

W/C: 6/11/17

Mock week 1

H

Year 11 Higher Tier Maths GCSE

Paper 2 – Calculator

Time allowed: 1 hour 30 minutes

Maximum mark: 80

Answer **all** questions in the spaces provided

- 1 Circle the decimal that is closest in value to $\frac{39}{800} = 0.04875$ [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

METHOD 1 NOTE 36 mm^2 HAS SQUARE ROOT = 6 mm

$$6 \text{ mm} \div 10 = 0.6 \text{ cm}$$

$$(0.6 \text{ cm})^2 = 0.36 \text{ cm}^2$$

METHOD 2

TO CHANGE mm TO cm, DIVIDE BY 10

TO CHANGE mm^2 TO cm^2 DIVIDE BY $10^2 = 100$

TO CHANGE mm^3 TO cm^3 DIVIDE BY $10^3 = 1000$

$$36 \text{ mm}^2 \div 10^2$$

$$= 36 \text{ mm}^2 \div 100 = 0.36 \text{ cm}^2$$



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

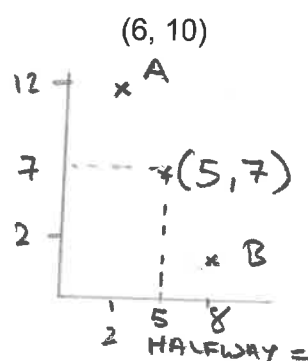
[1 mark]

(3, 5)

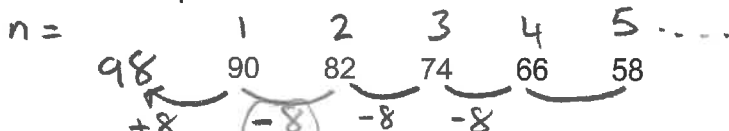
(4, 6)

(5, 7)

DRAW QUICK SKETCH



4 Here is a sequence.



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

MULTIPLIER = -8 SO $-8 \times n = -8n$ [1 mark]

$n - 8$

$98 - 8n$

$8n + 82$

$8n - 98$

MUST BE $(-8)n$ THEN ADD 98 = $-8n + 98$
OR $98 - 8n$

Turn over for the next question



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.

- 5411
- 5413
- 5415
- ~~5417~~
- 5419

What is the probability that she chooses the correct number?

[1 mark]

1 out of 4 choices

Answer $\frac{1}{4}$ or one out of 4 or 0.25
or 25%

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

How many possible codes are there?

so 1st digit 2nd 3rd 4th
1 choice x 10 choices x 10 choices x 5 choices

3410 } FIRST NUMBER 3,
3412 } LAST NUMBER IS
3414 } EVEN SO
3416 } 5 POSSIBLES, BUT 2nd
3418 } NUMBER CAN BE
0-9. (TEN POSSIBLES)
AND THIRD NUMBER
CAN BE 0-9. (SO TEN
POSSIBLES)
[2 marks]

TOTAL MUST BE $1 \times 10 \times 10 \times 5 = 500$

Answer $\frac{500}{1000} = 0.5$
 $5 \times 10 = 50$ POSSIBLES
 $3! = 6$
 $50 \times 6 = 300$
 $300 \times 10 = 3000$
 $3000 \div 6 = 500$



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

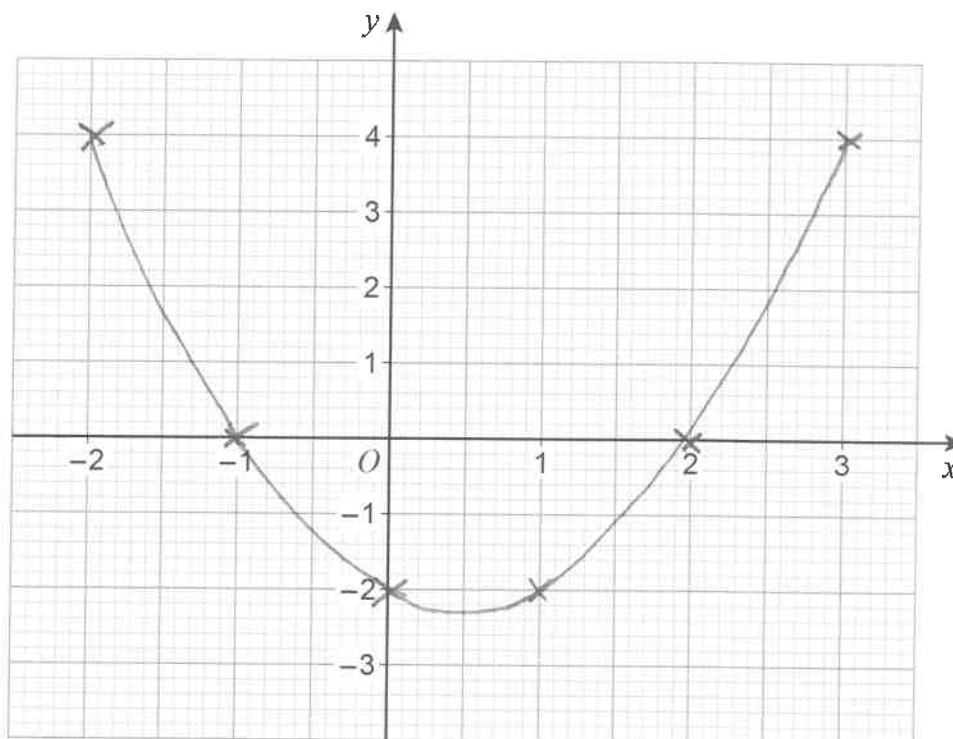
[2 marks]

$$\begin{aligned} (-2)^2 - (-2) - 2 &= 4 + 2 - 2 = 4 & 2^2 - 2 - 2 &= 0 \\ (-1)^2 - (-1) - 2 &= 1 + 1 - 2 = 0 \end{aligned}$$

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 OCCURS WHEN $x = 0.5$

$$(0.5)^2 - 0.5 - 2 = -2.25$$

Answer (0.5, -2.25)

8

SUBJECT TO YOUR GRAPH y VALUE
CAN BE BETWEEN -2.5 AND -2.1

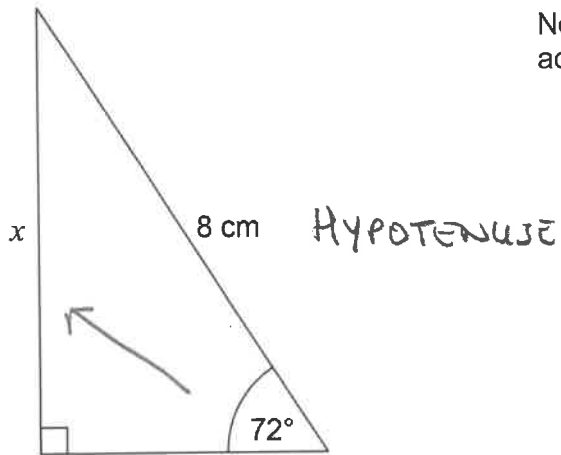
Turn over ►



7 Use trigonometry to work out the length x .

Not drawn
accurately

OPPOSITE



$$\angle \text{ANGLE} = 72^\circ$$

$$H = 8$$

$$O = ? = x$$

[2 marks]

$$\text{MUST USE } \sin 72 = \frac{\text{OPP}}{\text{HYP}}$$

$$\sin 72 = \frac{x}{8} \quad (\text{TIMES BOTH SIDES BY 8})$$

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

$$7.608... = x$$

Answer 7.61 (2d.p) cm



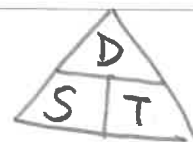
8 Lily goes on a car journey.

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. (= 15 minutes left)



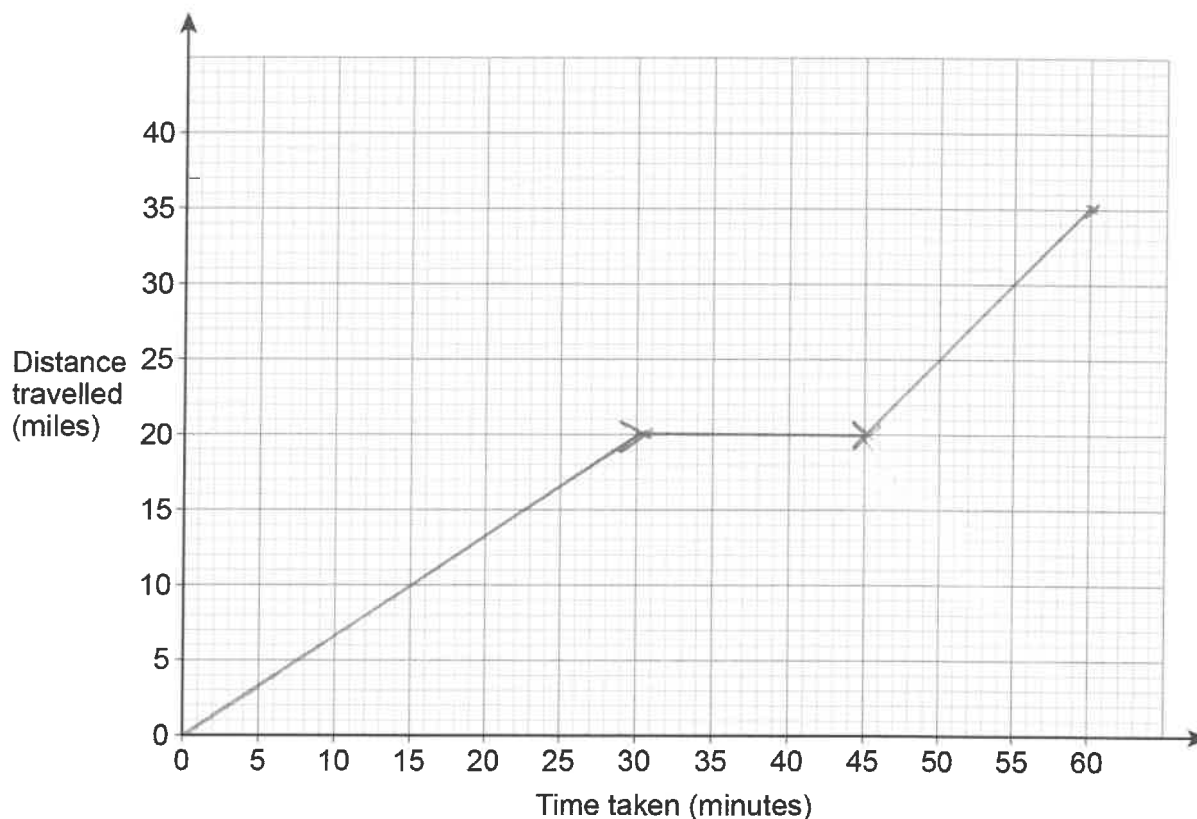
$$= 20 \text{ miles in } 30 \text{ mins}$$

$$S = \frac{D}{T} \quad (T = 30 \text{ mins})$$

$$40 =$$

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 TRAVELLED = 20 miles + 15 miles = 35
IN ONE HOUR (60 mins)

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 $\frac{1}{20} = \frac{2}{40} = 2 \text{ OUT OF TOTAL } (40)$

Work out the probability it is jazz.

[4 marks]

MUST FIND x

$$\text{TOTAL} = 2 + x + 2x + 5 = 3x + 7$$

$$\text{SO } 3x + 7 = 40$$

$$\quad \quad -7 \quad -7$$

$$3x = 33$$

$$x = 11$$

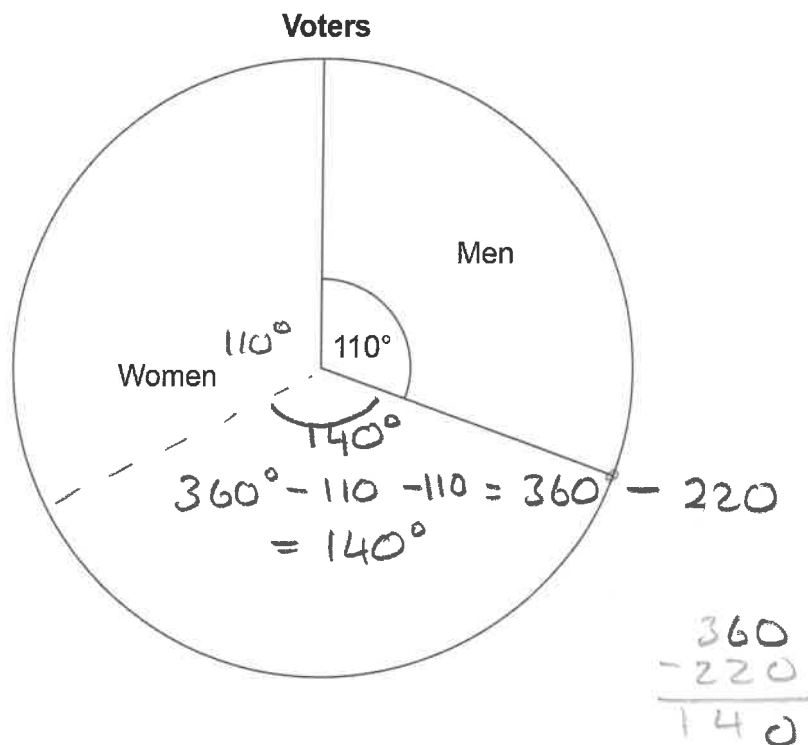
$$\text{TOTAL JAZZ} = 2 \times 11 + 5 = 22 + 5 = 27$$

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

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]

$$140^\circ = 3360 \text{ women} \quad (\text{DIVIDE BOTH SIDES BY } 140)$$

$$1^\circ = 24 \quad \text{so } 1^\circ = 24 \text{ PEOPLE}$$

$$24 \times 360^\circ = 8640 \text{ PEOPLE}$$

$$(\text{CHECK: } 110^\circ \times 24 = 2640)$$

$$110^\circ \times 24 = 2640$$

$$2640 + 2640 + 3360 = 8640$$

Answer 8640



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

9563

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

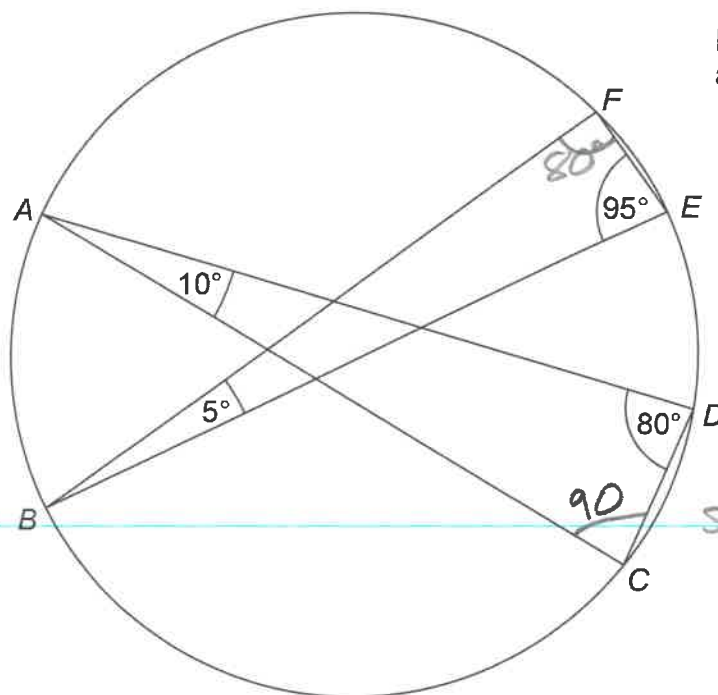
$$9.56 \times 3^{10} = 9.56 \times 59049 \\ = 564508.44$$

[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

$$180 - 95 - 5 = 80$$

$$180 - 80 - 10 = 90$$

so AD must be diameter

Circle the line that is a diameter of the circle.

(MUST MAKE A TRIANGLE WITH A 90° ANGLE)

[1 mark]

BE

AD

AC

BF

Turn over for the next question

3

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]

MULTIPLIES:

BREAD ROLL	15	30	45	60	75	90	105	120	135	150		
CHEESE SLICES	20	40	60	80	100	120	140	160	180	200	220	240

SHE WILL NEED TO BUY 120 ROLLS = 15 x 8 PACKS

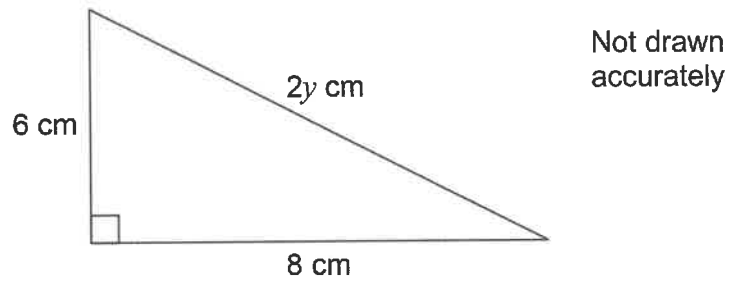
AND 240 CHEESE SLICES = 20 x 12 PACKS

$$\begin{aligned} \text{SO COST} &= 1.88 \times 8 + 2.15 \times 12 \\ &= \pounds 40.84 \end{aligned}$$

Answer £ 40.84



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



Here is her working.

$$\begin{aligned}
 (2y)^2 &= 6^2 + 8^2 \\
 4y^2 &\Rightarrow \textcircled{2y^2} = 36 + 64 \\
 2y^2 &= 100 \\
 y^2 &= 100 \div 2 \\
 y^2 &= 50 \\
 y &= \sqrt{50}
 \end{aligned}$$

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

[1 mark]

$$\begin{aligned}
 (2y)^2 &= 4y^2, \text{ NOT } 2y^2 \\
 \text{So } 4y^2 &= 100 \\
 y^2 &= 25 \\
 y &= 5
 \end{aligned}$$



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

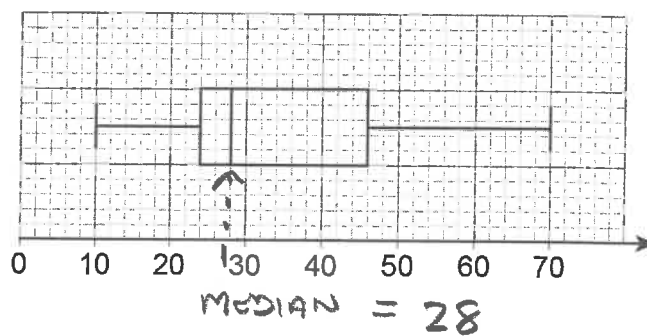
No

Give a reason for your answer.

[1 mark]

THE SIDE IS $2y = 2 \times 5 = 10$, NOT 5

16 Here is a box plot.



Circle the median value.

[1 mark]

28

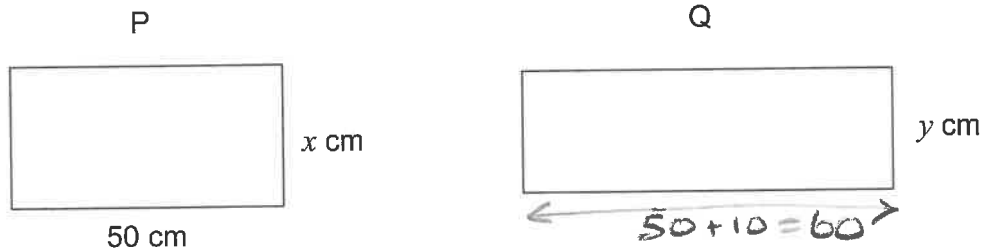
35

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]

$$\text{LENGTH OF Q} = 1.2 \times 50 = 60 \quad (\text{OR } \frac{1}{5} \text{ MORE})$$

$$\begin{aligned} \text{AREA OF P} &= 50 \times x \\ &= 50x \end{aligned} \quad \begin{aligned} \text{AREA OF Q} &= 60 \times y \\ &= 60y \end{aligned}$$

$$\begin{aligned} \text{AREA OF Q ALSO} &= 90\% \text{ OF AREA OF P} \\ &= 0.9 \times 50x = 45x \end{aligned}$$

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

$$\frac{x}{y} = \frac{60}{45} \quad \text{SO } x : y = 60 : 45 = 4 : 3$$

Answer 4 : 3

18 A school has 86 teachers.

42 are male and 44 are female.

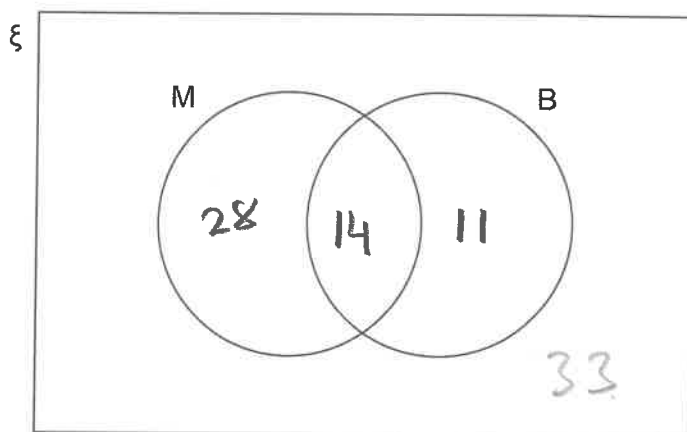
$$\frac{1}{3} \text{ of the male teachers have blue eyes. } = \frac{1}{3} \text{ of } 42 = 14 \quad (42 - 14 = 28)$$

$$\frac{1}{4} \text{ of the female teachers have blue eyes. } = \frac{1}{4} \text{ of } 44 = 11 \quad (44 - 11 = 33)$$

18 (a) ξ = teachers in the school

M = male teachers

B = teachers who have blue eyes



Complete the Venn diagram.

[3 marks]

CHECK $28 + 14 + 11 + 33 = 86$

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

$$\text{TOTAL BLUE EYES} = 14 + 11$$

Work out the probability that the teacher is male. $\text{MALE BLUE EYES} = 14 = 25$

[1 mark]

Answer $\frac{14}{25}$



19

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

The profit for one medium cake is twice the profit for one small cake. = 24

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]

$$\begin{array}{ccc} \text{S} & \text{M} & \text{L} \\ 7 & 6 & 11 \end{array} \rightarrow 24 \quad 192 \div 24 = 8$$

$$\begin{array}{ccc} \text{S} & \text{M} & \text{L} \\ 56 & 48 & 88 \end{array} \rightarrow 192$$

PROFIT FOR SMALL CAKE = P

" " MEDIUM CAKE = 2P

" " LARGE CAKE = 3P

$$\text{TOTAL PROFIT} = 532.48 = 56 \times P + 48 \times 2P + 88 \times 3P$$

$$532.48 = 56P + 96P + 264P$$

$$= 416P$$

$$532.48 \div 416 = P$$

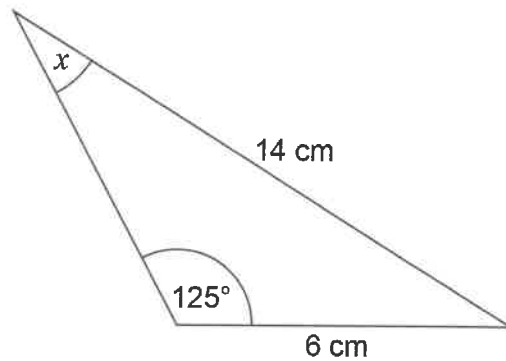
$$1.28 = P$$

Answer £

1.28



20

Work out the size of angle x .Not drawn
accurately

[3 marks]

$$\text{USE SINE RULE: } \frac{\sin x}{6} = \frac{\sin 125}{14}$$

$$\sin x = \frac{6 \times \sin 125}{14} = 0.351\dots$$

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

$$\text{Answer} = 20.55^\circ \text{ degrees}$$

(2 d.p.)

Turn over for the next question

Turn over ►



21

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

Give your answers to 2 decimal places.

PUT ALL ON LEFT SIDE

[4 marks]

$$5x^2 - 10x - 4 \quad \text{use } \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 5 \quad b = -10 \quad c = -4$$

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

$$= \frac{10 \pm \sqrt{100 + 80}}{10} = \frac{10 \pm \sqrt{180}}{10}$$

$$= 2.3416 \dots \quad \text{AND} \quad -0.34164 \dots$$

$$= 2.34 \quad -0.34$$

Answer 2.34, -0.34



22

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

d is directly proportional to the square of t . $d \propto t^2$

The ball drops 45 metres in the first 3 seconds.

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

[4 marks]

$$d \propto t^2 \text{ so } d = kt^2 \quad (k \text{ is a constant})$$

$$\text{WHEN } d=45, t=3$$

$$\text{so } 45 = k(3)^2 = 9k$$

$$45 = 9k$$

$$5 = k$$

$$\text{so } d = 5t^2$$

$$\text{NEXT 7 SECONDS MEANS TOTAL } t = 7 + 3 = 10$$

$$d = 5 \times 10^2 = 500$$

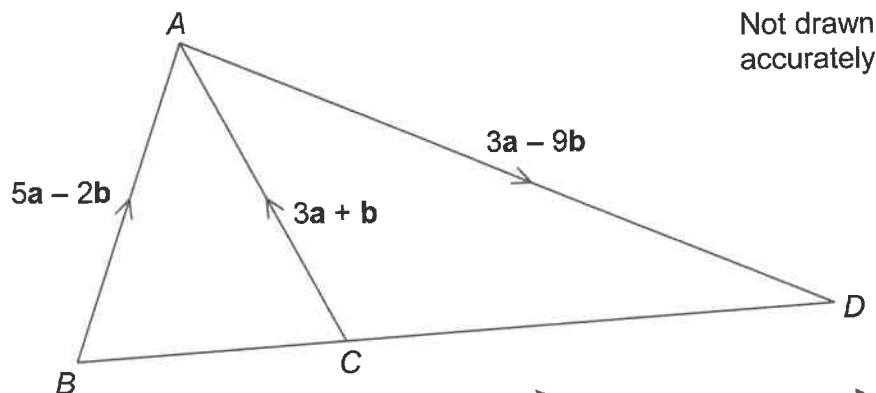
$$\text{BUT IN THOSE '7' SECONDS: } 500 - 45 \\ = 455$$

Answer 455 metres

Turn over for the next question



23



* NOTE $\vec{AC} = -(3a + b)$

Is BCD a straight line?

Show working to support your answer.

TO BE A STRAIGHT LINE, \vec{BD} MUST BE A SCALAR MULTIPLE OF \vec{BC} [3 marks]

$$\vec{BC} = \vec{BA} + \vec{AC}^* = 5a - 2b - (3a + b)$$

$$= 5a - 3a - 2b - b = 2a - 3b$$

$$\vec{BD} = \vec{BA} + \vec{AD} = 5a - 2b + 3a - 9b$$

$$= 8a - 11b$$

$$4 \times \vec{BC} = 4 \times (2a - 3b) = 8a - 12b \neq 8a - 11b$$

SO NO SCALAR MULTIPLE

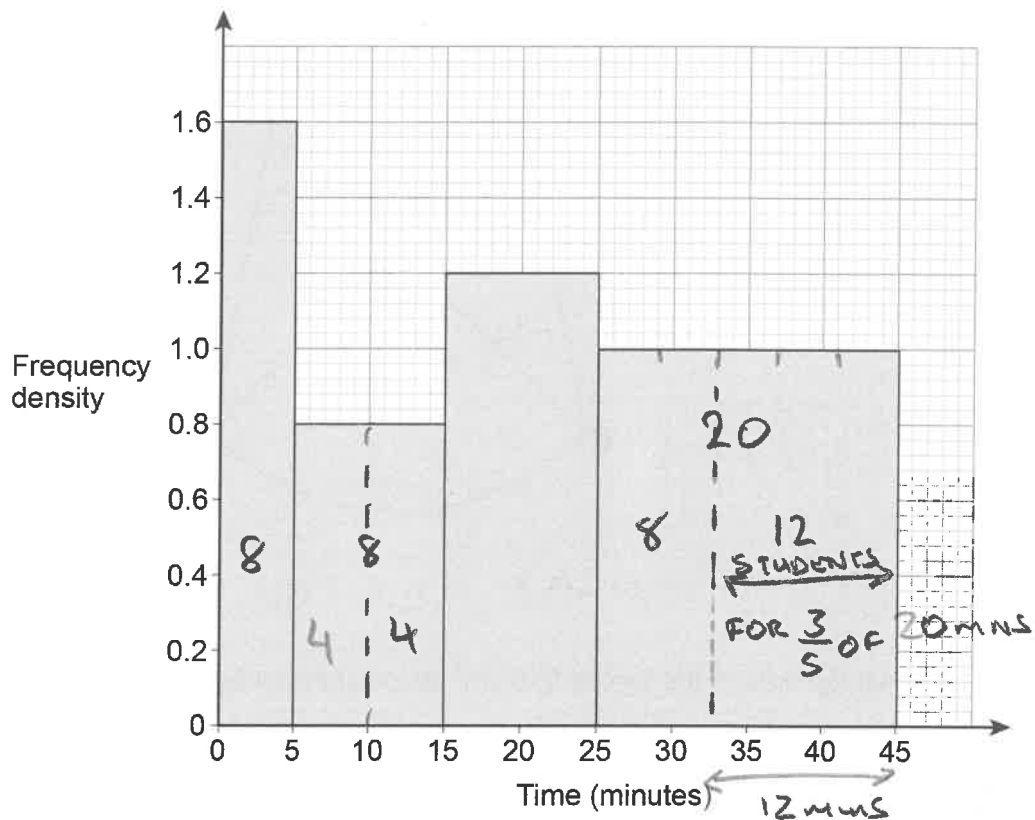
Answer NOT A STRAIGHT LINE



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.

$$\left(\begin{array}{l} \text{NO. OF STUDENTS} \\ \text{FREQUENCY} \end{array} \right) = fd \times cw$$

[4 marks]

$$5 \times 1.6 = 8$$

Lower quartile occurs at $48 \div 4 = 12$ students

$$10 \times 0.8 = 8$$

Upper quartile occurs at $\frac{3}{4}$ of 48 = 36 students

$$10 \times 1.2 = 12$$

$$20 \times 1 = 20 \quad LQ = 10$$

$$\text{TOTAL } 48 \quad UQ = 45 \text{ mins} - 12 \text{ mins} = 33 \text{ mins}$$

$$IQR = 33 - 10 = 23$$

Answer 23 minutes

7

Turn over ►



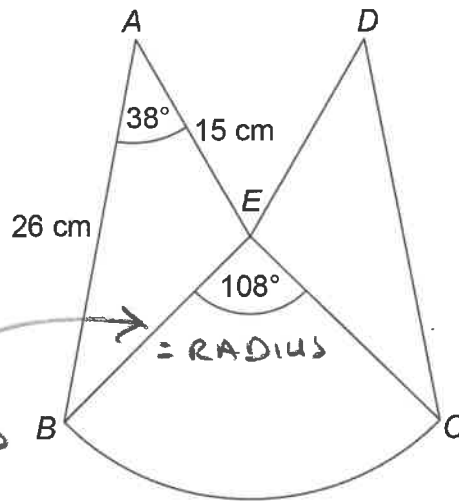
25

The diagram shows a logo.

ABE and DCE are congruent triangles. (SAME BUT REFLECTED OR/AND ROTATED)
 BCE is a sector of a circle, centre E .

FOR AREA OF TRIANGLE
 USE
 $\Delta = \frac{1}{2} ab \sin c$

USE COSINE
 RULE TO FIND
 $BE = \text{RADIUS}$
 $(a^2 = b^2 + c^2 - 2bc \cos A)$



Not drawn
accurately

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

[5 marks]

AREA OF TRIANGLES $ABE = DEC$

$$= \frac{1}{2} \times 15 \times 26 \sin 38 = 120.053 \dots$$

$$\text{AREA OF BOTH TRIANGLES} = 120.053 \dots \times 2 = 240.10798$$

$$\text{AREA OF SECTOR OF CIRCLE} = \frac{108^\circ}{360} \times \pi r^2$$

$$\text{COSINE RULE: } r^2 = 15^2 + 26^2 - 2 \times 15 \times 26 \times \cos 38$$

$$r^2 = 286.3516 \dots$$

$$r = 24.3655$$

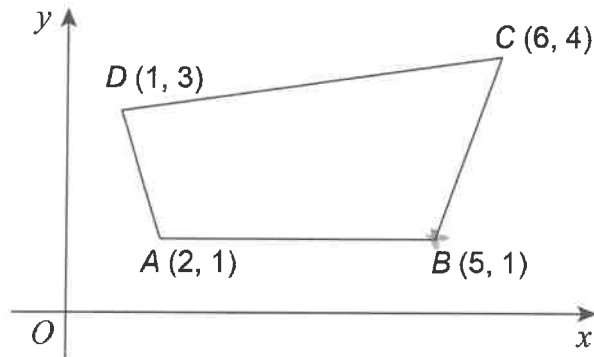
$$\text{SECTOR AREA} = \frac{108}{360} \times \pi r^2 = 269.88$$

$$\text{TOTAL AREA} = 269.88 + 240.108 = 509.988 \text{ cm}^2$$

$$= 510 \text{ (2 sig figs) cm}^2$$



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. (DOES NOT CHANGE)

[1 mark]

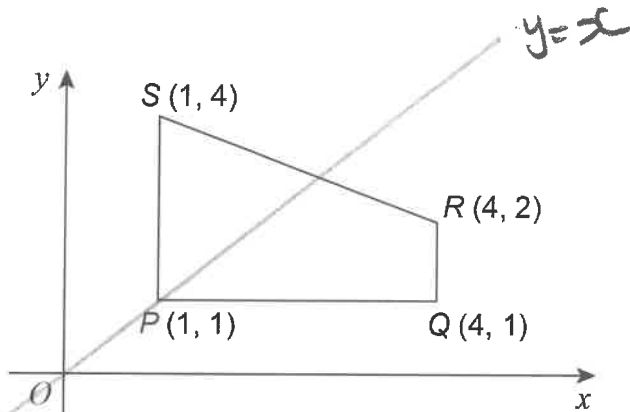
A

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

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 $-2 \leq x \leq 2$

$$y = x^{1/3}$$

[2 marks]

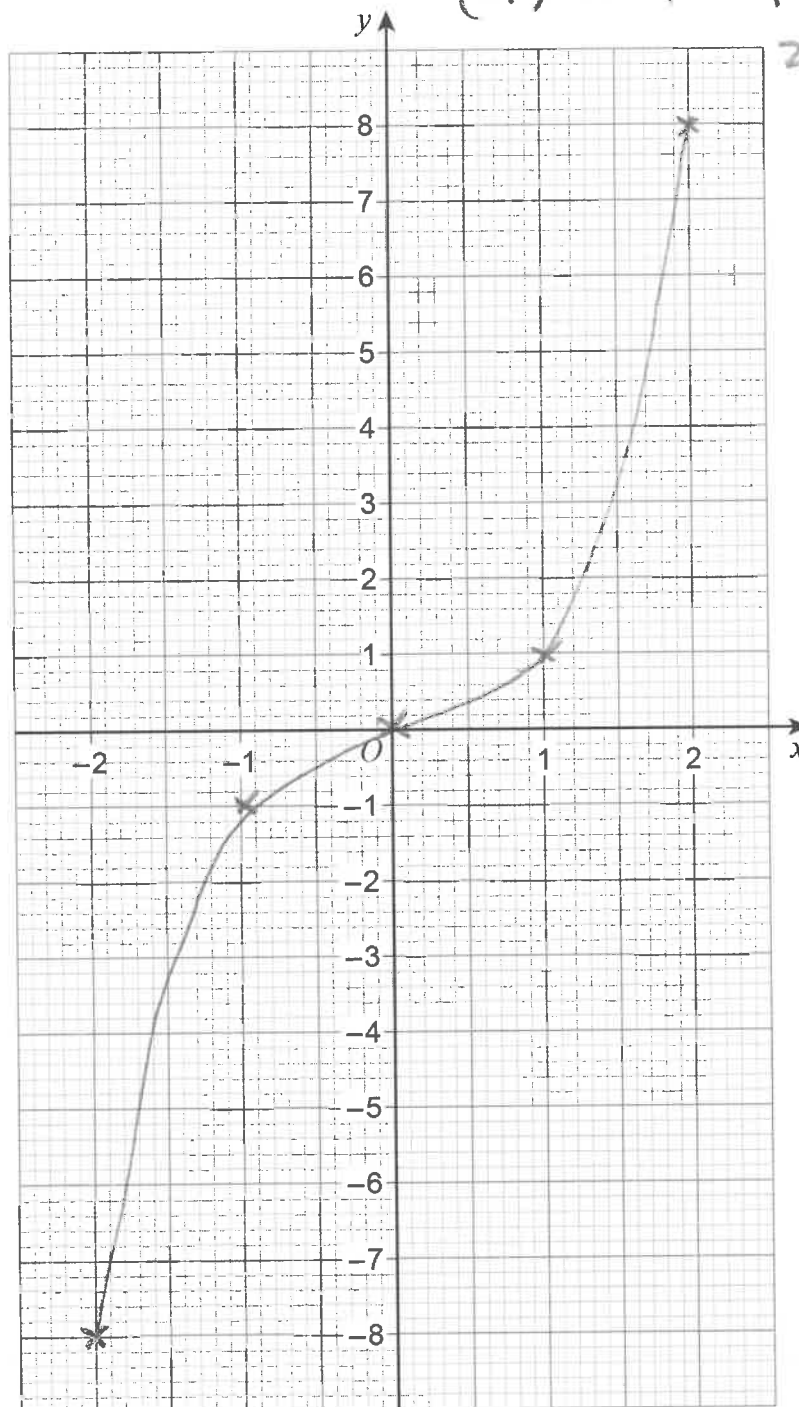
$$y^3 = x \text{ CHANGE } x \text{ AND } y$$

$$x^3 = y \text{ DRAW } y = x^3$$

$$(-2)^3 = -8 \quad 0^3 = 0$$

$$(-1)^3 = -1 \quad 1^3 = 1$$

$$2^3 = 8$$



27 (b) For all values of x

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

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

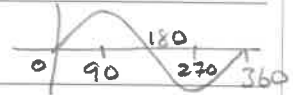
On the grid, draw the graph of the composite function $y = fg(x)$ for $0^\circ \leq x \leq 360^\circ$

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

[2 marks]

$$\text{so } y = f(x+90) = \sin(x+90)$$

THIS IS THE SINE GRAPH TRANSFORMED

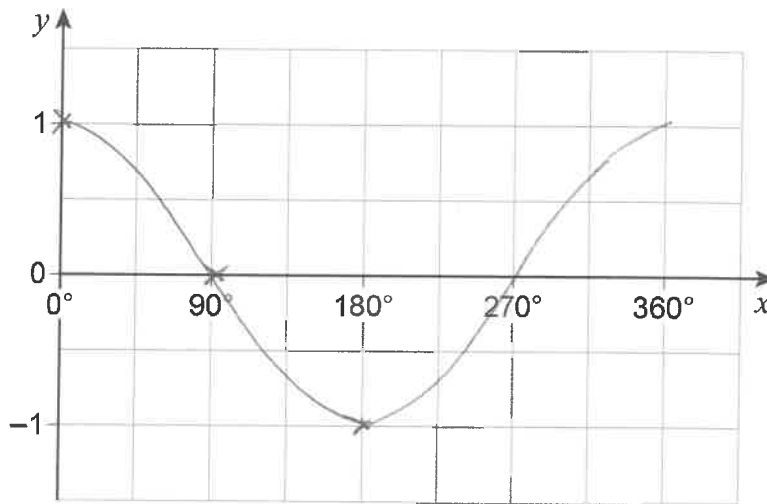


$$\text{let } x = 0 \quad \sin(0+90) = 1 \quad \text{so } (0, 1)$$

$$\text{let } x = 90 \quad \sin(90+90) = \sin 180 = 0 \quad \text{so } (90, 0)$$

$$\text{let } x = 180 \quad \sin(180+90) = \sin 270 = -1 \quad \text{so } (180, -1)$$

AND CONTINUE, BUT ^{SINE} GRAPH MOVES TO THE LEFT



END OF QUESTIONS



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