

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname *StemUp Model Solution*

Forename(s)

Candidate signature

GCSE MATHEMATICS

H

Higher Tier

Paper 2 Calculator

Thursday 8 June 2017

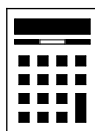
Morning

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	



J U N 1 7 8 3 0 0 2 H 0 1

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

- 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 

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

[1 mark]

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

- 4 Here is a sequence.

90 82 74 66 58

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?

[1 mark]

*Odd but not 7: 1, 3, 5, 9
so 4 equally likely choices, 1 is correct*

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?

[2 marks]

1st digit 3 (1 way), 2nd 10 ways, 3rd 10 ways, last even: 5 ways

$$1 \times 10 \times 10 \times 5 = 500$$

Answer 500



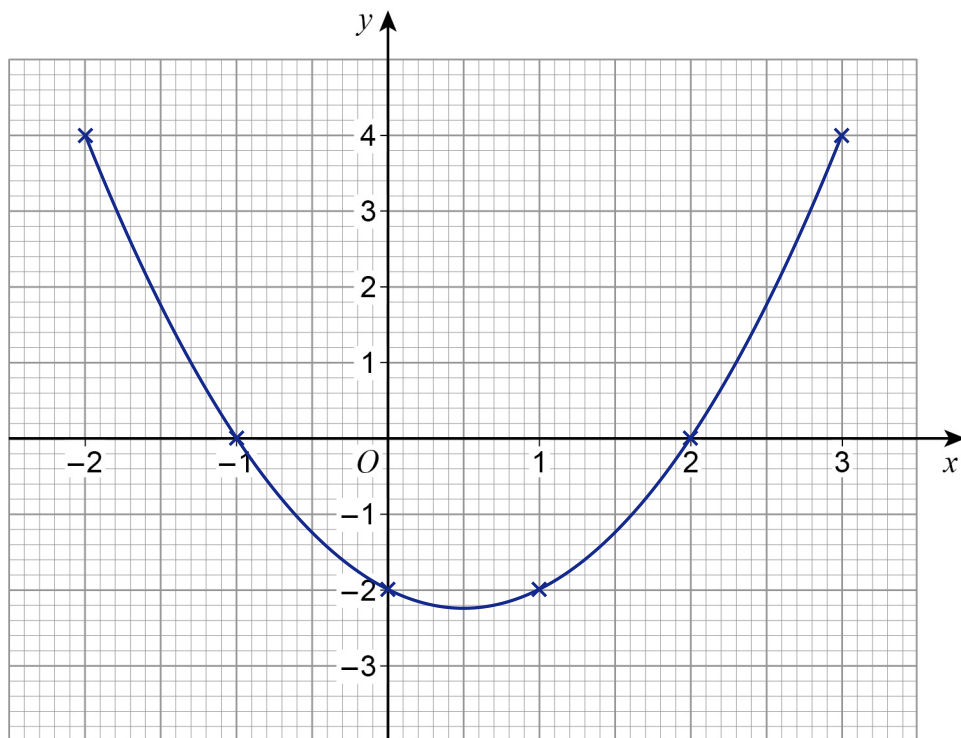
- 6 (a) Complete the table of values for $y = x^2 - x - 2$

[2 marks]

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.

[1 mark]

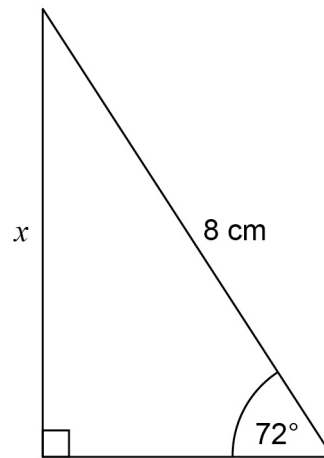
*Turning point is halfway between the
roots $x = -1$ and $x = 2$*

Answer 0.5

Turn over ►



- 7 Use trigonometry to work out the length x .



Not drawn
accurately

[2 marks]

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

$$x = 8 \times \sin 72^\circ$$

$$x = 7.608452...$$

Answer 7.61 cm



8

Lily goes on a car journey.

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

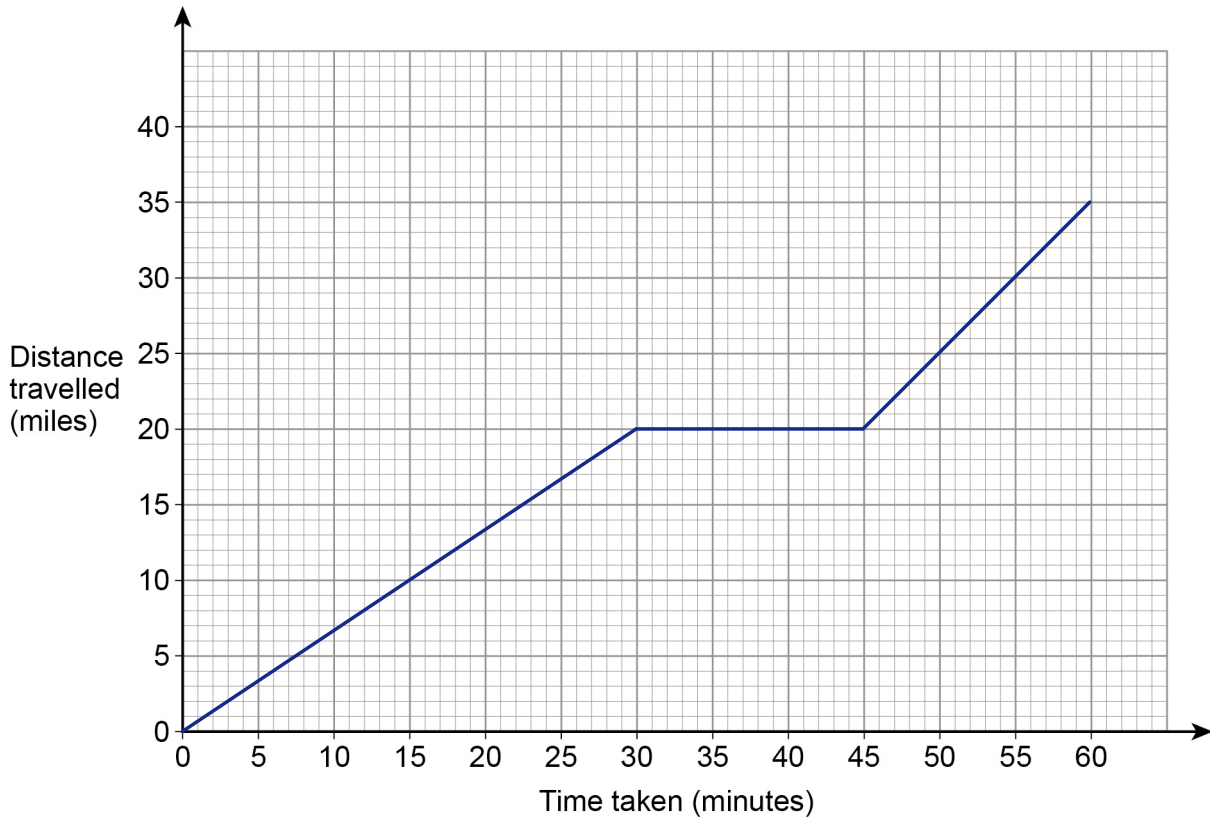
She then stops for 15 minutes.

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]

Total distance = 20 + 15 = 35 miles in 1 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]

$$P(\text{rock}) = \frac{1}{20} = \frac{2}{40} \quad \text{so there are 40 CDs}$$

$$2 + x + 2x + 5 = 40$$

$$3x + 7 = 40$$

$$3x = 33, \quad x = 11$$

$$\text{Jazz} = 2 \times 11 + 5 = 27$$

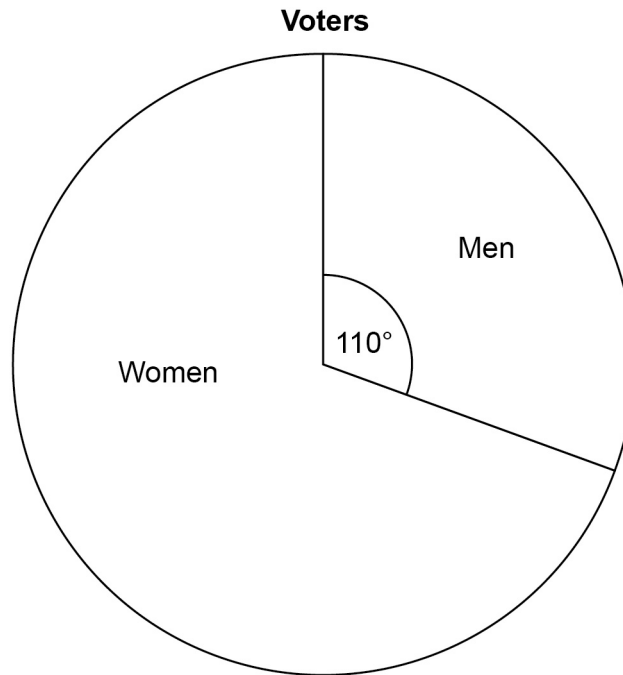
$$P(\text{jazz}) = \frac{27}{40}$$

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]

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

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

$$140^\circ \text{ represents } 3360 \text{ voters}$$

$$1^\circ = 3360 \div 140 = 24 \text{ voters}$$

$$\text{Total} = 360 \times 24 = 8640$$

Answer 8640

Turn over ►



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

$$9563$$

$$9.56 \times 10^3$$

$$9.56 \times 3^{10}$$

[2 marks]

$$9.56 \times 3^{10} = 564\,508.44$$

$$9.56 \times 10^3 = 9560$$

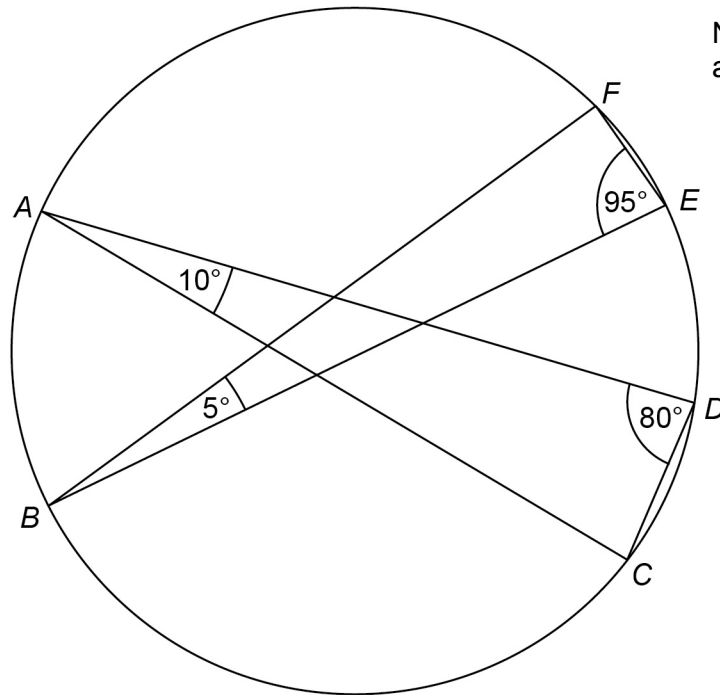
$$564\,508.44 > 9563 > 9560$$

Answer 9.56×3^{10} , 9563 , 9.56×10^3



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

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]

Rolls come in 15s, cheese slices in 20s, cheese = 2 × rolls

Rolls: 30, 60, 90, 120 ... (cheese 60, 120, 180, 240 ...)

More than 100 sandwiches: 120 rolls and 240 cheese slices

Bread: $120 \div 15 = 8$ packs, $8 \times 1.88 = £15.04$

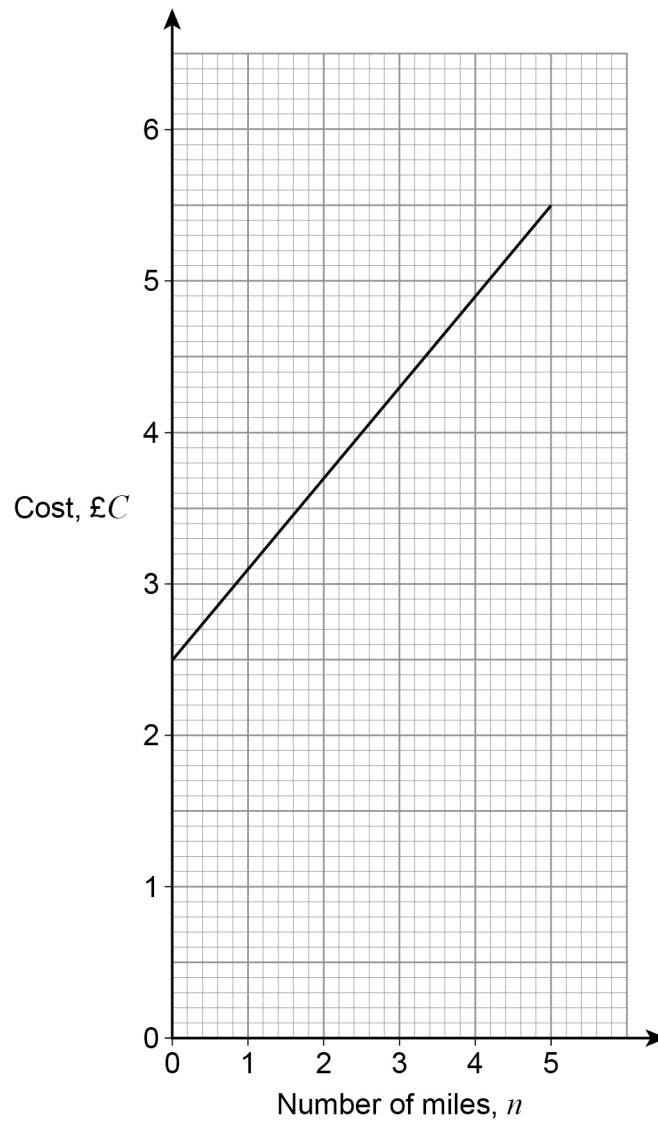
Cheese: $240 \div 20 = 12$ packs, $12 \times 2.15 = £25.80$

Total = $15.04 + 25.80 = £40.84$

Answer £ 40.84



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



Work out a formula for C in terms of n .

[3 marks]

C at $n = 0$ is 2.5

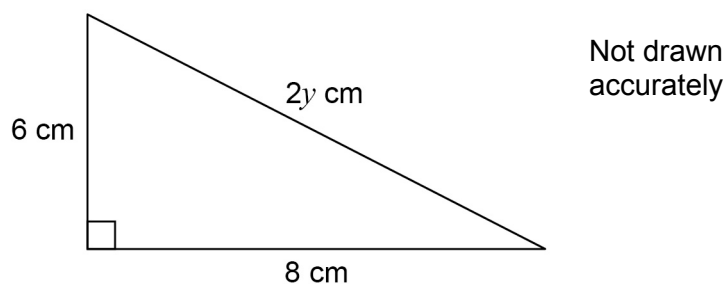
gradient = $(5.5 - 2.5) \div 5 = 3 \div 5 = 0.6$

Answer $C = 0.6n + 2.5$

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]

$(2y)^2$ should be $4y^2$: she has only squared the y

and not the 2 (line 2 should be $4y^2 = 36 + 64$)



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

☒

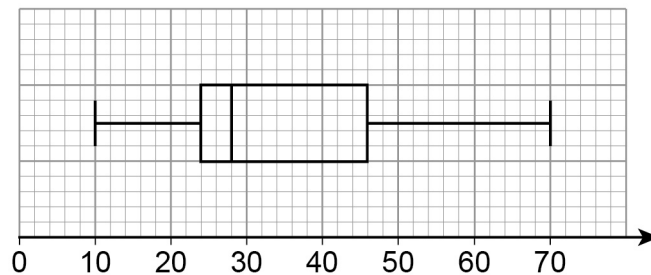
Give a reason for your answer.

[1 mark]

No. If $y = 5$ the hypotenuse is $2y = 10$ cm,

which is longer than 6 cm and 8 cm.

16 Here is a box plot.



Circle the median value.

[1 mark]

28

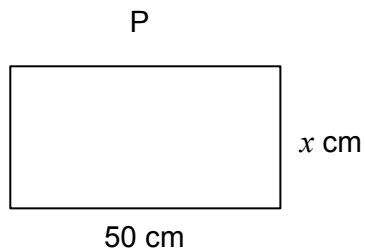
35

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]

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

$$\text{Area of P} = 50x$$

$$\text{Area of Q} = 0.9 \times 50x = 45x$$

$$\text{so } 60y = 45x$$

$$x : y = 60 : 45$$

$$= 4 : 3$$

Answer 4 : 3

18 A school has 86 teachers.

42 are male and 44 are female.

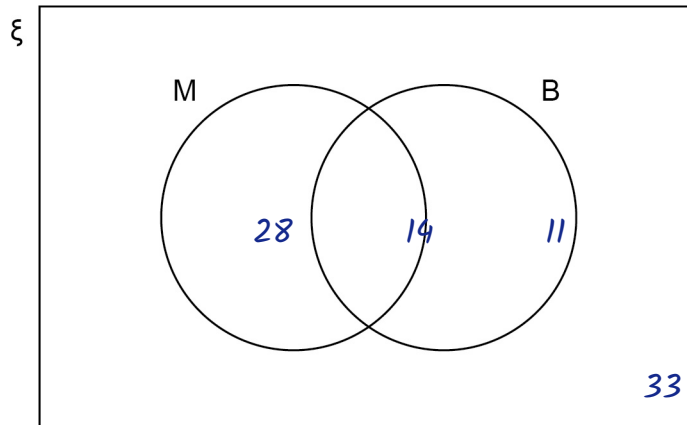
$\frac{1}{3}$ of the male teachers have blue eyes.

$\frac{1}{4}$ 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]

Male blue: $42 \div 3 = 14$, male not blue: $42 - 14 = 28$

Female blue: $44 \div 4 = 11$

Neither: $86 - 28 - 14 - 11 = 33$

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

Work out the probability that the teacher is male.

[1 mark]

Blue eyes: $14 + 11 = 25$

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]

$$7 + 6 + 11 = 24, \quad 192 \div 24 = 8$$

$$\text{Small} = 7 \times 8 = 56, \text{ medium} = 6 \times 8 = 48, \text{ large} = 11 \times 8 = 88$$

$$\text{Profit on a small cake} = \text{£}p$$

$$56 \times p + 48 \times 2p + 88 \times 3p = 532.48$$

$$56p + 96p + 264p = 532.48$$

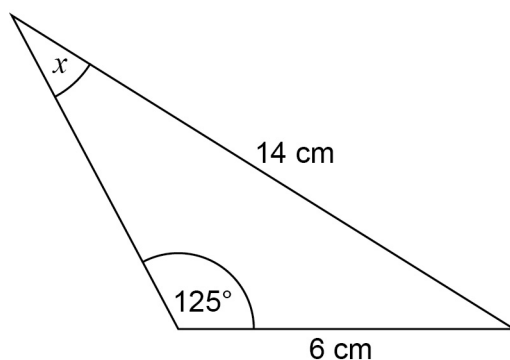
$$416p = 532.48$$

$$p = 532.48 \div 416 = 1.28$$

Answer £ 1.28



20

Work out the size of angle x .Not drawn
accurately

[3 marks]

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

$$\sin x = 6 \times \sin 125^\circ \div 14 = 0.351065...$$

$$x = \sin^{-1}(0.351065...)$$

$$x = 20.552479...$$

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]

$$5x^2 - 10x - 4 = 0$$

$$a = 5, b = -10, c = -4$$

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4 \times 5 \times (-4)}}{2 \times 5}$$

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

$$x = 2.341640... \text{ or } x = -0.341640...$$

Answer $x = 2.34 \text{ or } x = -0.34$ 

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]

$$d = kt^2$$

$$45 = k \times 3^2$$

$$k = 45 \div 9 = 5, \text{ so } d = 5t^2$$

$$\text{After } 3 + 7 = 10 \text{ seconds: } d = 5 \times 10^2 = 500$$

$$\text{Next 7 seconds} = 500 - 45$$

$$= 455$$

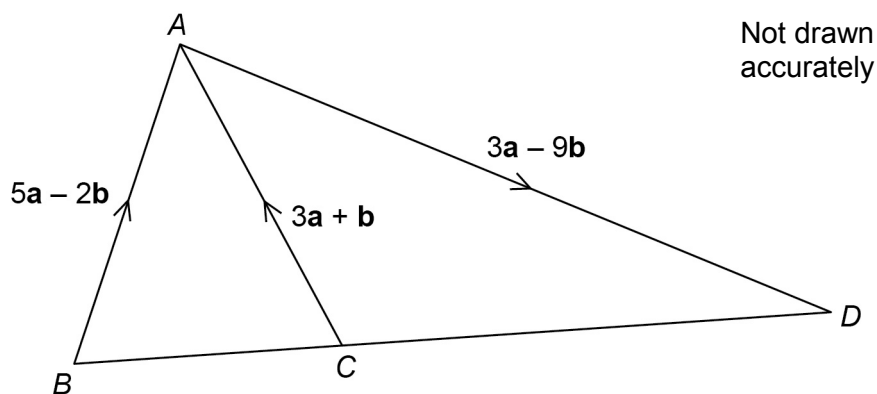
Answer 455 metres

Turn over for the next question

Turn over ►



23



Is BCD a straight line?

Show working to support your answer.

[3 marks]

$$BC = BA + AC = (5a - 2b) - (3a + b) = 2a - 3b$$

$$CD = CA + AD = (3a + b) + (3a - 9b) = 6a - 8b$$

$$3 \times BC = 3(2a - 3b) = 6a - 9b, \text{ which is not } 6a - 8b$$

so CD is not a multiple of BC

BC and CD are not parallel,

so BCD is not a straight line.

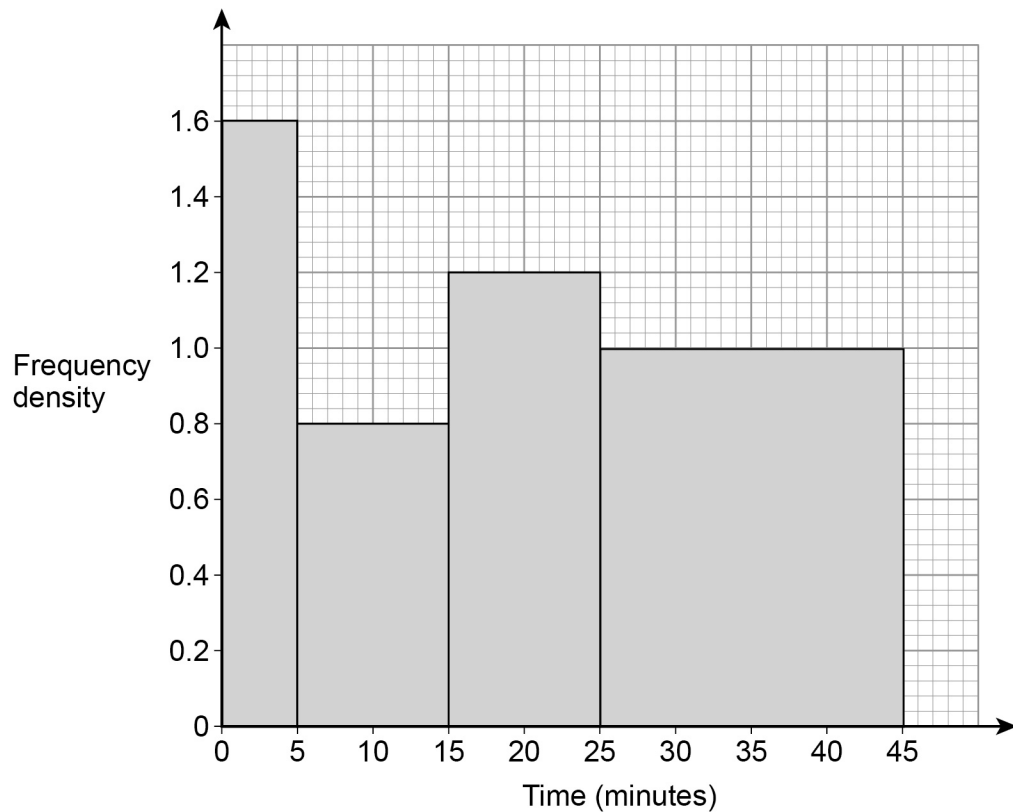
Answer No



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]**

$$\text{Frequencies: } 1.6 \times 5 = 8, 0.8 \times 10 = 8, 1.2 \times 10 = 12, 1 \times 20 = 20$$

$$LQ: 48 \div 4 = 12\text{th}, 8 \text{ in } 0 \text{ to } 5, \text{ then } 4 \text{ of the } 8 \text{ in } 5 \text{ to } 15$$

$$LQ = 5 + 4/8 \times 10 = 10$$

$$UQ: 36\text{th}, 28 \text{ up to } 25, \text{ then } 8 \text{ of the } 20 \text{ in } 25 \text{ to } 45$$

$$UQ = 25 + 8/20 \times 20 = 33$$

$$IQR = 33 - 10 = 23$$

Answer 23 minutes

Turn over ►

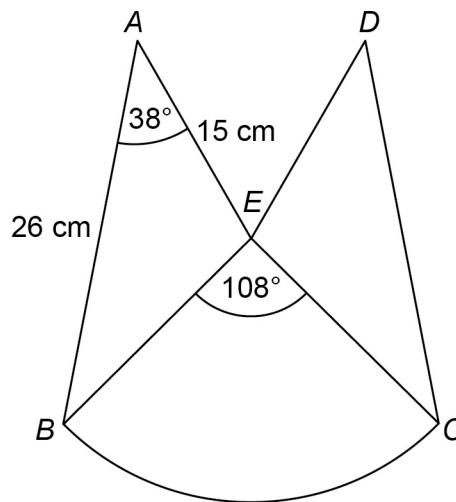


25

The diagram shows a logo.

ABE and DCE are congruent triangles.

BCE is a sector of a circle, centre E .



Not drawn
accurately

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

[5 marks]

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

$$BE^2 = 286.3516... \quad BE = 16.9219... \text{ cm}$$

$$\text{Sector } BCE = 108/360 \times \pi \times 286.3516...$$

$$= 269.8800... \text{ cm}^2$$

$$\text{Triangle } ABE = \frac{1}{2} \times 15 \times 26 \times \sin 38^\circ$$

$$= 120.0539... \text{ cm}^2$$

$$\text{Two triangles} = 2 \times 120.0539... = 240.1079... \text{ cm}^2$$

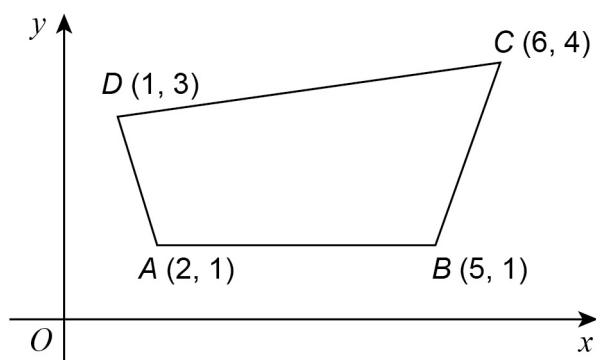
$$\text{Area of logo} = 269.8800... + 240.1079...$$

$$= 509.988... \text{ cm}^2$$

$$= 510 \text{ cm}^2 \text{ to 2 significant figures}$$



- 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]

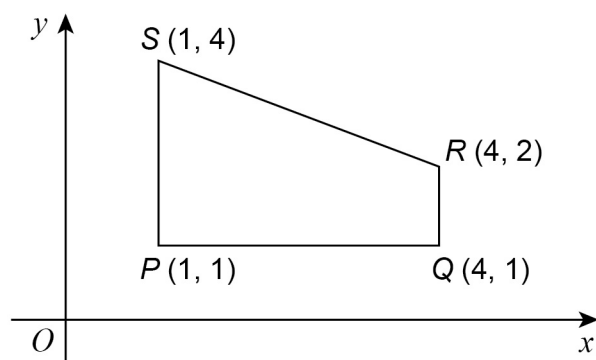
A

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]

P

Q

R

S



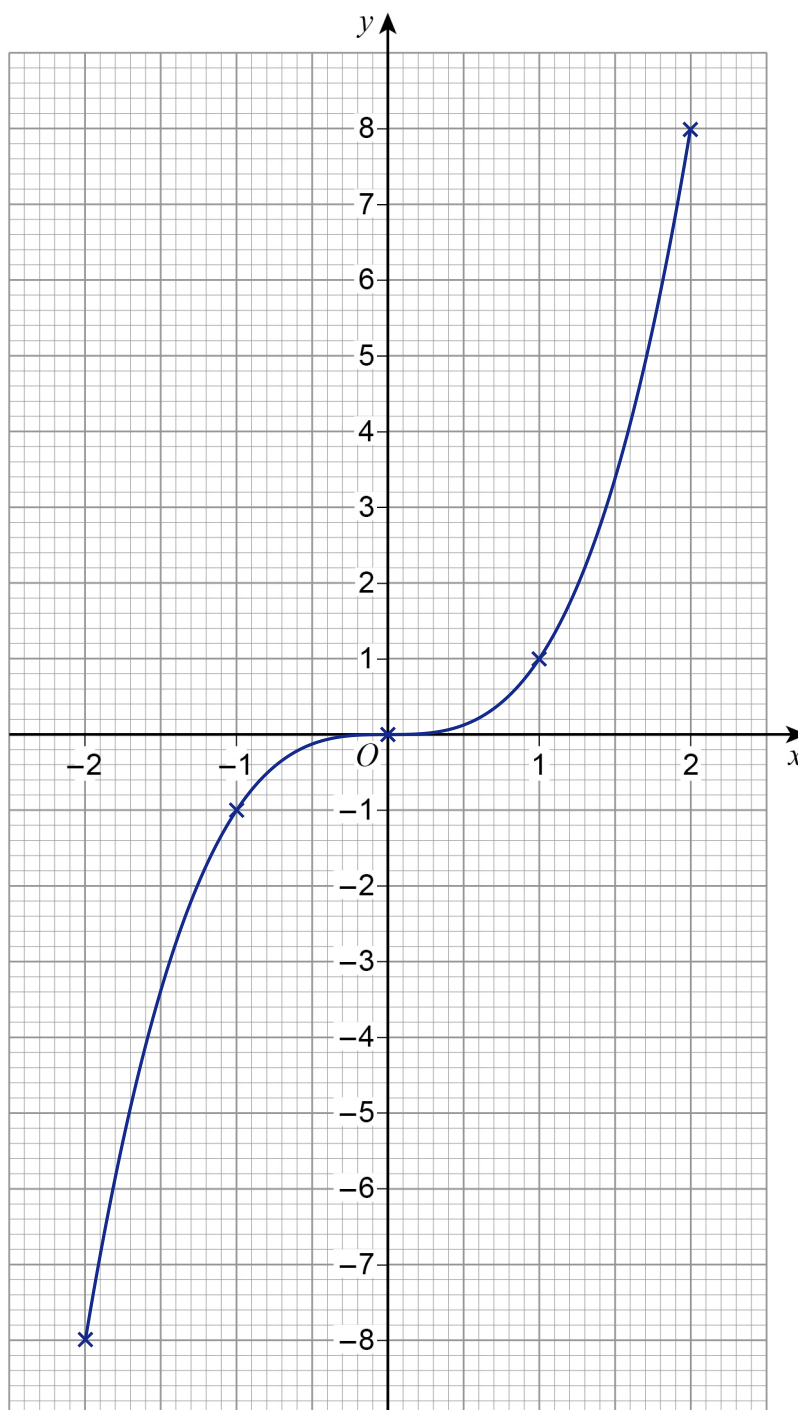
27 (a) $h(x) = \sqrt[3]{x}$ for all values of x

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

[2 marks]

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

$$x: -2, -1, 0, 1, 2 \quad y: -8, -1, 0, 1, 8$$



27 (b) For all values of x

$$f(x) = \sin x$$

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

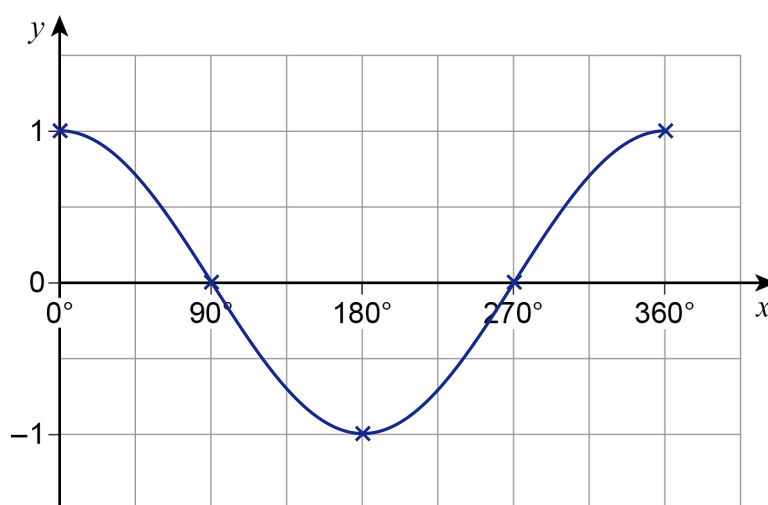
On the grid, draw the graph of the composite function $y = fg(x)$ for $0^\circ \leq x \leq 360^\circ$

[2 marks]

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

$$x: 0^\circ, 90^\circ, 180^\circ, 270^\circ, 360^\circ$$

$$y: 1, 0, -1, 0, 1$$



END OF QUESTIONS



There are no questions printed on this page

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