AQA

GCSE
MATHEMATICS

H

Higher Tier   Paper 2 Calculator
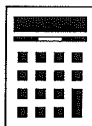
Thursday 8 June 2017   Morning   Time allowed: 1 hour 30 minutes

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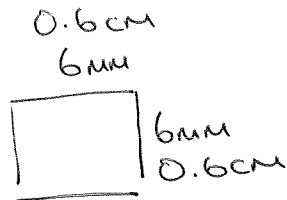* In all calculations, show clearly how you work out your answer.

Answer all questions in the spaces provided

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

0.6 cm
6 mm

6 mm
0.6 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)

4   Here is a sequence.

– 8   – 8

90   82   74   66   58

Circle the expression for the nth term of the sequence.

[1 mark]

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

Turn over for the next question

4

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   1, 3, 5, 9

She chooses a different odd number at random.

What is the probability that she chooses the correct number?

[1 mark]

Answer $\dfrac{1}{4}$

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

The first digit is 3

How many possible codes are there?
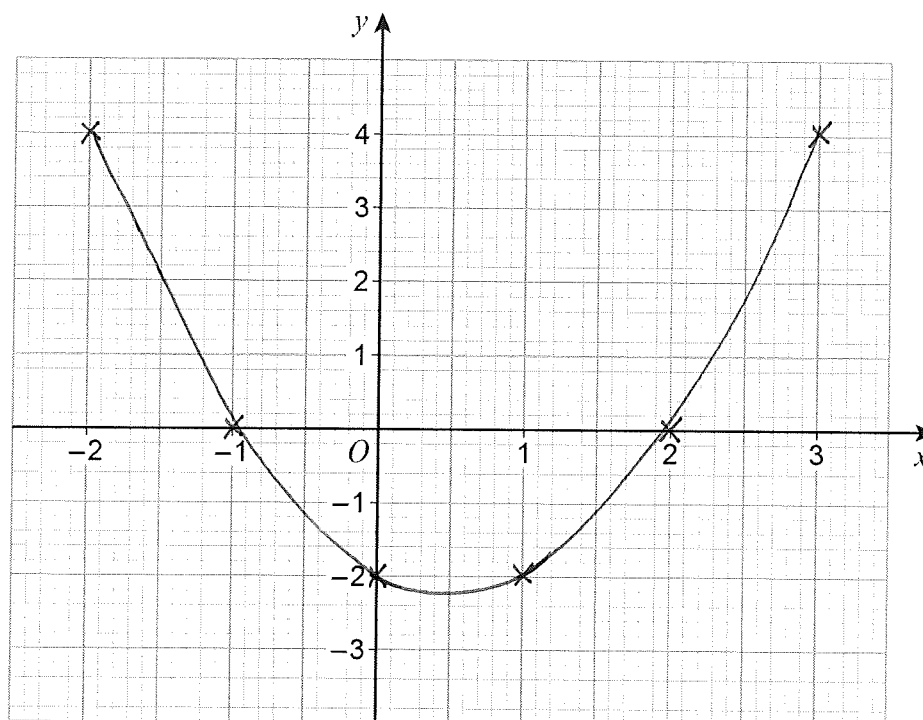
[2 marks]

3 ☐ ☐ ☐(E)

10 × 10 × 5

4×7

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.
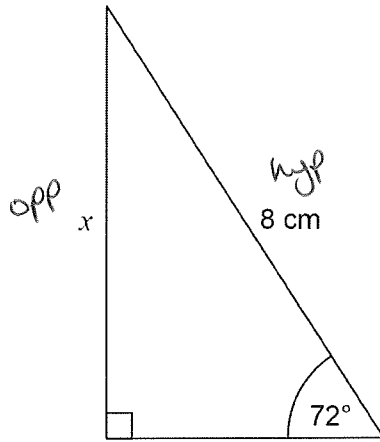
[1 mark]

Answer $\left(\frac{1}{2}, -\frac{9}{4}\right)$ or $(0.5, -2.25)$

8

Turn over ▶

7   Use trigonometry to work out the length x.

opp x

hyp
8 cm

72°

Not drawn accurately

[2 marks]

$$\sin 72 = \frac{x}{8} \quad (\times 8)$$
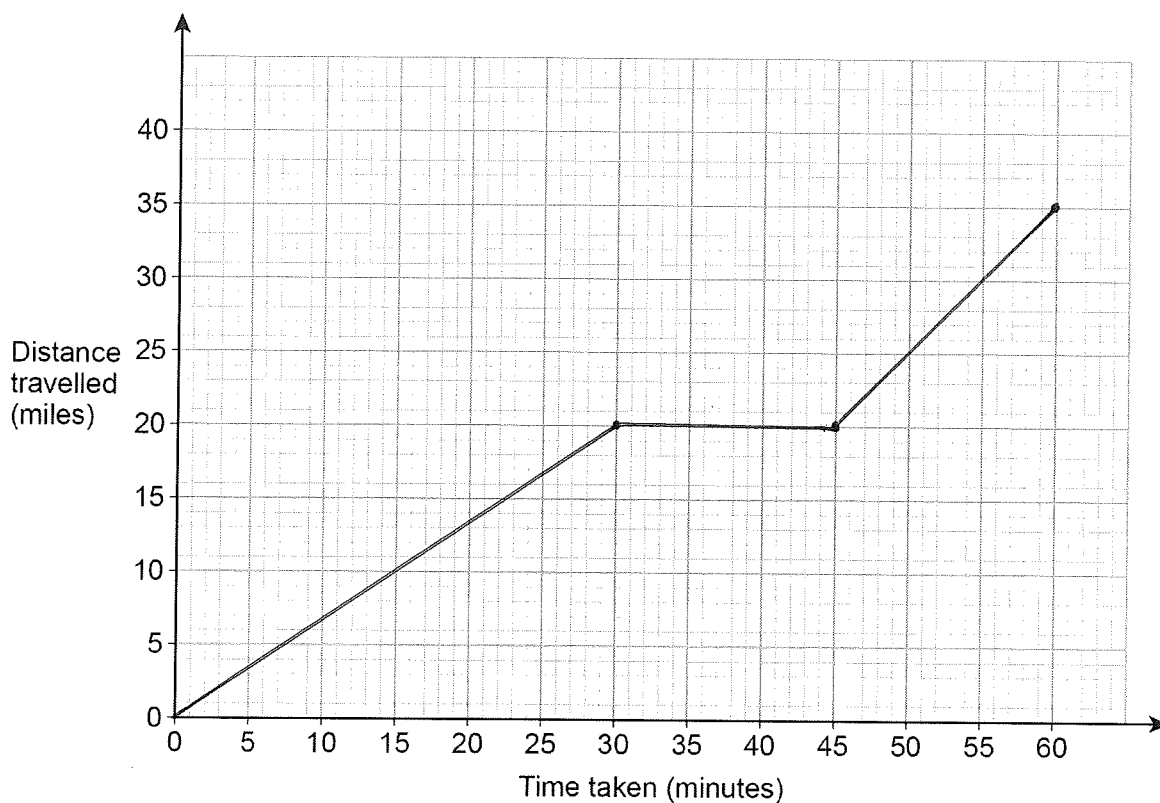
$$x = 8 \times \sin 72$$

$$x = 7.608$$

Answer ___7.6___ 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]

Answer _____35_____ mph

Turn over for the next question

6

Turn over ▶

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 $\dfrac{1}{20}$

Work out the probability it is jazz.

[4 marks]

$$\frac{1}{20} = \frac{2}{40}$$

40 cds in total

$$3x + 5 + 2 = 40 \qquad (-7)$$
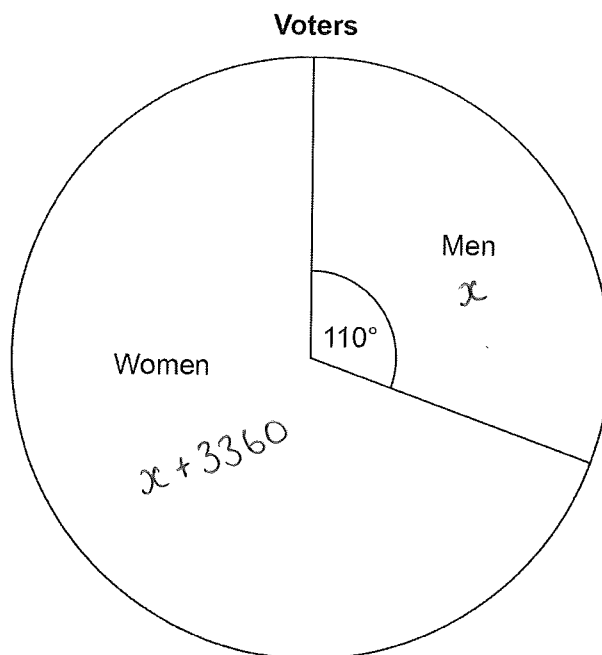$$3x = 33$$
$$x = 11$$

$$Jazz = \frac{2 \times 11 + 5}{40}$$

Answer $\dfrac{27}{40}$

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

Voters

3360 **more** women voted than men.

Work out the total number of voters.

[3 marks]

$$\frac{11}{36} \text{ of } x + x + 3360 = x$$

$$\frac{11}{36} \times (2x + 3360) = x .$$

$$\frac{11x}{18} + \frac{3080}{3} = x \qquad (\times 18)$$

$$11x + 18480 = 18x$$

$$7x = 18480$$

$$x = 2640$$

$$\begin{array}{r} 2640 + \\ 3360 \\ \hline 6000 \end{array}$$

Answer _____6000_____
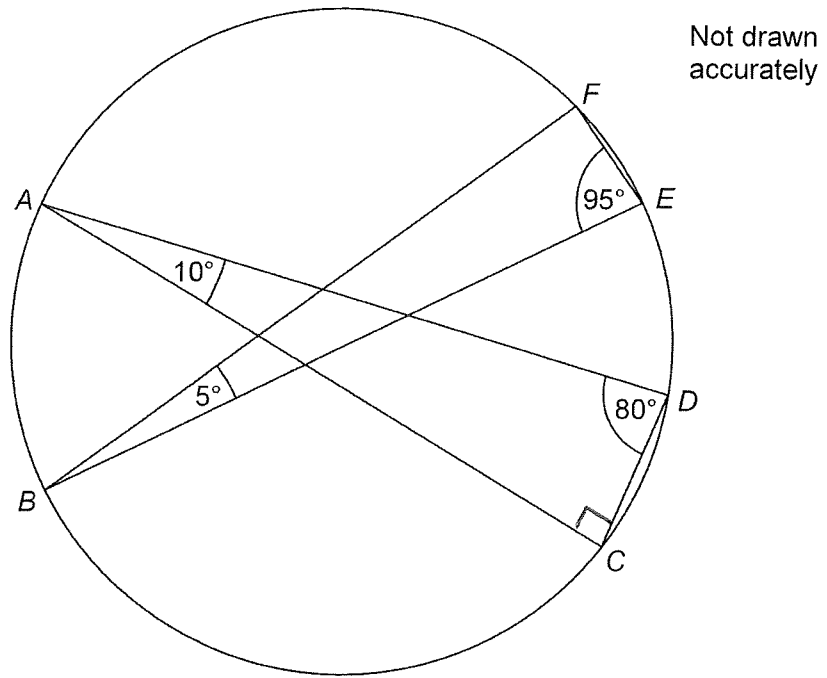
Turn over ▶

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

$$9563 \qquad 9.56 \times 10^3 \qquad 9.56 \times 3^{10}$$

9.563×10^3

564508.44

5.6450844×10^5 **[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   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	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]

> 100 bread rolls   > 200 cheese slices
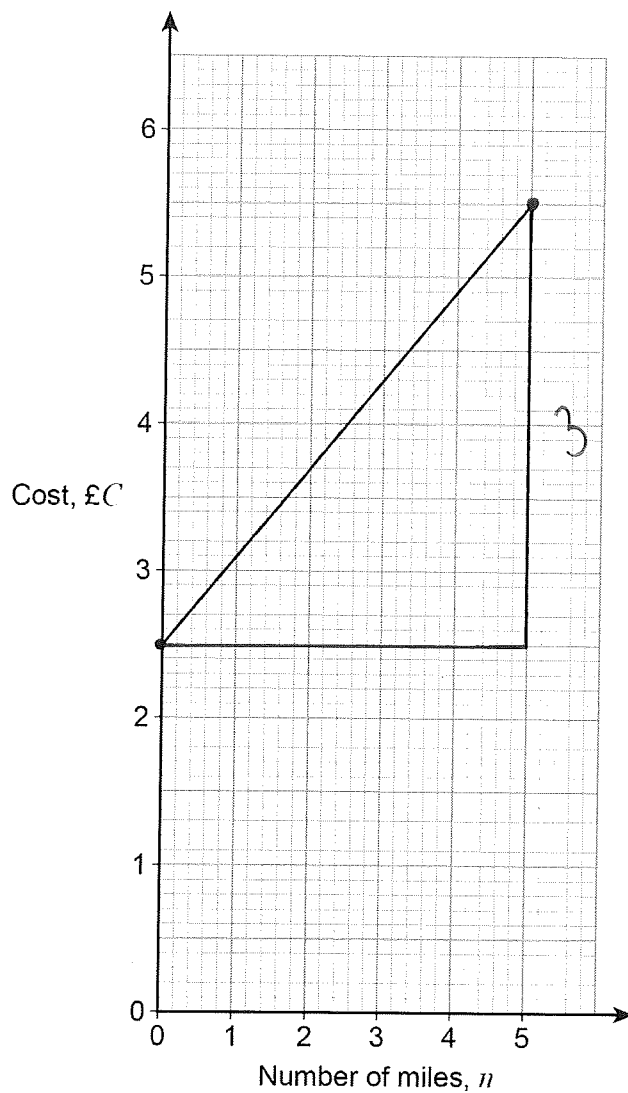
7 packs of bread rolls   11 packs of cheese slices

7 × 1.88 + 11 × 2.15 = £36.81

Answer £ 36.81

14 The graph shows the cost of some taxi journeys.

Cost, £C

Number of miles, n

Work out a formula for C in terms of n.

[3 marks]

gradient $= \dfrac{3}{2.5} = \dfrac{6}{5}$
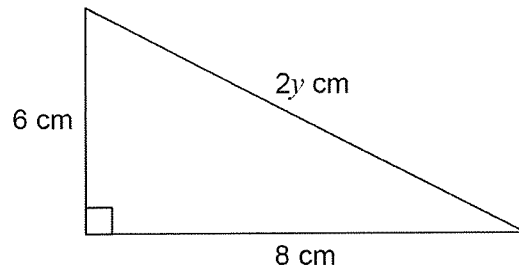
y intercept $= 2.5$ or $\dfrac{5}{2}$

Answer $\underline{C = \dfrac{6}{5}n + \dfrac{5}{2}}$

Turn over ▶

7

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

6 cm

2y cm

8 cm

Not drawn accurately

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]

$$(2y)^2 = 2^2 y^2 = 4y^2$$

She's forgotten to square the 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]

y is 5 because the hypotenuse is 2y which = 10

16   Here is a box plot.
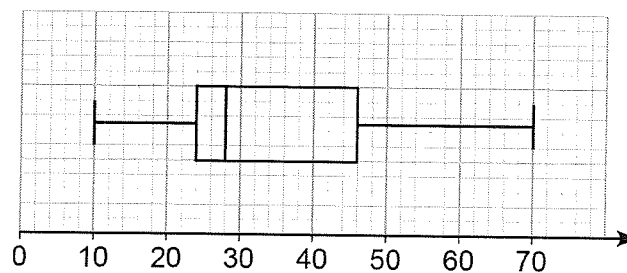
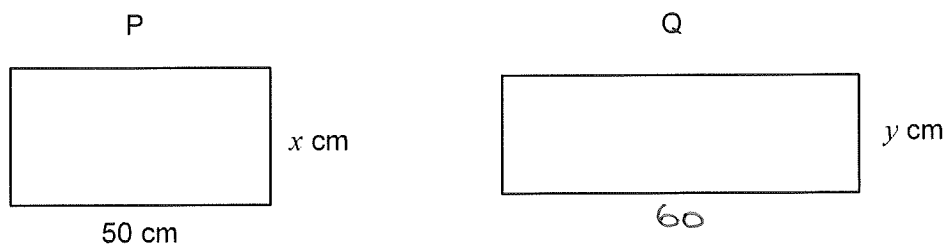Circle the median value.

[1 mark]

(28)   35   24   22

Turn over ▶

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

Q is a rectangle with width y cm

Not drawn accurately

P

Q

x cm

y cm

50 cm

60

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]

$50 \times 1.2 = 60$

$60y \times 0.9 = 50x$

$54y = 50x$

$50x = 54y$

$25x = 27y$

Answer ___27 : 25___

1620

1350

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.

	B	B'
M	14	28
M'	11	33

18 (a) ξ = teachers in the school

M = male teachers

B = teachers who have blue eyes
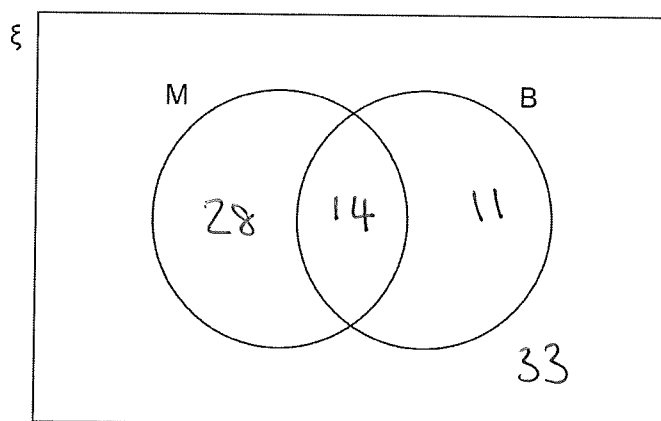
Complete the Venn diagram.

[3 marks]

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

Work out the probability that the teacher is male.

[1 mark]

Answer $\dfrac{14}{25}$

Turn over ▶

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]

$$\frac{192}{24} = 8$$

$8 \times 7 = 56$ Small

$8 \times 6 = 48$ medium

$8 \times 11 = 88$ large

$56 : 48 : 88$

$x \quad 2x \quad 3x$

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

$416x = 532.48$

$x = 1.28$

Answer £ _____ 1.28 _____

20   Work out the size of angle x.

A

x

Not drawn
accurately

14 cm   b

C

125°

B   6 cm   C

a
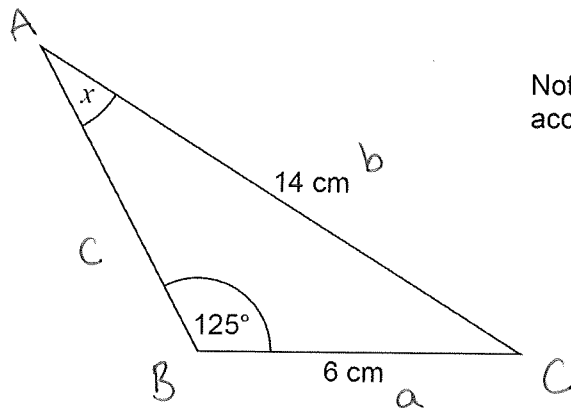
[3 marks]

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

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

$$\sin x = 0.351$$

$$x = \sin^{-1}(0.351)$$

Answer _____ 20.6 _____ degrees

Turn over for the next question

8

Turn over ▶

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

Give your answers to 2 decimal places.

[4 marks]

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

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

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

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

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

Answer 2.34 or -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?

So 10 seconds in total.

[4 marks]

$$d = kt^2$$

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

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

when $t = 10$

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

$$d = 500$$

$$500 - 45 = 455$$

Answer _____ 455 _____ metres

Turn over for the next question

8

23

Not drawn accurately
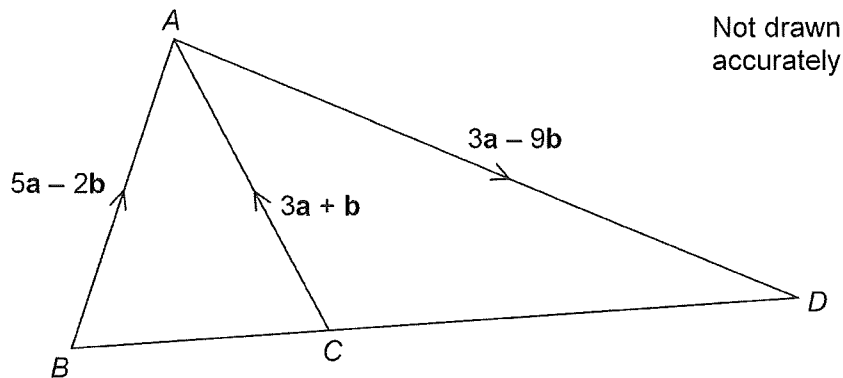
Is *BCD* a straight line?

Show working to support your answer.

[3 marks]

$$\overrightarrow{BC} = 5a - 2b - (3a+b)$$

$$= 2a - 3b$$

$$\overrightarrow{CD} = 3a+b + 3a-9b$$

$$= 6a - 8b.$$

$$3(2a - 3b) = 6a - 9b \neq \overrightarrow{CD}$$

No since they are not parallel as they are not multiples.

Answer _____ No. _____

24 48 students completed some homework.

This histogram shows information about the times taken.
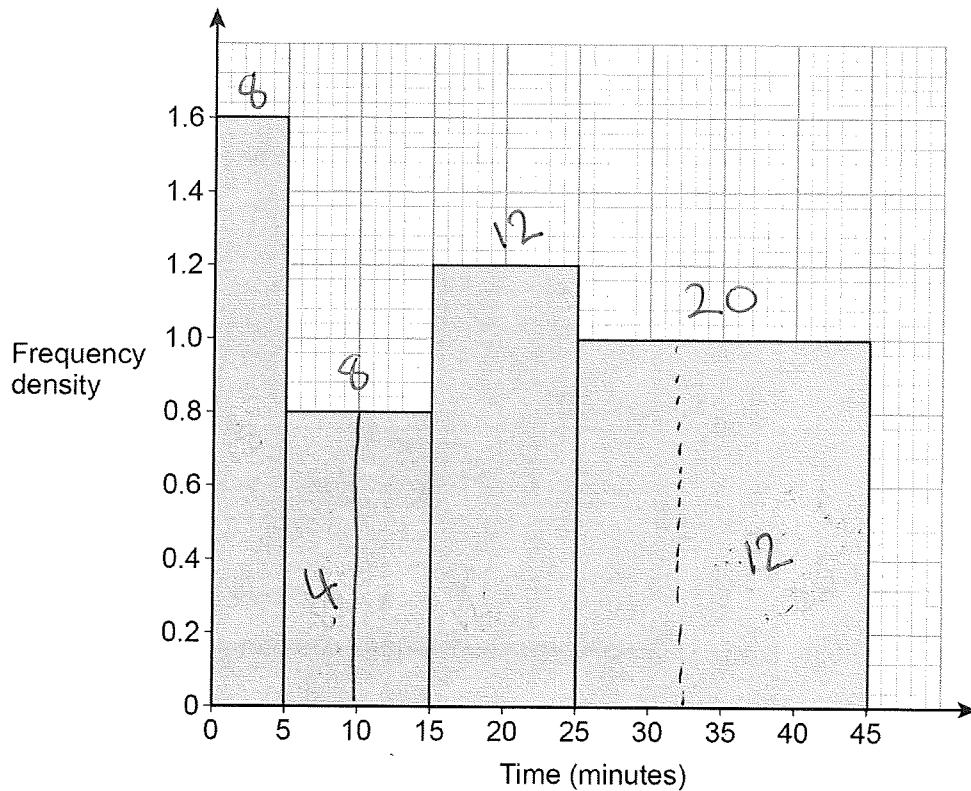
Work out an estimate of the interquartile range.

You **must** show your working.

[4 marks]

48 students in total. So 12 in each quartile.

LQ = 10

UQ = 4 45 - 12 = 33

IQR = 33 - 10
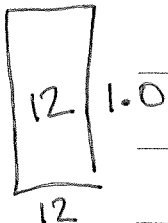
Answer _____ 23. _____ minutes

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

[Diagram: triangles ABE and DCE with angle 38° at A, 15 cm, E, 26 cm, angle x, 108°, B, C]
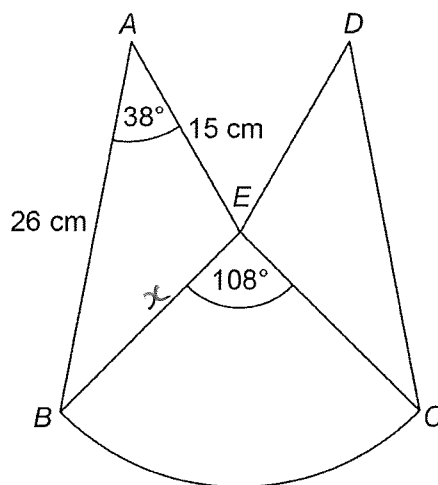
Show that the area of the logo is 510 cm^2 to 2 significant figures.

[5 marks]

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

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

= 120.1 (A)

length of BE : $x^2 = 26^2 + 15^2 - 2 \times 26 \times 15 \cos 38$

$x^2 = 286.4$

$x = 16.9$ (B)

Area of sector = $\frac{108 \times \pi \times 16.9^2}{360}$ =

Sector + 2 triangles = 269.9 + 2 × 120.1

= 509.99

= 510 cm^2 (2sf)

26 (a) A sketch of a quadrilateral *ABCD* is shown.
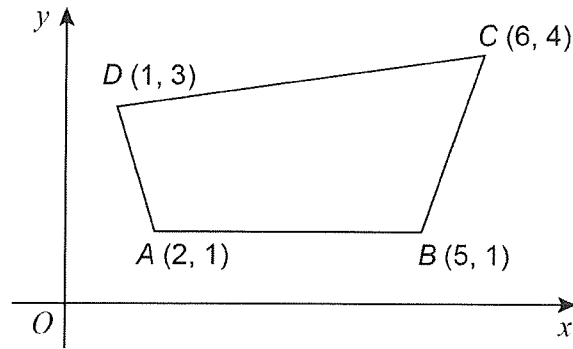
Not drawn accurately

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

Circle the vertex that is invariant.

[1 mark]

A   ⟨B⟩   C   D

Note

Invariant means that the point doesn't change position.

26 (b) A sketch of a quadrilateral *PQRS* is shown.
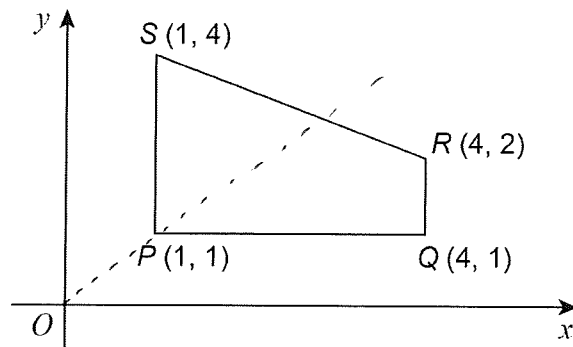
Not drawn accurately

PQRS is reflected in the line $y = x$

Circle the vertex that is invariant.

[1 mark]

⟨P⟩   Q   R   S

Turn over ▶

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 $-2 \leqslant x \leqslant 2$

[2 marks]

$y = \sqrt[3]{x}$

$y^3 = x$

$h^{-1}(x) = x^3$
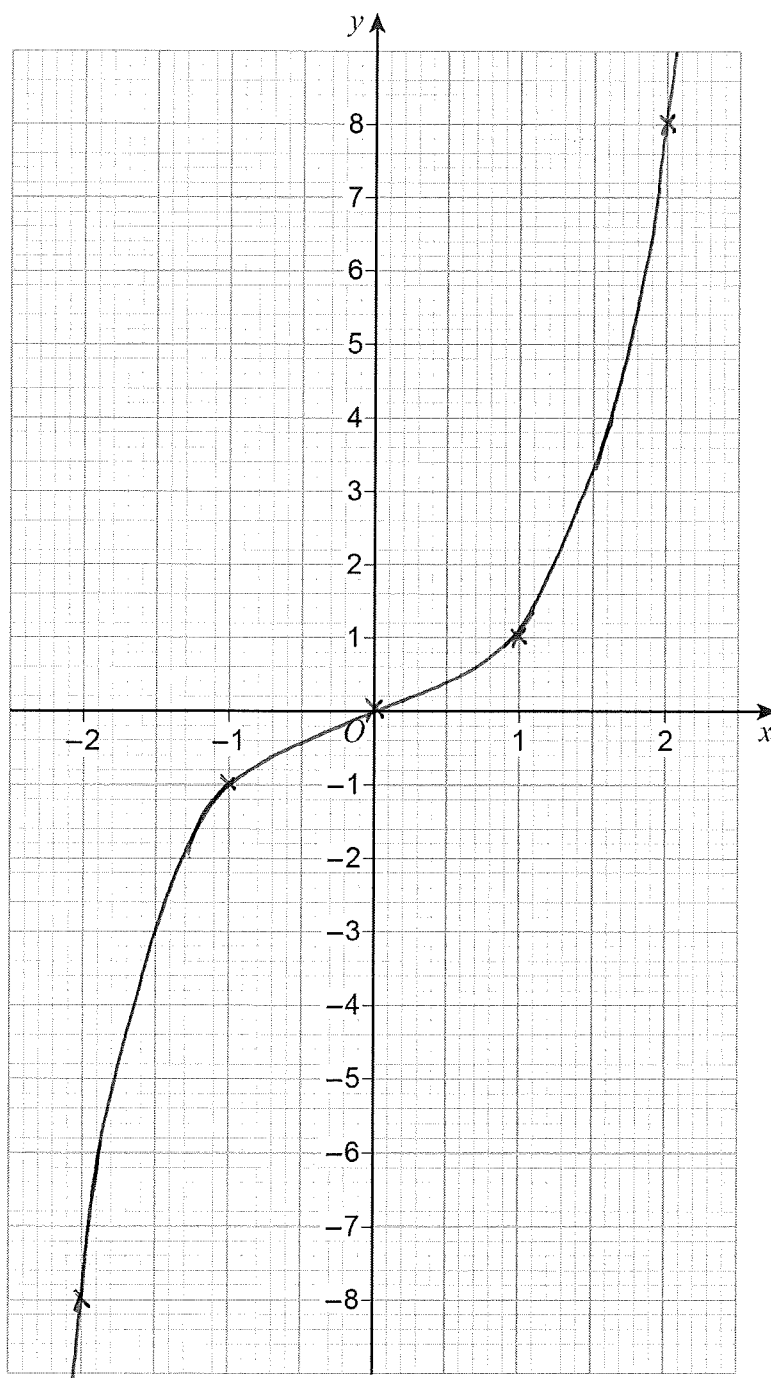
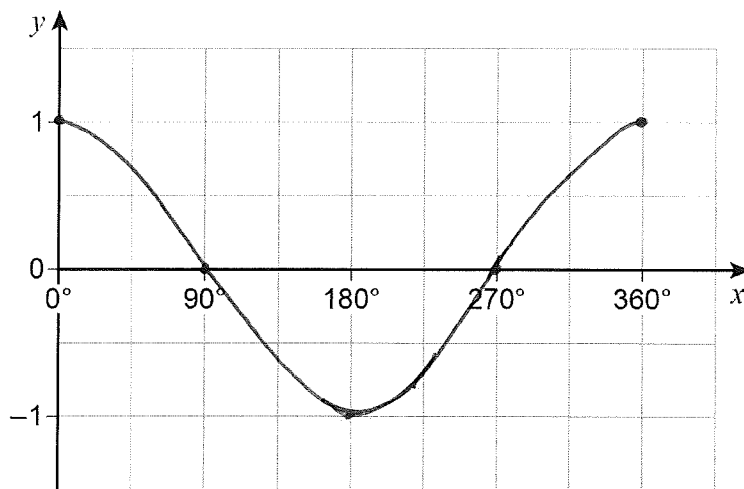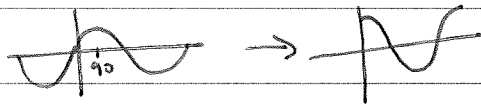**27 (b)** For all values of x

$f(x) = \sin x$

$g(x) = x + 90$

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

[2 marks]

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

$\sin x$ needs shifting $90°$ left.

END OF QUESTIONS

4

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED