

5 (b) The 4-digit code is changed to an even number.

The first digit is 3

How many possible codes are there?

[2 marks]

Use the product rule for counting. Multiplying the number of outcomes for each digit gives the total number of outcomes.

Answer _____

6 (a) Complete the table of values for $y = x^2 - x - 2$

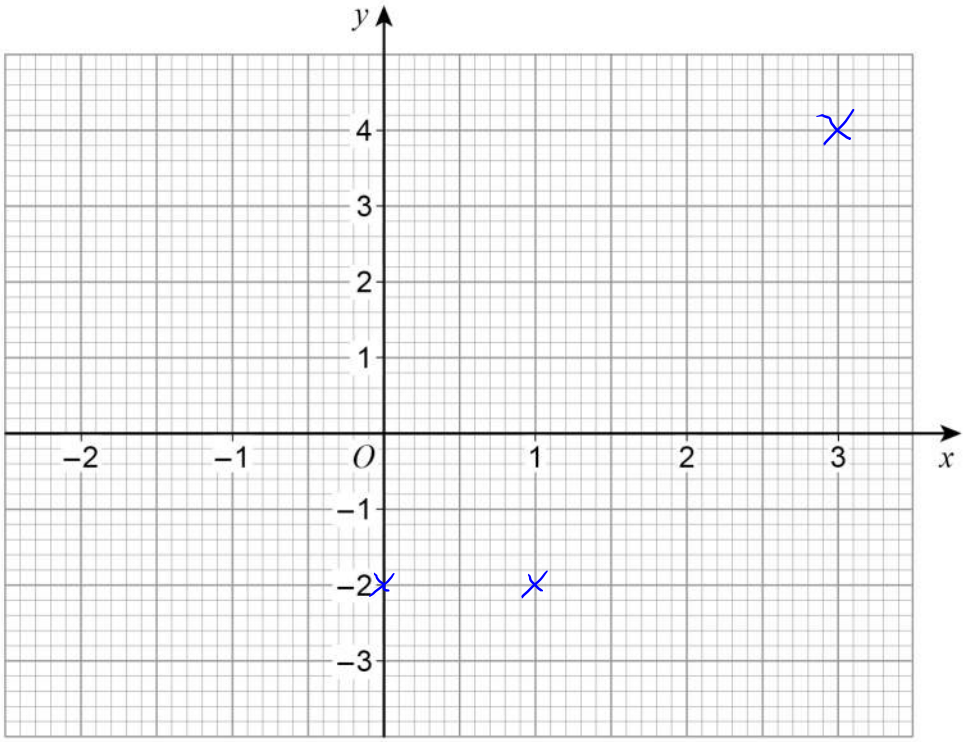
[2 marks]

Substitute -2, -1 then 2 for x.

x	–2	–1	0	1	2	3
y			–2	–2		4

6 (b) Draw the graph of $y = x^2 - x - 2$ for values of x from –2 to 3

[2 marks]



6 (c) Write down the x-coordinate of the turning point of the graph.

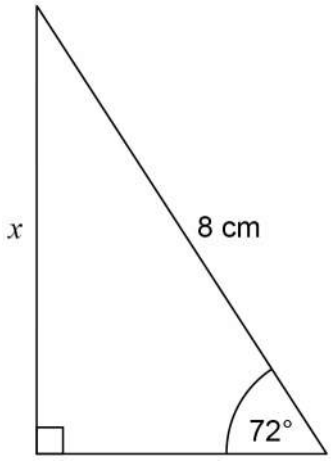
[1 mark]

The turning point it where the line starts to go up instead of down.

Answer _____

8

7 Use trigonometry to work out the length x.



Not drawn accurately

[2 marks]

SOH CAH TOA

Tick what you have and what you are trying to find out.
O- Opposite
A - Adjacent
H - Hypotenuse
S - Sin of the angle
C - Cos of the angle
T- Tan of the angle
The one with two ticks is the formula you need to use.

Answer _____ cm

8 Lily goes on a car journey.

For the first 30 minutes her average speed is 40 miles per hour.

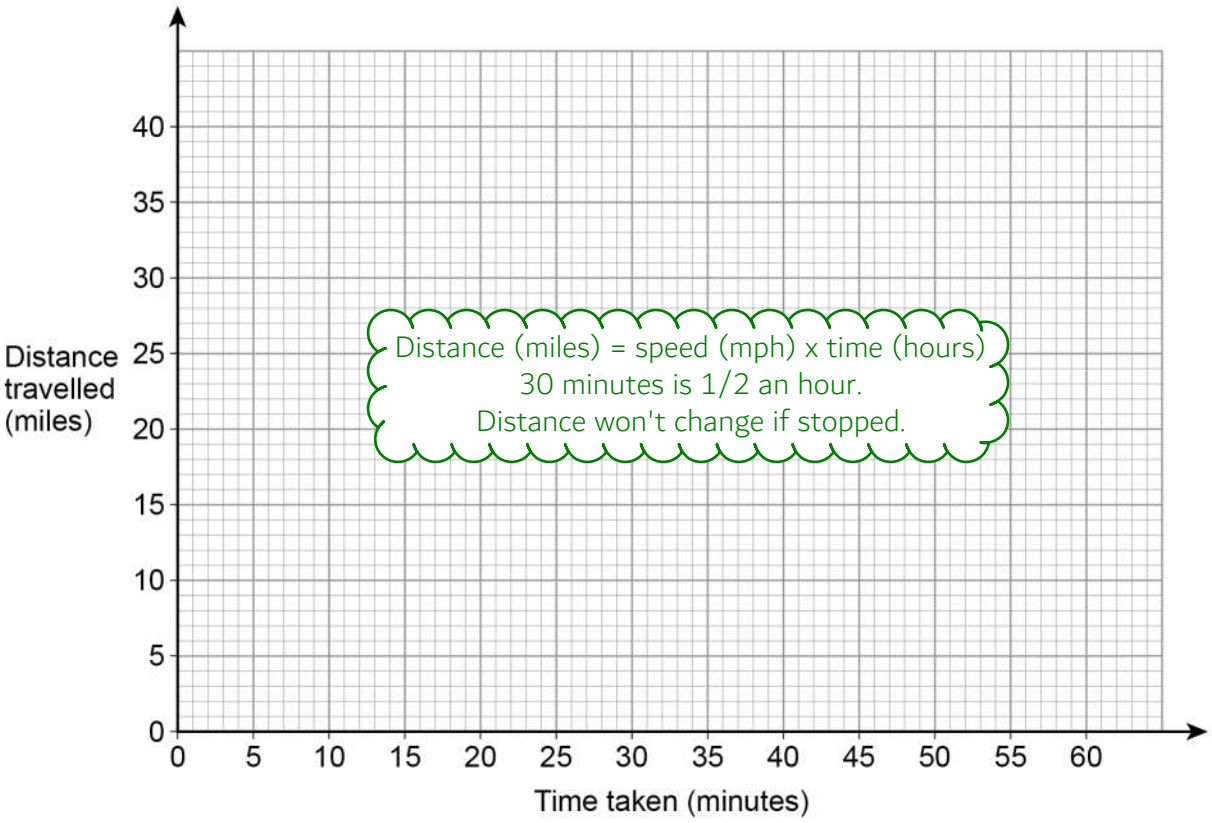
She then stops for 15 minutes.

She then completes the journey at an average speed of 60 miles per hour.

The total journey time is 1 hour.

8 (a) Draw a distance-time graph for her journey.

[3 marks]



8 (b) Write down the average speed for the total journey.

[1 mark]

No calculations required.

Answer _____ mph

? miles were travelled in an hour.

Turn over for the next question

6

9 The table shows information about some CDs.

Type	Rock	Pop	Jazz
Number of CDs	2	x	$2x + 5$

A CD is chosen at random.

The probability it is **rock** is $\frac{1}{20}$

Work out the probability it is jazz.

[4 marks]

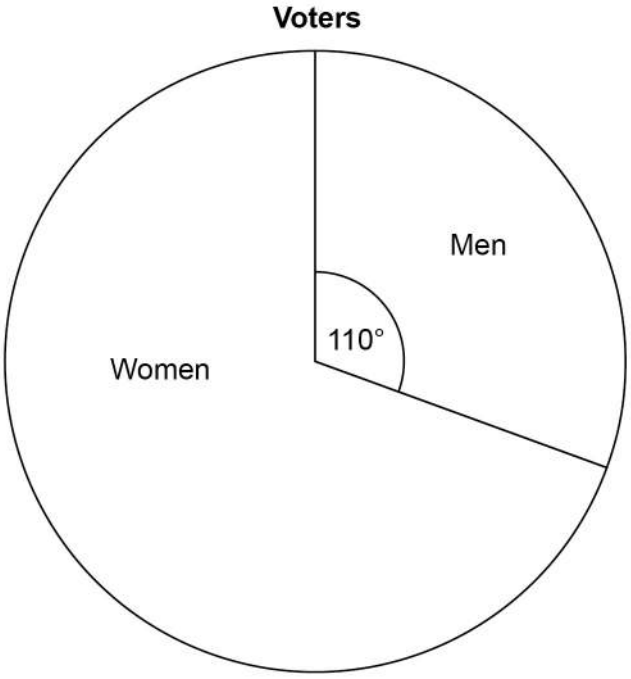
The probability is going to be:

$$\frac{\text{Number of Jazz CDs}}{\text{Number of CDs}}$$

We can find out the number of CDs from the probability that it is Rock and the number of Rock CDs.
To find out the number of Jazz CDs we need to set up and solve an equation involving x.
Adding up the numbers of each type of CD will equal to the total number of CDs.

Answer _____

10 The pie chart shows information about voters in an election.



3360 **more** women voted than men.

Work out the total number of voters.

[3 marks]

Work out how many degrees represent the women.
The number of degrees this is more than 110° represents 3360.
Work out how many voters are represented by 1° then 360° as this represents all the voters.

Answer _____

7

11 Write these numbers in **descending** order.

Largest to smallest.

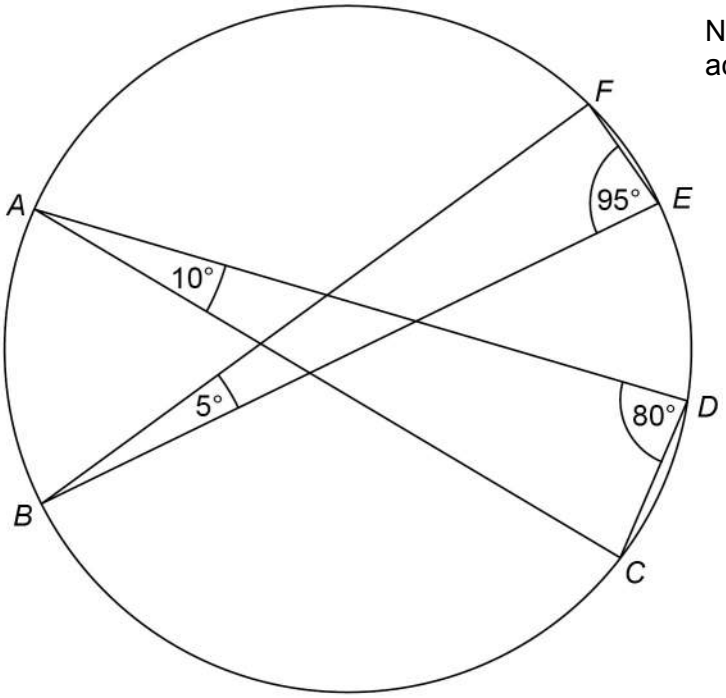
9563 9.56×10^3 9.56×3^{10}

Putting these into a calculator can convert them into ordinary numbers and make them comparable.

[2 marks]

Answer _____ , _____ , _____

12 *A*, *B*, *C*, *D*, *E* and *F* are points on a circle.



Circle the line that is a diameter of the circle.

[1 mark]

BE *AD* *AC* *BF*

The angle in a semi-circle is 90°. We are going to have to look for an angle of 90° in the triangles. Don't be confused by the diagram as it is not drawn accurately.

Turn over for the next question

3

13 To make one cheese sandwich, Gina uses one bread roll and two cheese slices.

Pack of 15 bread rolls	**Pack of 20 cheese slices**
£1.88	£2.15

She is going to buy enough packs to

have exactly twice as many cheese slices as bread rolls

make **more than** 100 cheese sandwiches.

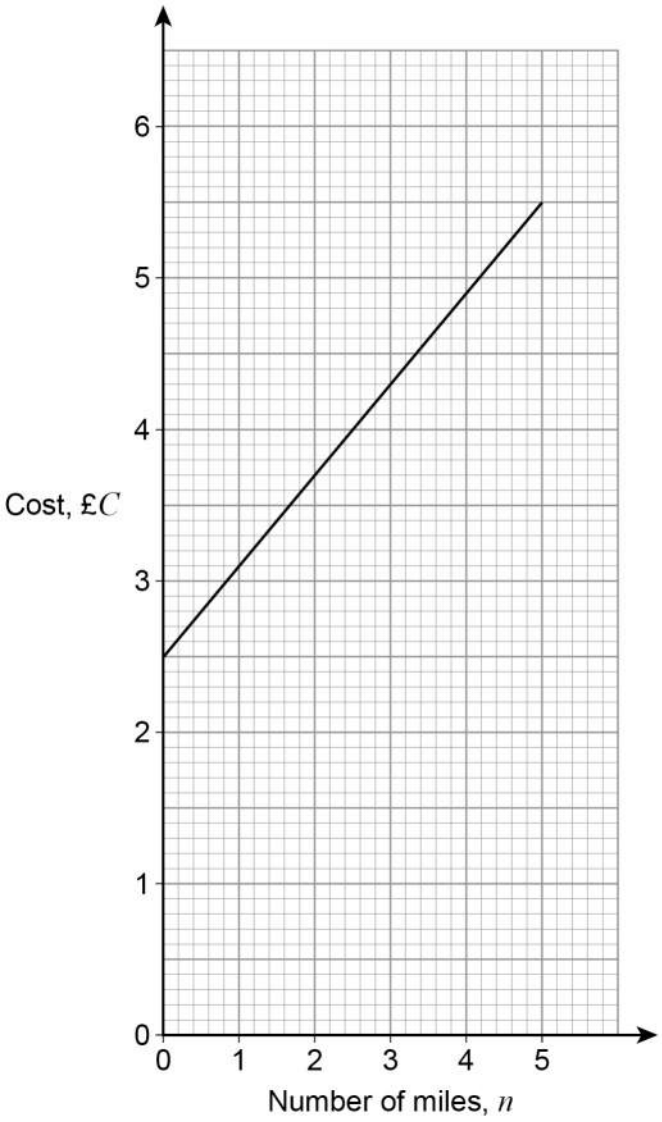
Work out the least amount she can spend.

[4 marks]

First work out how many packs of bread rolls would give you over 100. See if it is possible to buy exactly twice as many cheese slices. If not, try adding more packs of bread rolls until it is possible to buy exactly twice as many cheese slices. We can then work out the cost from the number of packs of bread rolls and cheese slices.

Answer £ _____

14 The graph shows the cost of some taxi journeys.



Work out a formula for C in terms of n.

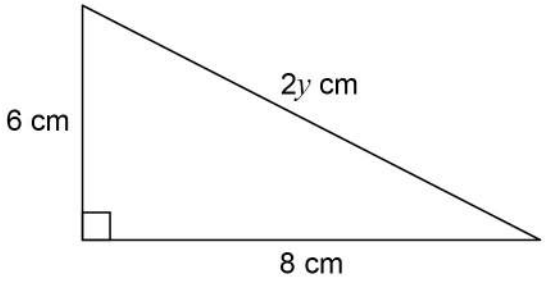
[3 marks]

The general equation of a straight line is y = mx + c, where m is the gradient and c is the y-intercept. y needs to be changed for C and x needs to be changed for n as these are the variables given. Gradient = (change in y)/(change in x)

Answer _____

7

15 Sami is trying to work out the exact value of y using Pythagoras' theorem.



Not drawn accurately

Here is her working.

There is a mistake here. The $(2y)^2$ hasn't been expanded out correctly

$(2y)^2 = 6^2 + 8^2$

$2y^2 = 36 + 64$

$2y^2 = 100$

$y^2 = 100 \div 2$

$y^2 = 50$

$y = \sqrt{50}$

15 (a) What error has she made in her working?

[1 mark]

15 (b) Kai works out that $y = 5$

Mel says,

"y cannot be 5 because the hypotenuse should be the longest side and the other sides are longer than 5 cm"

Is Mel correct?

Tick a box.

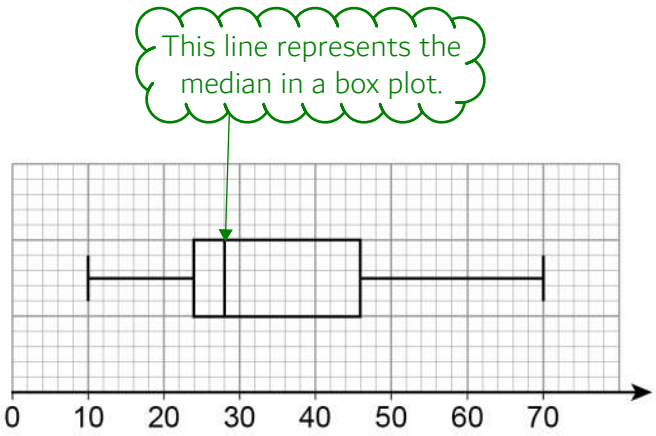
The side is $2y$, not y.

Yes ☐ No ☐

Give a reason for your answer.

[1 mark]

16 Here is a box plot.



Circle the median value.

[1 mark]

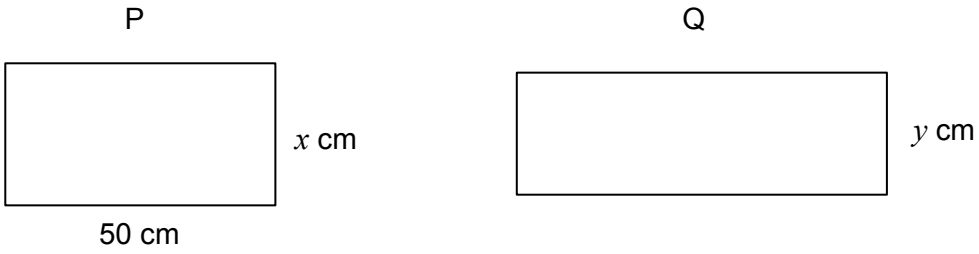
28 35 24 22

3

17 P is a rectangle with length 50 cm and width x cm

Q is a rectangle with width y cm

Not drawn accurately



The length of Q is 20% **more** than the length of P.

The area of Q is 10% **less** than the area of P.

Work out the ratio $x : y$

Give your answer in its simplest form.

[4 marks]

90% of the area of P must be equal to the area of Q. We can use this to create an equation involving x and y. Area of rectangle = base x height.

Answer _____ : _____

18 A school has 86 teachers.

42 are male and 44 are female.

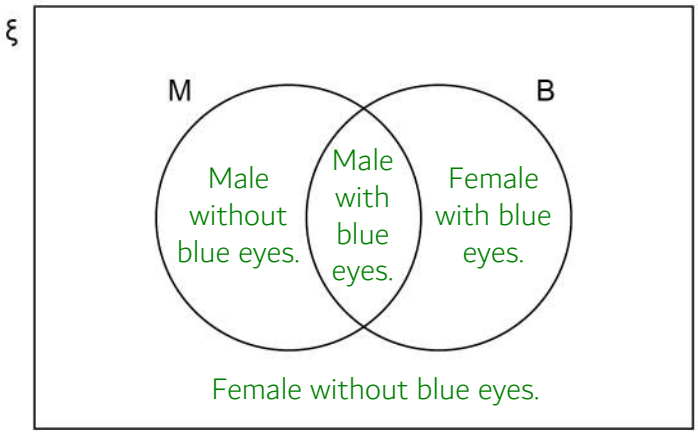
$\frac{1}{3}$ of the male teachers have blue eyes.

$\frac{1}{4}$ of the female teachers have blue eyes.

18 (a) ξ = teachers in the school

M = male teachers

B = teachers who have blue eyes



Complete the Venn diagram.

[3 marks]

18 (b) One teacher who has blue eyes is chosen at random.

Work out the probability that the teacher is male.

$$\frac{\text{Number of males with blue eyes}}{\text{Number of teachers with blue eyes}}$$

[1 mark]

Answer _____

8

19 Rana sells 192 cakes in the ratio small : medium : large = 7 : 6 : 11

The profit for one medium cake is twice the profit for one small cake.

The profit for one large cake is three times the profit for one small cake.

Her total profit is £532.48

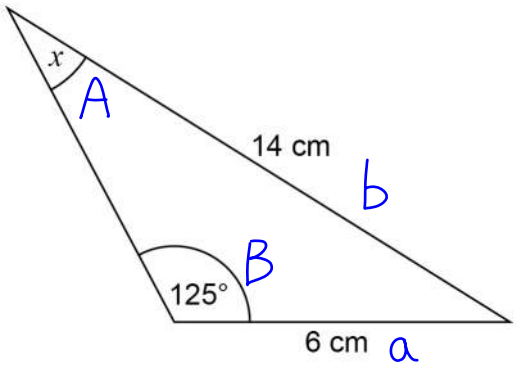
Work out the profit for one small cake.

[5 marks]

Let x be the price of one small cake. $2x$ is the price of a medium and $3x$ is large.
(number of small x x) + (medium x $2x$) + (large x $3x$) = £532.48
This is an equation only involving x so can be rearranged and solved.

Answer £ _____

20 Work out the size of angle x.



Not drawn accurately

[3 marks]

This is not a right-angled triangle and we have pairs of sides and their opposite angles. Therefore we should use the sine rule.

$\frac{\sin A}{a} = \frac{\sin B}{b}$

Answer _____ degrees

Turn over for the next question

8

21 Solve $5x^2 = 10x + 4$

Give your answers to 2 decimal places.

[4 marks]

Its a quadratic. As the question wants an answer to 2 decimal places, it will not be possible to factorise. We could complete the square but it is faster to use the quadratic formula. The equation needs to be rearranged into the form $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Answer _____

22 A ball, dropped vertically, falls d metres in t seconds.

d is directly proportional to the square of t.

The ball drops 45 metres in the first 3 seconds.

How far does the ball drop in the **next** 7 seconds?

[4 marks]

Distance in the next 7 seconds = distance in 10s - distance in first 3s.
We can use the the data given and the proportion to find an equation for the distance given a certain time.

$d \propto t^2$

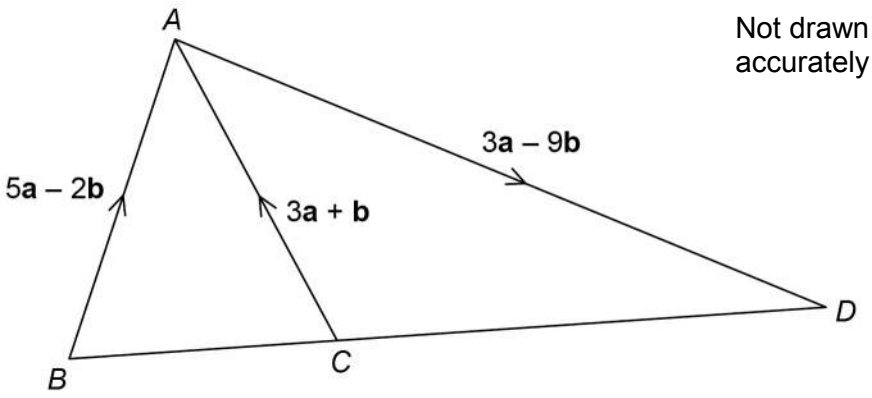
$d = kt^2$

Answer _____ metres

Turn over for the next question

8

23



Is *BCD* a straight line?

Show working to support your answer.

[3 marks]

If BCD is a straight line, vectors BC and CD must be in the same direction; a multiple of the same vector. These can be found by using the other vectors we are given.

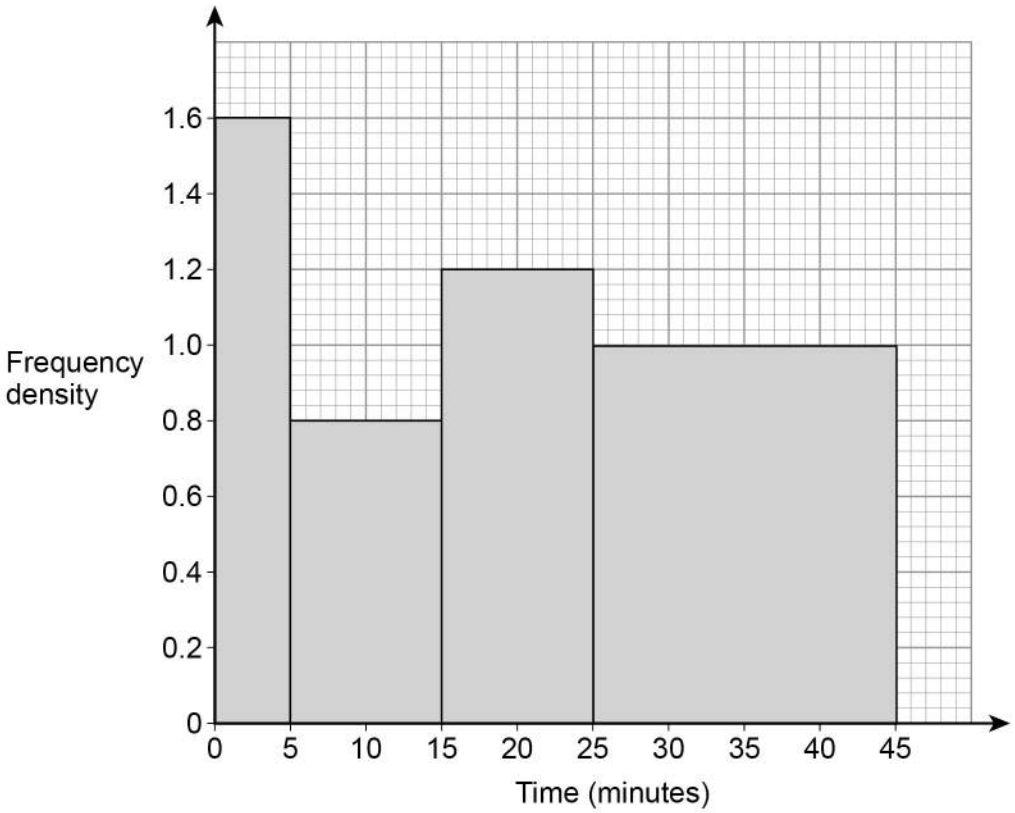
$\overrightarrow{BC} = \overrightarrow{BA} - \overrightarrow{CA}$

$\overrightarrow{CD} =$

Answer _____

24 48 students completed some homework.

This histogram shows information about the times taken.



Work out an estimate of the interquartile range.

You **must** show your working.

[4 marks]

Frequency = class width x frequency density
Interquartile range = upper quartile - lower quartile
The lower quartile is roughly 1/4 of the way through the data. The upper quartile is roughly 3/4 of the way through the data. Work out which class the quartiles lie within then what fraction of the way through the class they are, assuming that all of the data points are evenly spread.

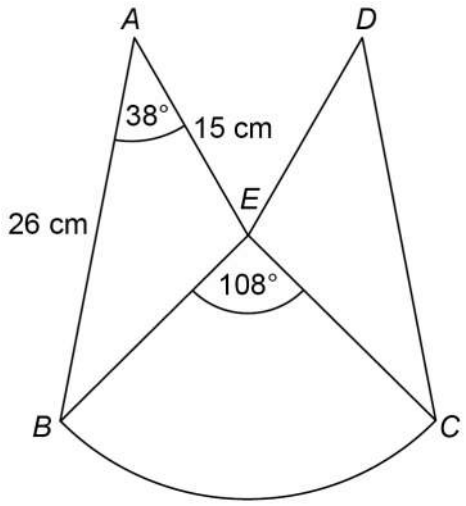
Answer _____ minutes

7

25 The diagram shows a logo.

ABE and *DCE* are congruent triangles.

BCE is a sector of a circle, centre *E*.



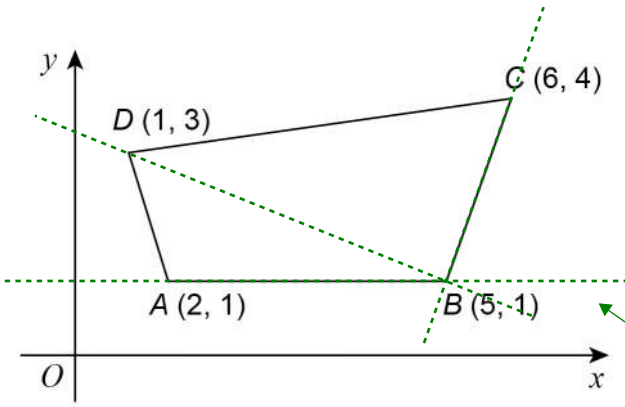
Not drawn accurately

Show that the area of the logo is 510 cm^2 to 2 significant figures.

[5 marks]

Area of logo = 2 x area of triangle + area of sector.
Area of triangle = $(ab\sin C)/2$
Area of sector = $(x^\circ/360)\pi r^2$
r can be found with the cosine rule.
$a^2 = b^2 + c^2 - 2bc\cos A$

26 (a) A sketch of a quadrilateral *ABCD* is shown.



Not drawn accurately

The shape follows these lines of enlargement.

ABCD is enlarged, centre *B*, scale factor $\frac{1}{3}$

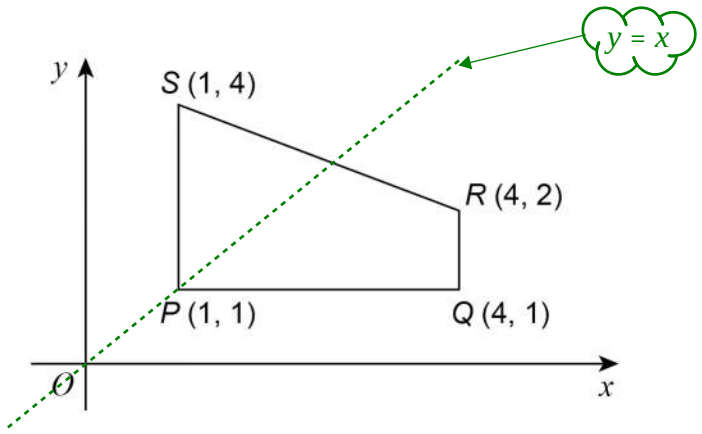
Circle the vertex that is invariant.

Doesn't change.

[1 mark]

A *B* *C* *D*

26 (b) A sketch of a quadrilateral *PQRS* is shown.



Not drawn accurately

PQRS is reflected in the line $y = x$

Circle the vertex that is invariant.

[1 mark]

P *Q* *R* *S*

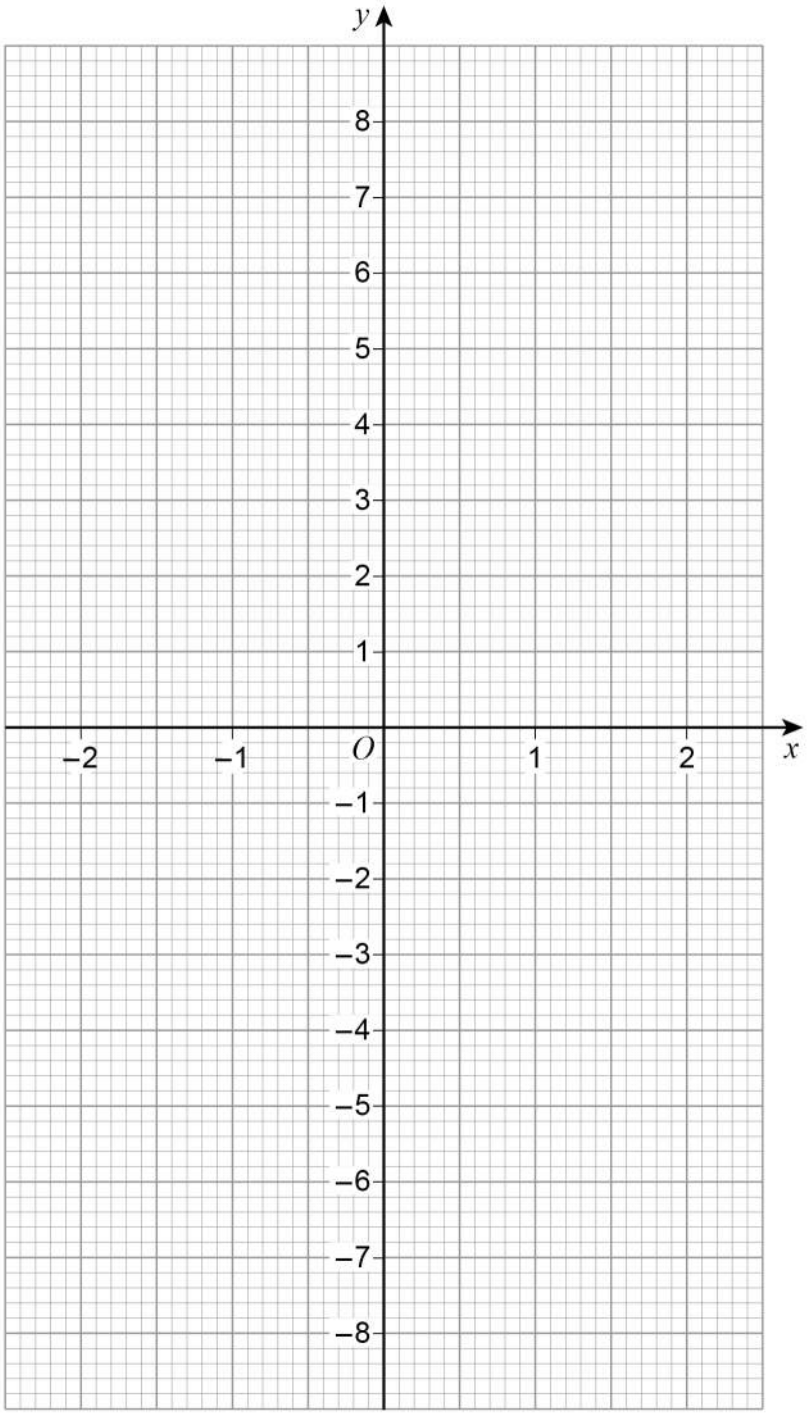
7

27 (a) $h(x) = \sqrt[3]{x}$ for all values of x

On the grid, draw the graph of the inverse function $y = h^{-1}(x)$ for $-2 \leqslant x \leqslant 2$

Inverse functions essentially do the opposite. Plot y values for x = -2, -1, 0, 1 and 2 then join up with a line.

[2 marks]



27 (b) For all values of x

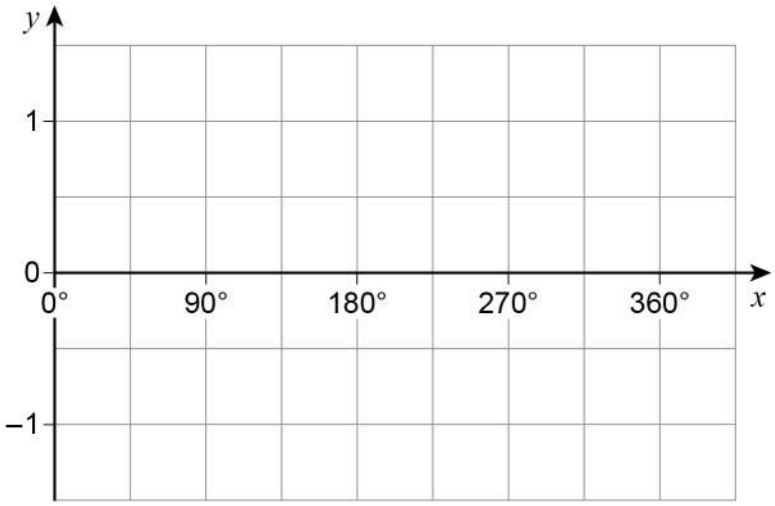
f(x) = sin x

g(x) = x + 90

On the grid, draw the graph of the composite function y = fg(x) for $0° \leqslant x \leqslant 360°$

[2 marks]

fg(x) = f(g(x)) = f(x + 90)
Plot fg(90), fg(180) fg(270) and fg(360)
Join up with a line.



END OF QUESTIONS

4