

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE MATHEMATICS

H

Higher Tier

Paper 2 Calculator

Thursday 8 June 2017

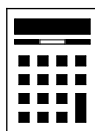
Morning

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	



Answer **all** questions in the spaces provided

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

[1 mark]

0.04

0.048

0.049

0.05

$$39 \div 800 = 0.04875$$

- 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

$$36 \div 10 \div 10 \quad \leftarrow \text{cm}^2$$
$$= 0.36$$



- 3 A is (2, 12) and B is (8, 2)
Circle the midpoint of AB.

$$\left(\frac{8+2}{2}, \frac{12+2}{2} \right) = (5, 7)$$

[1 mark]

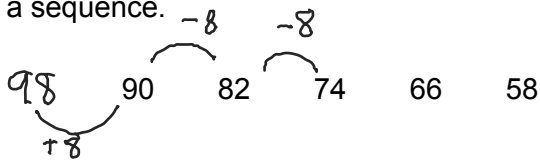
(3, 5)

(4, 6)

(5, 7)

(6, 10)

- 4 Here is a sequence.



$$\begin{array}{r} D: \\ n \\ 0 \end{array} \quad \begin{array}{r} - -8 \\ n \\ +98 \end{array}$$

Circle the expression for the n th term of the sequence.

[1 mark]

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

Turn over for the next question

Turn over ►



- 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?

odd = 1, 3, 5, ~~7~~, 9 - 4 options
correct

[1 mark]

Answer $\frac{1}{4}$

- 5 (b)** The 4-digit code is changed to an even number.
The first digit is 3

How many possible codes are there?

1st 2nd 3rd 4th [2 marks]

1 x 10 x 10 x 5

3 ↗ 1 1 even

any any

Answer 500



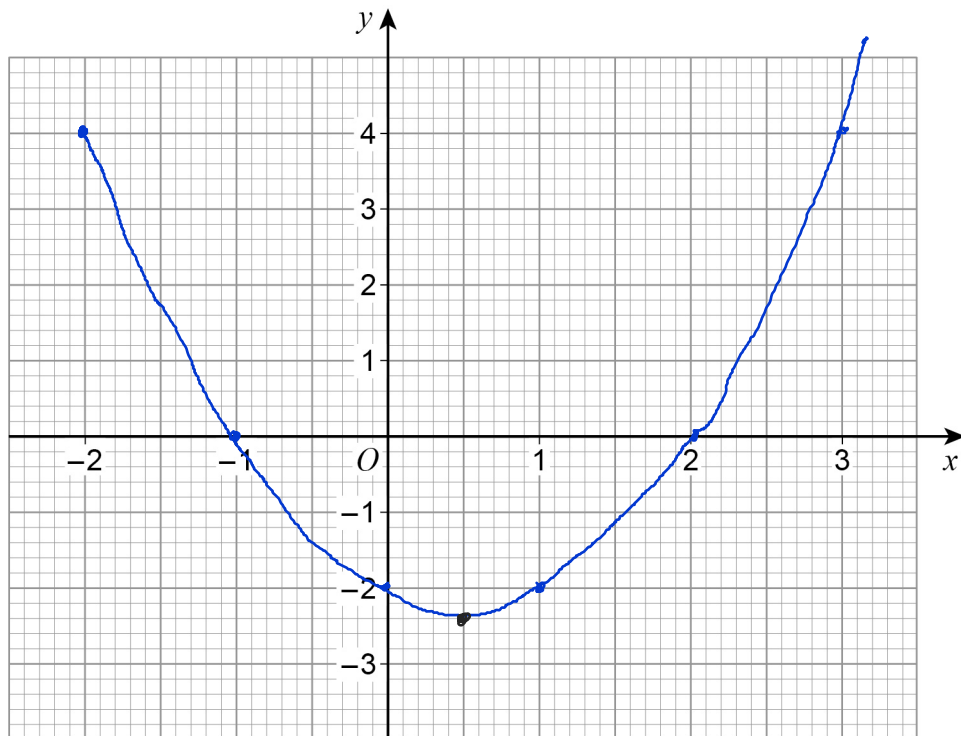
6 (a) Complete the table of values for $y = x^2 - x - 2$

[2 marks]

	$4+2-2$	$1+1-2$			$4-2-2$	
x	-2	-1	0	1	2	3
y	4	0	-2	-2	0	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.

$$x = 0.5$$

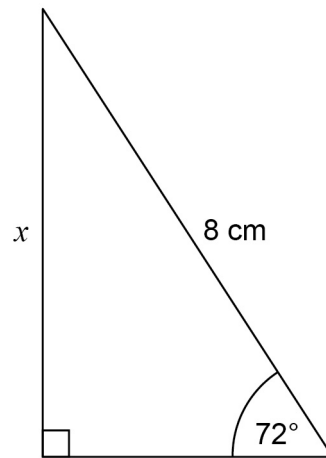
[1 mark]

Answer 0.5

Turn over ►



- 7 Use trigonometry to work out the length x .



Not drawn
accurately

[2 marks]

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 72 = \frac{x}{8}$$

$$8 \sin 72 = x$$

Answer 7.61 cm



$$\text{speed} = \frac{\text{dist}}{\text{time}}$$

8 Lily goes on a car journey. $\frac{1}{2}h$

For the first 30 minutes her average speed is 40 miles per hour. $\text{dist} = 40 \times \frac{1}{2} = 20$

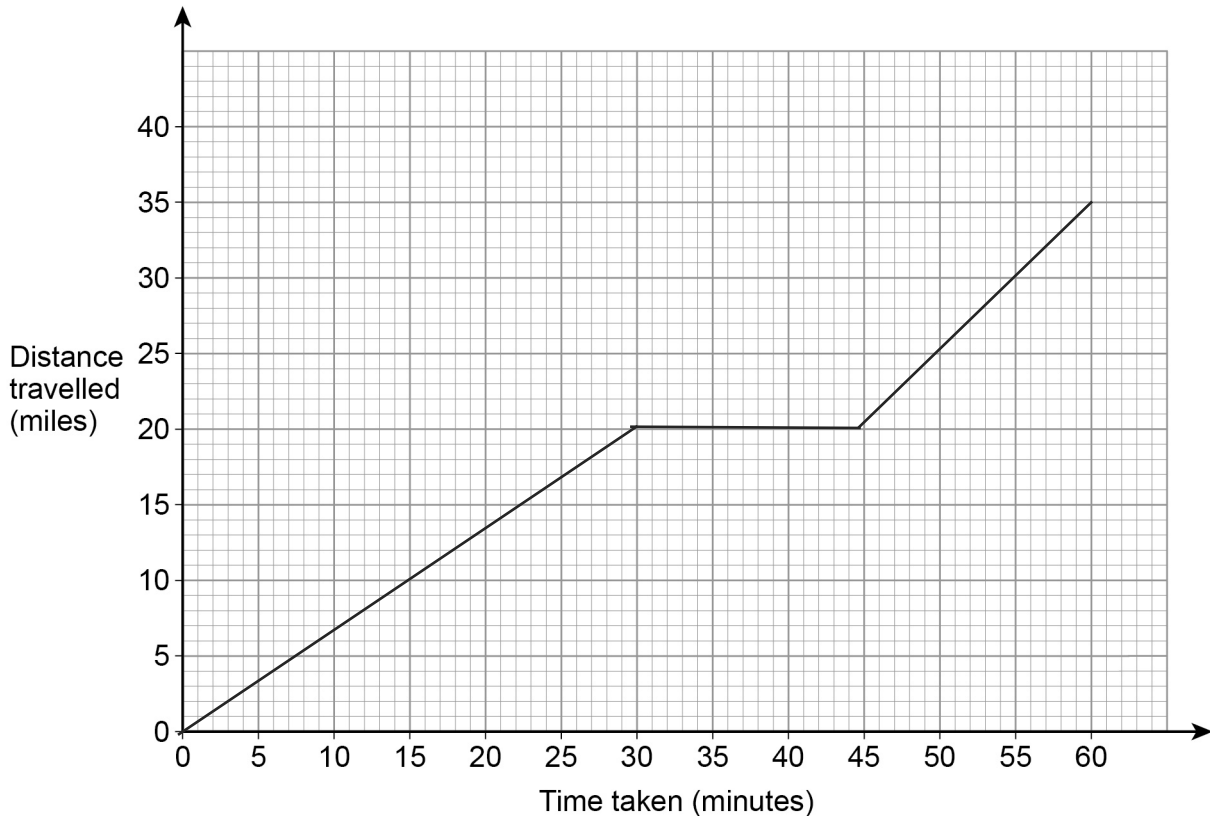
She then stops for 15 minutes.

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

The total journey time is 1 hour. $60 - 45 = 15 \text{ min} = \frac{1}{4}h$
 $\text{dist} = 60 \times \frac{1}{4}h = 15 \text{ miles}$

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

[3 marks]



8 (b) Write down the average speed for the total journey. $= \frac{\text{Total dist}}{\text{Total time}}$

[1 mark]

$$= \frac{35 \text{ miles}}{1 \text{ hour}}$$

Answer 35 mph

Turn over for the next question



- 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]

$$P(\text{Rock}) = \frac{2}{2+x+2x+5} = \frac{2}{3x+7}$$

$$\frac{1}{20} = \frac{2}{3x+7}$$

cross multiply

$$3x+7 = 40$$

$$3x = \overset{-7}{33}$$

$$x = \underset{\div 3}{11}$$

$$P(\text{Jazz}) = \frac{2(11)+5}{3(11)+7}$$

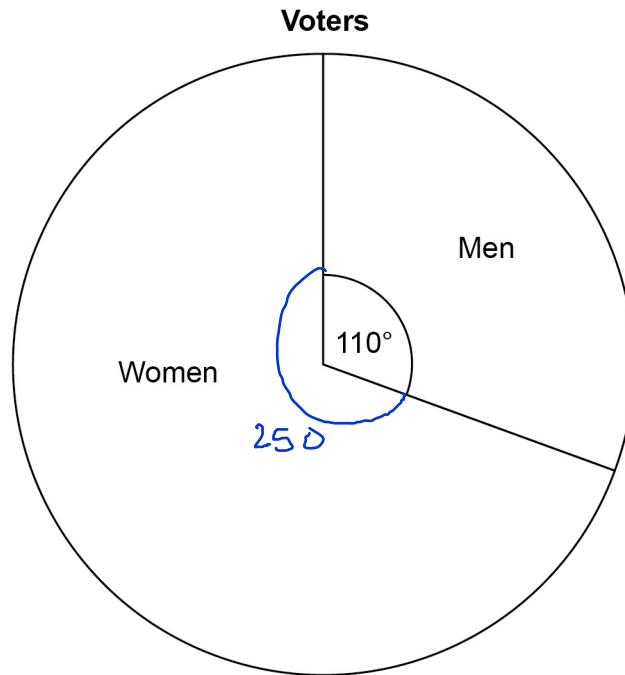
$$= \frac{27}{40}$$

Answer $\frac{27}{40}$



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]

$$\text{Women} = 360 - 110 = 250^\circ$$

$$\text{Difference} = 250^\circ - 110^\circ = 140^\circ = 3360 \text{ ppl}$$

$$\div 14 \quad 140^\circ = 3360 \text{ ppl} \quad \div 14$$

$$10^\circ = 240$$

$$\times 36 \quad 360^\circ = 8640 \text{ ppl} \quad \times 36$$

Answer 8640

Turn over ►



11 Write these numbers in descending order.

$$\begin{array}{c} 2 \\ 9563 \end{array}$$

$$\begin{array}{c} 3 \\ 9.56 \times 10^3 \\ | \\ 9560 \end{array}$$

$$\begin{array}{c} 1 \\ 9.56 \times 3^{10} \\ | \\ 564508.4... \end{array}$$

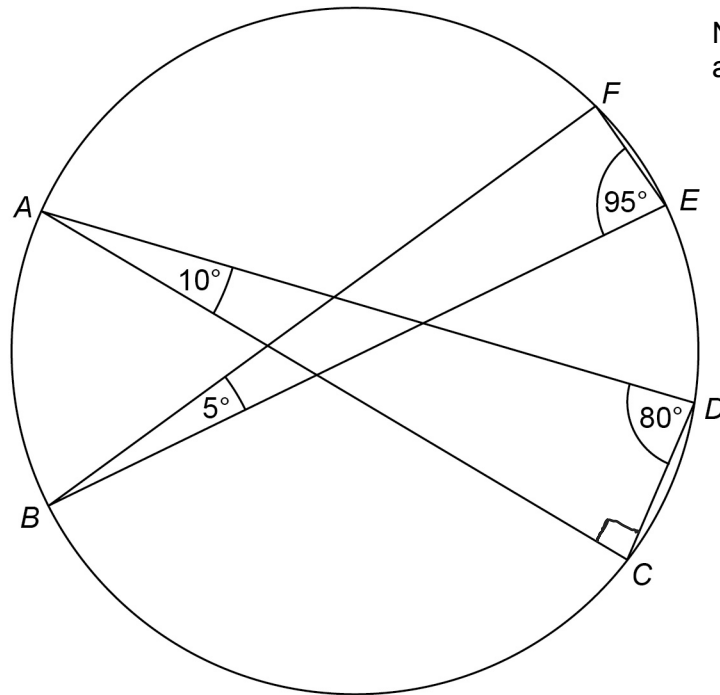
[2 marks]

Answer 9.56×3^{10} , 9563 , 9.56×10^3



12

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

Not drawn
accurately

Circle the line that is a diameter of the circle.

[1 mark]

BE



AC

BF

}
angles in semicircle is 90°

Turn over for the next question

Turn over ►



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

Pack of 15 bread rolls

£1.88

Pack of 20 cheese slices

£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]

More than 100 bread rolls

First common multiple after 100 between
15 and 20 is 120

120 bread rolls | 240 slices

$120 \div 15 = 8 \text{ packs}$

$240 \div 20 = 12 \text{ packs}$

$8 \times 1.88 =$

12×2.15

£15.04

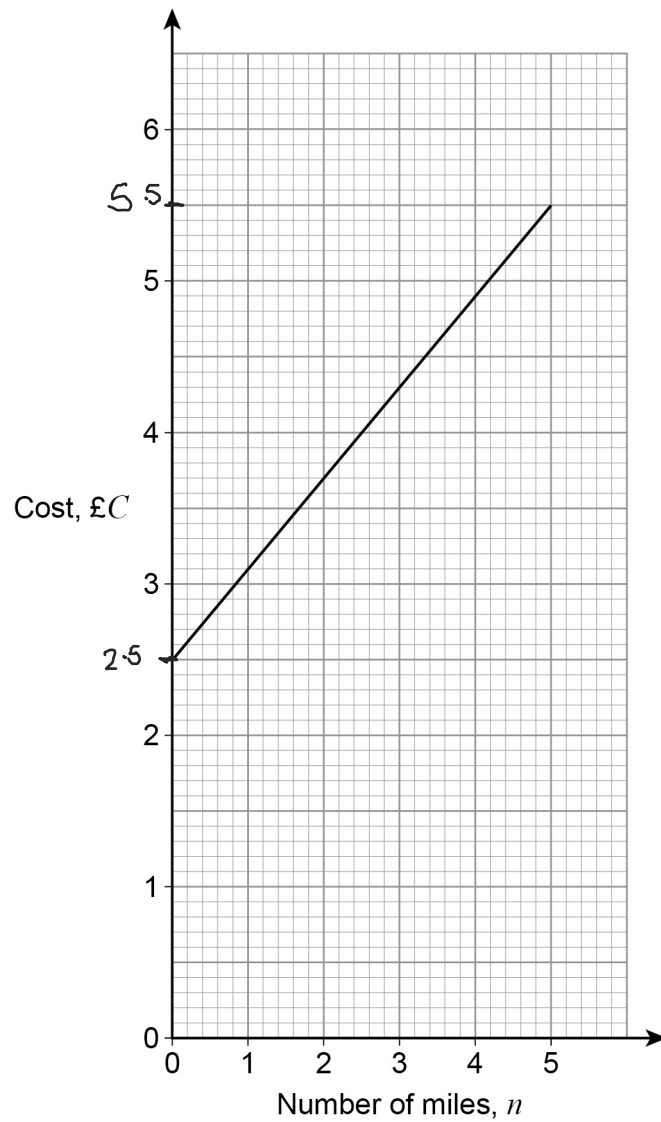
= £25.80

$15.04 + 25.80$

Answer £ 40.84



- 14 The graph shows the cost of some taxi journeys.



Work out a formula for C in terms of n .

$$\frac{y_1 - y_2}{x_1 - x_2}$$

[3 marks]

$$\text{Gradient} = \frac{5.5 - 2.5}{5 - 0} = \frac{3}{5}$$

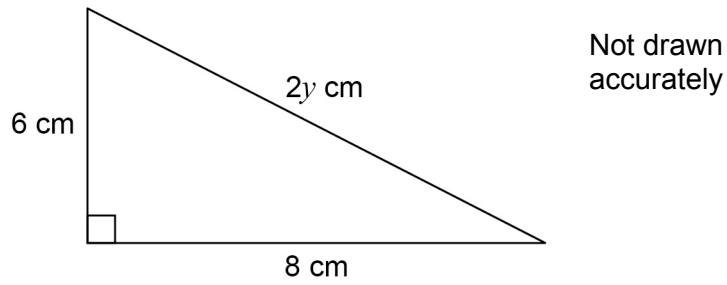
$$\text{Yintercept} = 2.5$$

Answer $C = \frac{3}{5}n + 2.5$

Turn over ►



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



Here is her working.

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

$$2y^2 = 36 + 64$$

$$2y^2 = 100$$

$$y^2 = 100 \div 2$$

$$y^2 = 50$$

$$y = \sqrt{50}$$

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

[1 mark]

She didn't square the 2, it should
be $4y^2$ not $2y^2$



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.

Yes

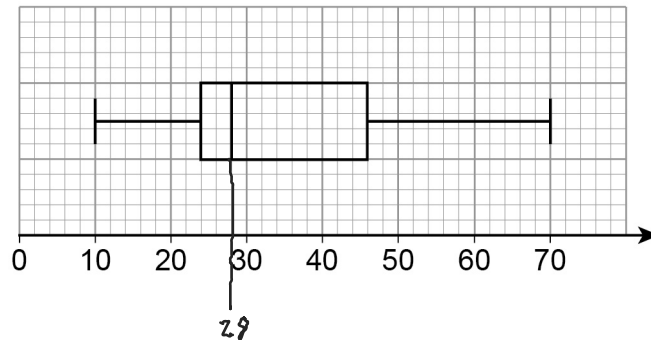
No

Give a reason for your answer.

[1 mark]

The hypotenuse is $2y$ which is $2 \times 5 = 10\text{cm}$

16 Here is a box plot.



Circle the median value.

[1 mark]

28

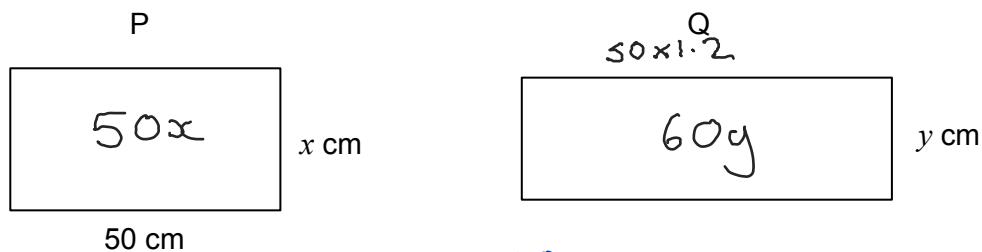
35

24

22



17

P is a rectangle with length 50 cm and width x cmQ is a rectangle with width y cmNot drawn
accuratelyThe 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]

$$\text{length of Q} = 1.2 \times 50 = 60$$

$$\text{Area of Q} = 60y, \quad \text{Area of P} = 50x$$

$$\text{Area of Q is 10\% less} = 90\% \text{ of P}$$

$$60y = 0.9 \times 50x$$

$$60y = 45x$$

$$\frac{60}{45} = \frac{x}{y}$$

$$x : y$$

$$\begin{aligned} & \div 15 \quad 60 : 45 \\ & \quad \quad 4 : 3 \quad \div 15 \end{aligned}$$

$$\text{Answer } \underline{4} : \underline{3}$$



18 A school has 86 teachers.

42 are male and 44 are female.

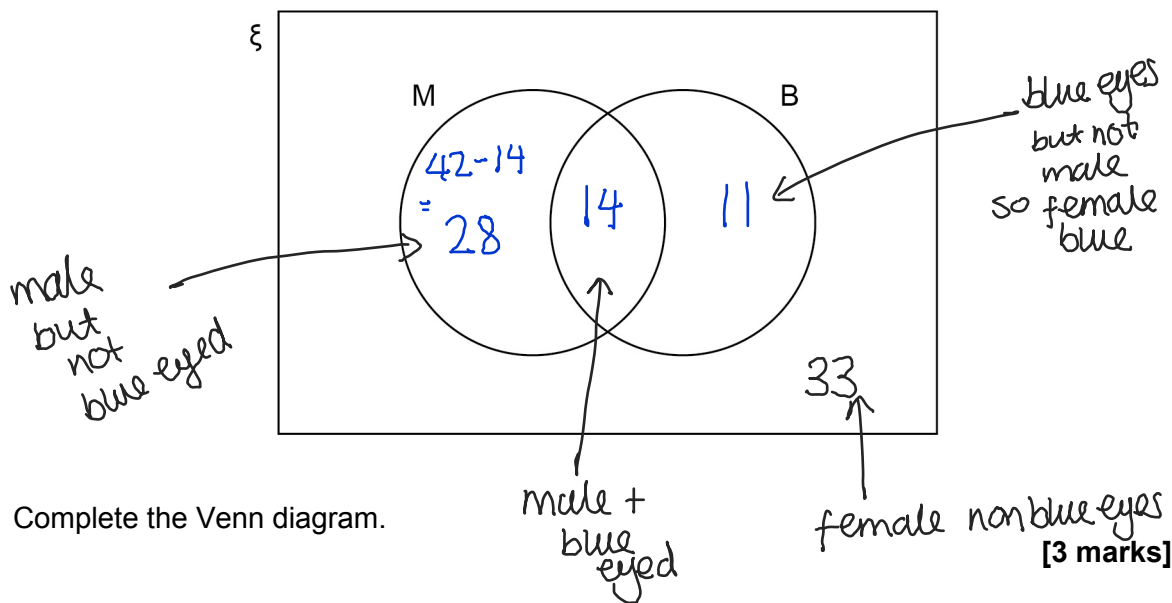
$\frac{1}{3}$ of the male teachers have blue eyes. $\frac{1}{3} \times 42 = 14$

$\frac{1}{4}$ of the female teachers have blue eyes. $\frac{1}{4} \times 44 = 11$

18 (a) ξ = teachers in the school

M = male teachers

B = teachers who have blue eyes



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

Work out the probability that the teacher is male.

Teachers with blue eyes: $14 + 11 = 25$ [1 mark]

14 are males

Answer _____

$\frac{14}{25}$



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]

S	M	L	Total
7	6	11	24
56	48	88	192

$\left. \begin{array}{l} 24 \\ 192 \end{array} \right\} \times 8$

$$\text{Profit for small} = x$$

$$\text{medium} = 2x$$

$$\text{large} = 3x$$

$$\text{Profit: small} = 56x, \text{ medium} = \overset{2 \times 48}{96x}, \text{ large} = \overset{3 \times 88}{264x}$$

$$\text{Total} = 416x$$

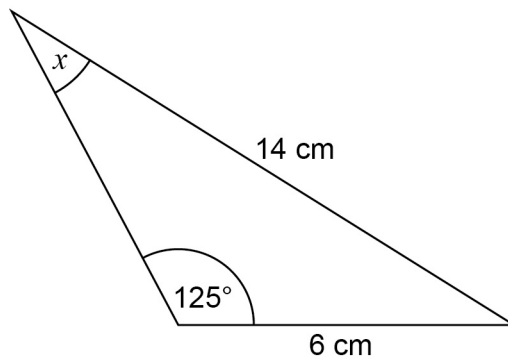
$$416x = £532.48$$

$$x = £1.28 \quad - \quad \text{profit for small}$$

$$\text{Answer } £ \quad 1.28$$



20

Work out the size of angle x .Not drawn
accurately

[3 marks]

$$\text{Sine rule : } \frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin x}{6} = \frac{\sin 125}{14}$$

$$\sin x = \frac{6 \sin 125}{14}$$

$$x = \sin^{-1} \left(\frac{6 \sin 125}{14} \right)$$

Answer 20.6 degrees

Turn over for the next question

Turn over ►



21

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

Give your answers to 2 decimal places.

[4 marks]

$$\overset{a}{5}x^2 - \overset{b}{10}x - \overset{c}{4} = 0$$

$$\text{Quadratic formula: } \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{10 \pm \sqrt{100 + 4 \times 5 \times 4}}{2 \times 5}$$

$$x = \frac{10 \pm \sqrt{180}}{10}$$

$$\text{Answer } \overset{\oplus}{x = 2.34} \quad \overset{\ominus}{-0.34}$$



22

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

d is directly proportional to the square of t . 1

The ball drops 45 metres in the first 3 seconds. 2

How far does the ball drop in the **next** 7 seconds? 3

[4 marks]

$$\textcircled{1} \quad d \propto t^2, \quad d = kt^2 \quad \rightarrow \quad d = 5t^2$$

$$\textcircled{2} \quad 45 = k \times 3^2$$

$$k = \frac{45}{9} = 5$$

$$\textcircled{3} \quad \text{Next 7sec} = 7 + 3 = 10\text{sec} = t$$

$$d = 5 \times 10^2 = 5 \times 100 \text{ in } 10\text{sec}$$

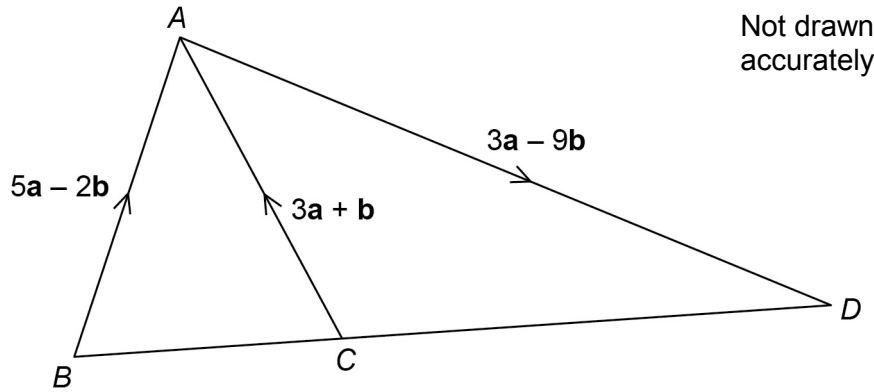
$$500 - 45 = 455 \text{ in } 7\text{sec}$$

Answer 455 metres

Turn over for the next question



23



Is BCD a straight line?

Show working to support your answer.

*If BCD is a straight line
 \vec{BC} and \vec{CD} would
be multiples of each other*

[3 marks]

$$\begin{aligned} \vec{BC} &= 5a - 2b - (3a + b) \\ &= 5a - 2b - 3a - b = 2a - 3b \end{aligned}$$

$$\vec{CD} = 3a + b + 3a - 9b = 6a - 8b$$

$$2a - 3b \times 3 = 6a - 9b$$

CD and BC are not multiples of
each other

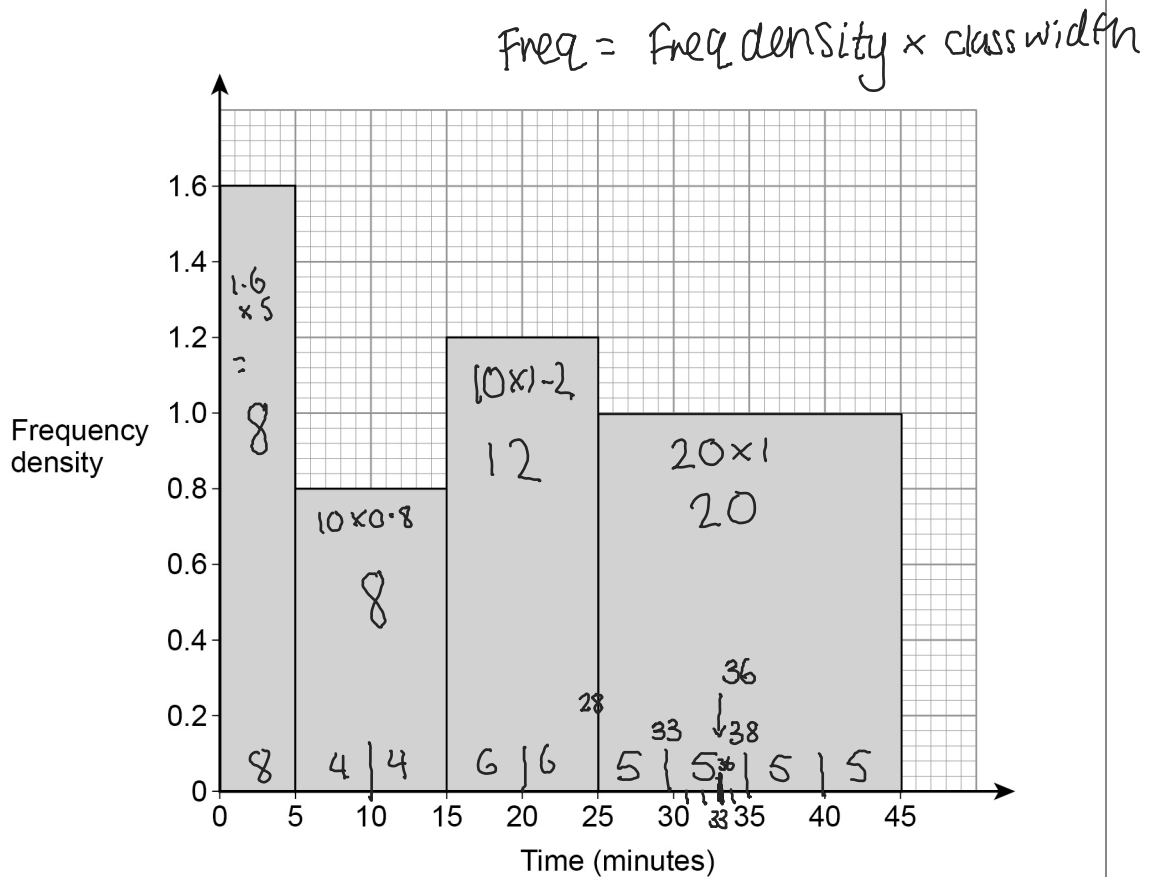
Answer No



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]**

$$LQ = \frac{48}{4} = 12$$

The 12th person would be in the
middle of the second bar. Time = 10 min

$$UQ = 12 \times 3 = 36^{\text{th}} \text{ person} \quad \text{Time} = 33 \text{ min}$$

$$LQR = 33 - 10$$

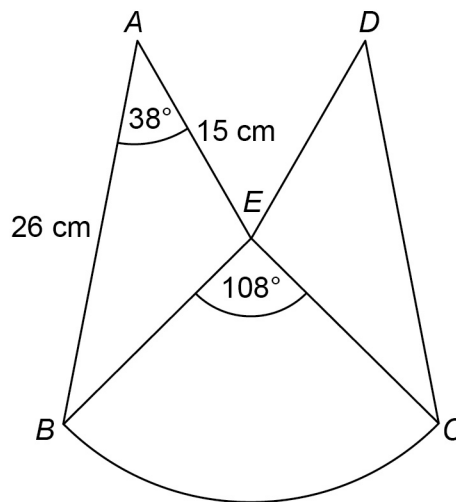
Answer 23 minutes

Turn over ►



25

The diagram shows a logo.

 ABE and DCE are congruent triangles. BCE is a sector of a circle, centre E .Not drawn
accuratelyShow that the area of the logo is 510 cm^2 to 2 significant figures.

[5 marks]

$$\text{Area of triangle: } \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} \times 15 \times 26 \sin 38 \quad \times 2 \text{ (two tri)}$$

$$= 390 \sin 38$$

$$= 240.10797\dots$$

$$\text{Length } BE: \text{ cosine rule } a^2 = b^2 + c^2 - 2bc \cos A$$

$$BE^2 = 15^2 + 26^2 - 2 \times 15 \times 26 \cos 38$$

$$= 286.35\dots$$

$$BE = 16.9219\dots \text{ cm}$$

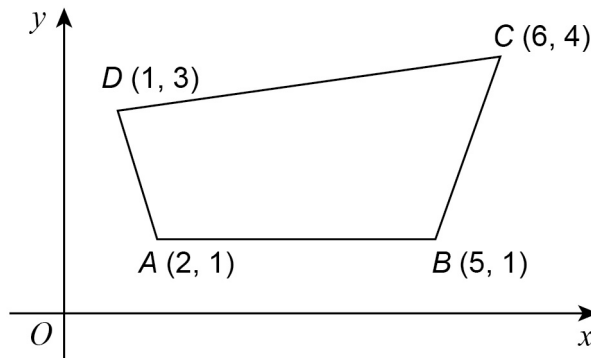
$$\text{Area of sector} = \pi BE^2 \times \frac{108}{360} = 269.8800$$

Total
Area

$$269.88 + 240.107 = 509.988\dots \text{ cm}^2 = 510 \text{ cm}^2 \text{ (2sf)}$$



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



Not drawn accurately

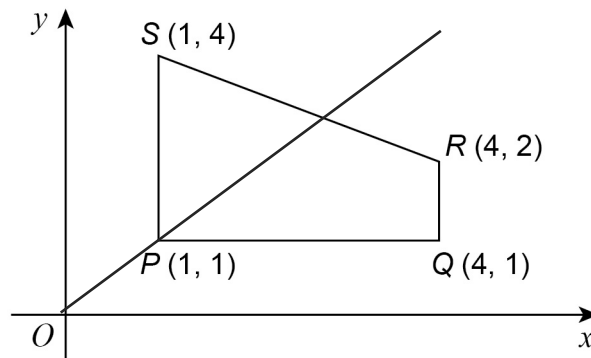
$ABCD$ is enlarged, centre B , scale factor $\frac{1}{3}$

Circle the vertex that is invariant.

[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]

$y=x$ — P Q R S

7

Turn over ►



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

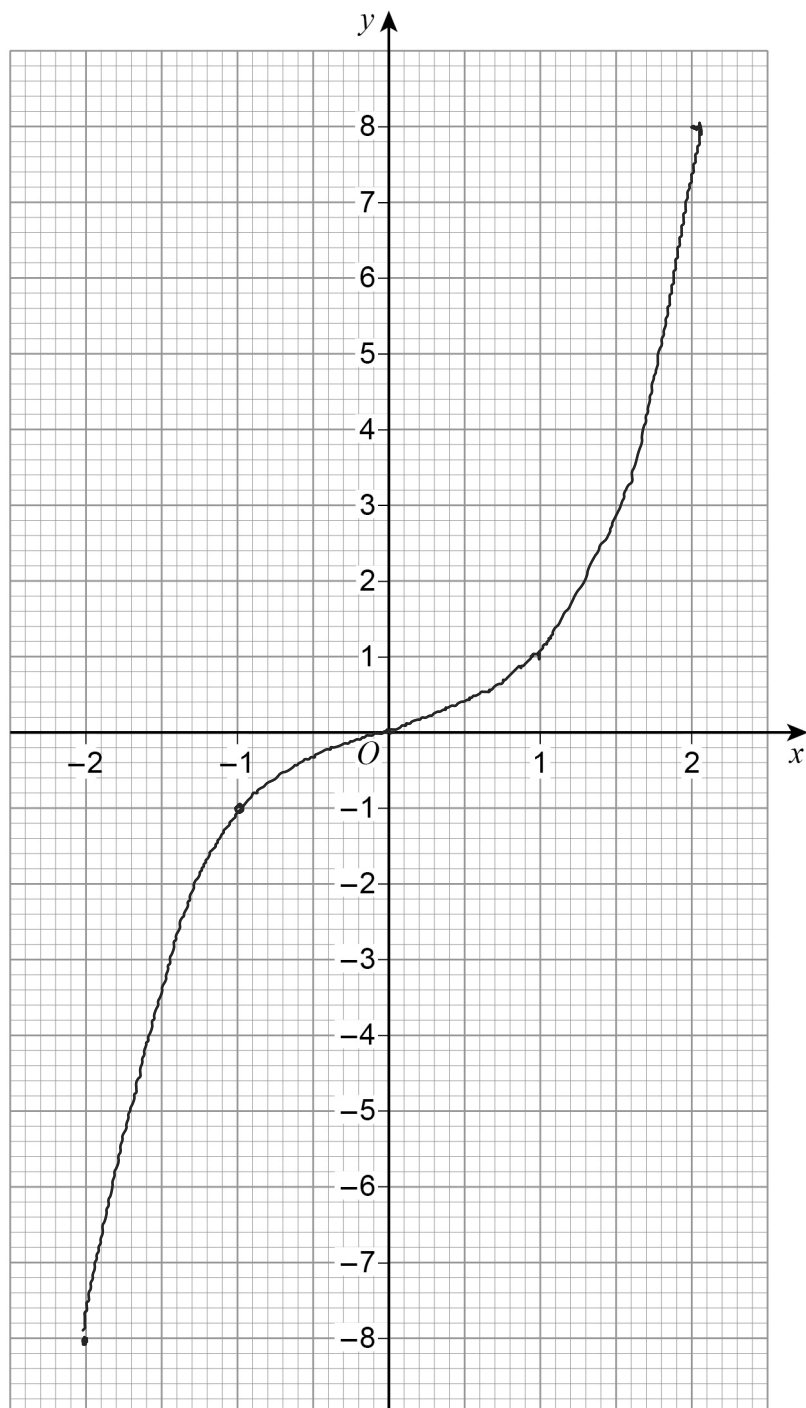
On the grid, draw the graph of the inverse function $y = h^{-1}(x)$ for $-2 \leq x \leq 2$

$$h^{-1}(x): y = \sqrt[3]{x}$$

$$y^3 = x$$

x	-2	-1	0	1	2	[2 marks]
y	-8	-1	0	1	8	

$$h^{-1}(x) = x^3$$



27 (b) For all values of x

$$f(x) = \sin x \leftarrow \text{replace } x \text{ for } x+90$$

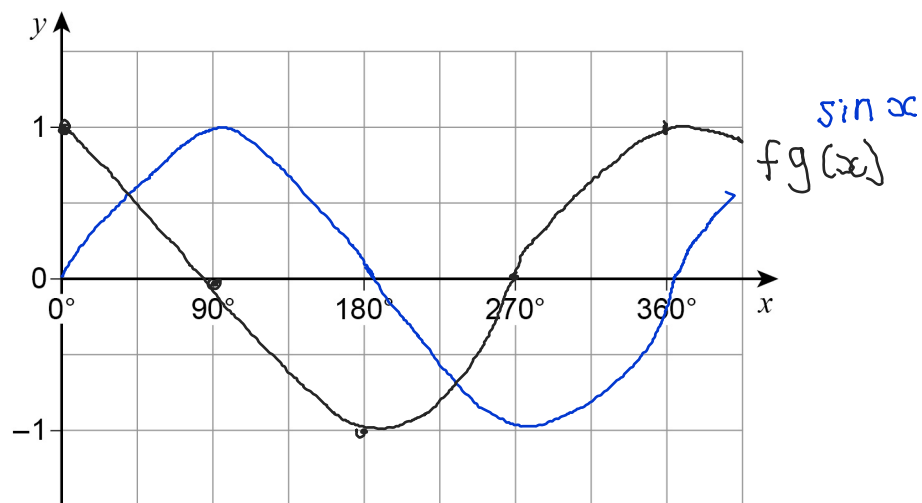
$$g(x) = x + 90$$

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

[2 marks]

$$fg(x) = \sin(x+90)$$

sin graph
but move left 90



END OF QUESTIONS



There are no questions printed on this page

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