AQA-H Nov'24 P2-Calc

Do not write outside the box

Answer **all** questions in the spaces provided.

1 Choose a word from the list below to complete each sentence.

arc	centre	circumference	diameter
radius	sector	segment	tangent

1 (a) The length of the diameter is double the length of the radius.

[1 mark]

1 (b) A segment is a region created by drawing a chord through a circle.

[1 mark]

1 (c) A radius meets a tangent at a right angle.

[1 mark]

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2 Here is a grouped frequency table.

Value, v	Frequency	Midpoint	
$0 \leqslant v < 10$	16	5	80
$10 \leqslant v < 20$	22	15	330
$20 \leqslant v < 30$	13	25	325
$30 \leqslant v < 40$	9	35	315
	Total = 60		1050

Work out an estimate of the mean value.

[3 marks]

22 × 15 = 330

13 × 25 = 325

35 × 9 = 315

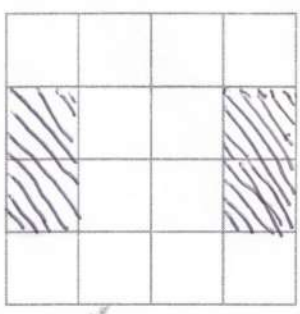
1050 ÷ 60 = 17.5

Answer 17.5

3 In the grid below, shade **one quarter** of the squares so that the grid has exactly **two** lines of symmetry.

Shade complete squares only.

[2 marks]



8

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4 A map has a scale of 1 : 4000

On the map, the distance from a station to a museum is 7 cm

Is the **actual** distance from the station to the museum **more** than 300 m?

Tick a box.

Yes ☐ No ☑

Show working to support your answer.

[3 marks]

7cm x 4000 = 28000 cm (÷100) ✓

= 280 m ✓

280 < 300 and no ✓

5 X is inversely proportional to Y.

Circle the correct statement.

$X = \frac{1}{y}$

[1 mark]

X is directly proportional to Y

X is directly proportional to $\frac{1}{Y}$

X is directly proportional to $2Y$

X is directly proportional to $\sqrt{Y}$

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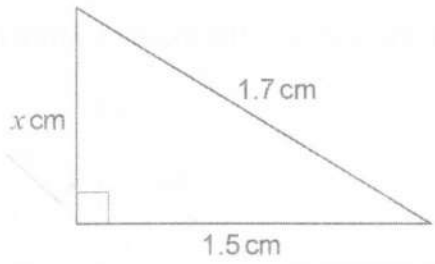
6 Here is a right-angled triangle.



Not drawn accurately

Use Pythagoras' theorem to show that $x = 0.8$

[2 marks]

$x = \sqrt{1.7^2 - 1.5^2}$ ✓

$= \sqrt{0.64}$ ✓

$= 0.8$

Turn over for the next question

6

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7 Beth and Lynn each spin the same biased coin a number of times.

The table shows information about the results.

	Beth	Lynn
Number of spins	125	80
Relative frequency of Heads	0.32	0.35

7 (a) How many **more** Heads did Beth spin than Lynn?

[2 marks]

B: $125 \times 0.32 = 40$

L: $80 \times 0.35 = 28$

$40 - 28 = 12$

Answer 12

7 (b) Lynn says,

"My estimate of the probability of the coin landing on Heads must be the best, because 0.35 is greater than 0.32"

Is she correct?

Tick a box.

Yes ☐ No ☑

Give a reason for your answer.

[1 mark]

Lynn did fewer spins

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8 Some oil has

a mass of 537 g

a density of 895 000 g/m^3

1 m^3 = 1000 litres

D M V

Work out the volume of the oil.

Give your answer in litres.

[2 marks]

$V = \frac{M}{D} = \frac{537}{895000} = 0.0006$ ✓

$\times 1000$

✓

Answer 0.6 litres

9 The length of a wall is 9 metres to the nearest metre. $\pm \frac{1}{2}$ m

Complete the error interval for the length of the wall.

[2 marks]

Answer 8.5 m ⩽ length < 9.5 m

or 9.49

✓ ✓

Turn over for the next question

7

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10 384 000 electric cars were sold this year.

This is 20% **more** than last year.

How many were sold **last year**?

[3 marks]

$x \times 1.2 = 384000$ ✓

$x = 384000 \div 1.2$ ✓

Answer 320000 ✓

11 Here are three terms.

xy x^2 $5y^2$

Alec multiplies two of these terms.

Work out the **three** possible fully simplified answers.

[3 marks]

Answer x^3y

Answer $5xy^3$

Answer $5x^2y^2$

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12 At a music festival, four types of instrument are played.

guitars keyboards drums trumpets

- The total number of instruments is 80
- Half of the instruments are guitars.
- keyboards : drums : trumpets = 3 : 4 : 1

How many **keyboards** are there?

[4 marks]

G = 80 ÷ 2 = 40 ✓OE

K = $\frac{3}{8}$ × 40 ✓✓

Answer 15 ✓

Turn over for the next question

10

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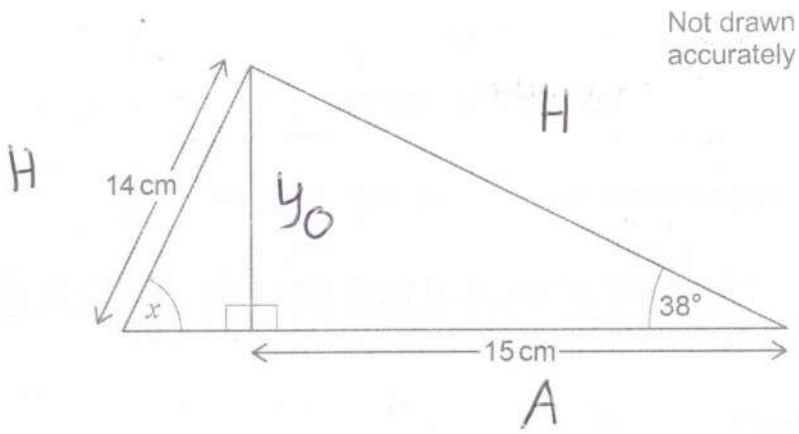
13 Two right-angled triangles are joined to make a larger triangle.



Work out the size of angle x.

[4 marks]

TOA $\quad y = \tan 38 \times 15$ ✓

$= 11.719...$ ✓

SOH $\quad x = \sin^{-1}\left(\frac{11.719}{14}\right)$ ✓

$x =$ 56.8 ° ✓

[ms 56.6 → 57.14012]

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14 Here is a sign in a shop.

SALE

20% OFF ALL ITEMS

TODAY ONLY 10% OFF THE REDUCED PRICE

THAT MEANS YOU SAVE 30%

Is the sign correct?

Tick a box.

Yes ☐ No ☑

Give a reason for your answer.

[1 mark]

$0.8 \times 0.9 = 0.72$

$= 28\%$ reduction

Turn over for the next question

5

Do not write outside the box

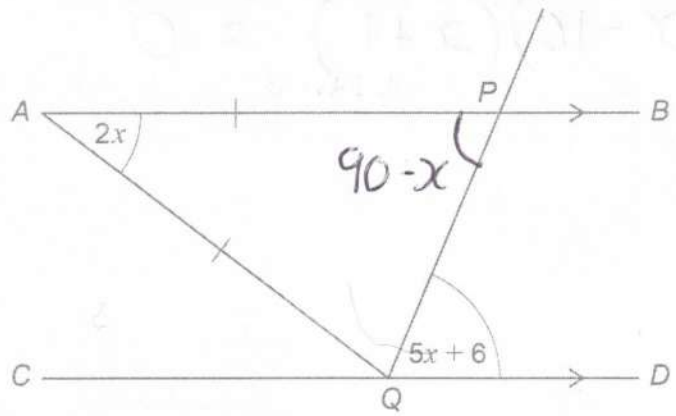
15 *AB* and *CD* are straight, parallel lines.

P is a point on *AB*.

Q is a point on *CD*.

$AP = AQ$

Not drawn accurately



Work out the value of x.

[4 marks]

$\frac{180-2x}{2} = 90-x$ ✓

$90-x = 5x+6$ ✓

$84 = 6x$ ✓

$x =$ 14 ° ✓

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16 Solve $(x + 2)(x - 5) = 6x$

[4 marks]

$x^2 + 2x - 5x - 6x - 10 = 0$ ✓

$x^2 - 9x - 10 = 0$ ✓

$(x - 10)(x + 1) = 0$ ✓

Answer $x = 10, \; x = -1$ ✓

17 Straight line LM has equation $y = 4x - 7$

Straight line ST has equation $y = \frac{9 - x}{4} = -\frac{x}{4} + \frac{9}{4}$

Are the lines LM and ST perpendicular?

Tick a box.

Yes ☑ ✓ No ☐

Give a reason for your answer.

[2 marks]

LM $m = 4$ $\quad$ ST $m = -\frac{1}{4}$ ✓

$4 \times -\frac{1}{4} = -1$ ✓

10

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18 Two types of battery, P and Q, were tested.

100 of each type were put into clocks.

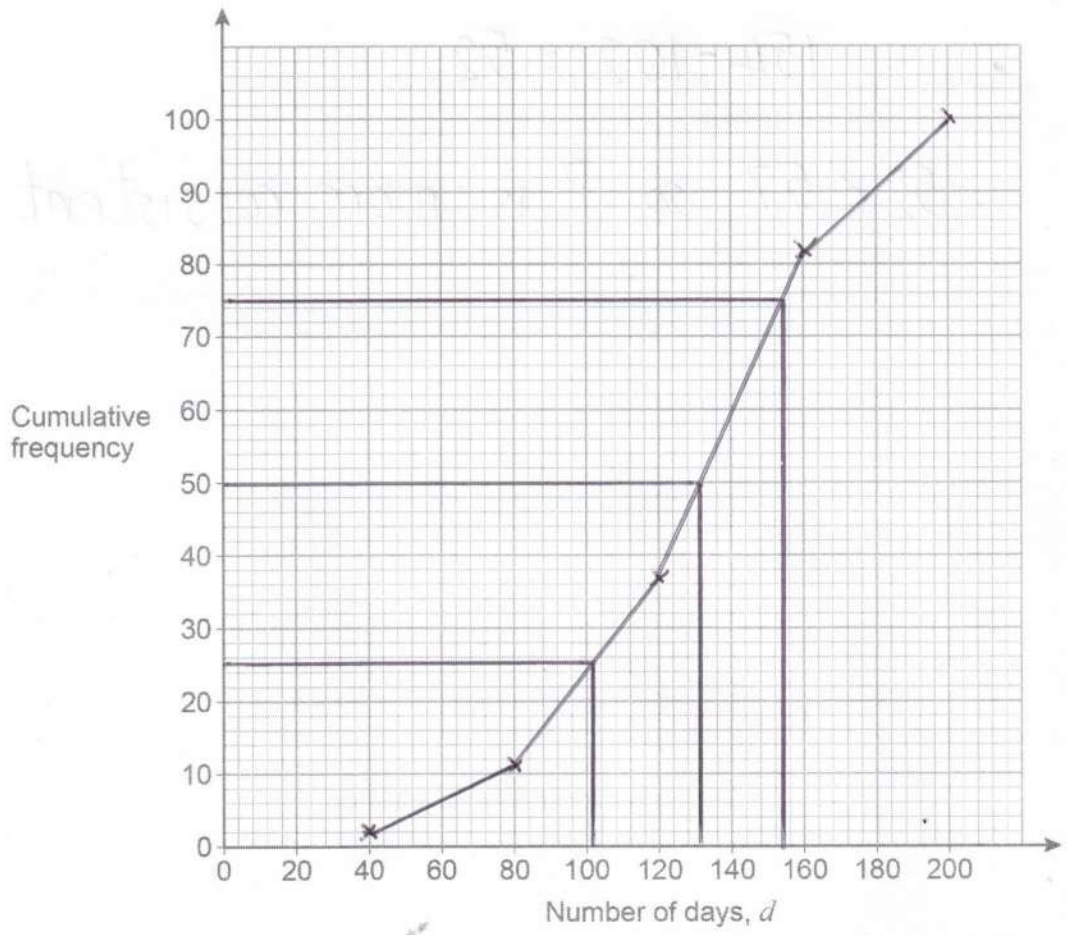
The number of days each battery lasted was recorded.

18 (a) The frequency table represents the results for **type P**.

Number of days, d	Frequency	cf
$0 \leqslant d < 40$	2	2
$40 \leqslant d < 80$	9	11
$80 \leqslant d < 120$	26	37
$120 \leqslant d < 160$	45	82
$160 \leqslant d < 200$	18	100

On the grid, draw a cumulative frequency diagram to represent the data.

[3 marks]



102 154

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18 (b) For **type Q**,

the median was 126 days

the interquartile range was 57 days.

Compare the number of days that types P and Q lasted.

Make **one** statement about the average and **one** statement about the spread.

Use statistical measures to support your statements.

[4 marks]

Average 132 > 126 so on average P lasted longer

Spread 154 - 102 = 52

52 < 57 so P is more consistent

Turn over for the next question

7

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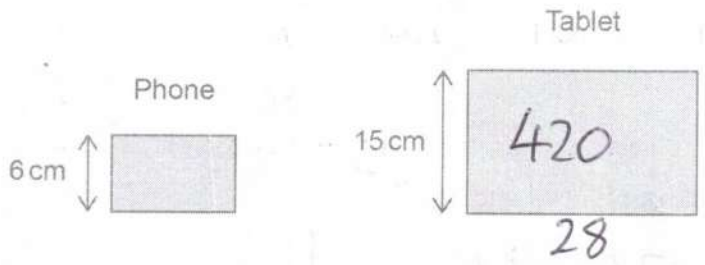
19 A phone screen is **similar** to a tablet screen.



The area of the **tablet** screen is 420 cm^2

A screen costs £7000 per **square metre**.

Work out the cost of a screen for the **phone**.

[5 marks]

420 ÷ 15

scale = x $\frac{6}{15}$ = x $\frac{2}{5}$

phone screen area = $6 \times \left(28 \times \frac{2}{5}\right) = 67.2$ cm^2

Cost 1cm^2 = $\frac{7000}{100 \times 100}$ = £0.70

67.2 x 0.7

Answer £ 47.04

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20 Here is a formula for an iterative process.

$$u_{n+1} = \frac{24}{u_n} + 4$$

$u_2 = 8$

Work out the values of u_1 and u_3

[3 marks]

$8 = \frac{24}{x} + 4$ ✓

$4 = \frac{24}{x}$

$x = \frac{24}{4}$

$u_1 = 6$ ✓

$u_3 = \frac{24}{8} + 4$

$= 3 + 4$

$u_3 = 7$ ✓

Turn over for the next question

8

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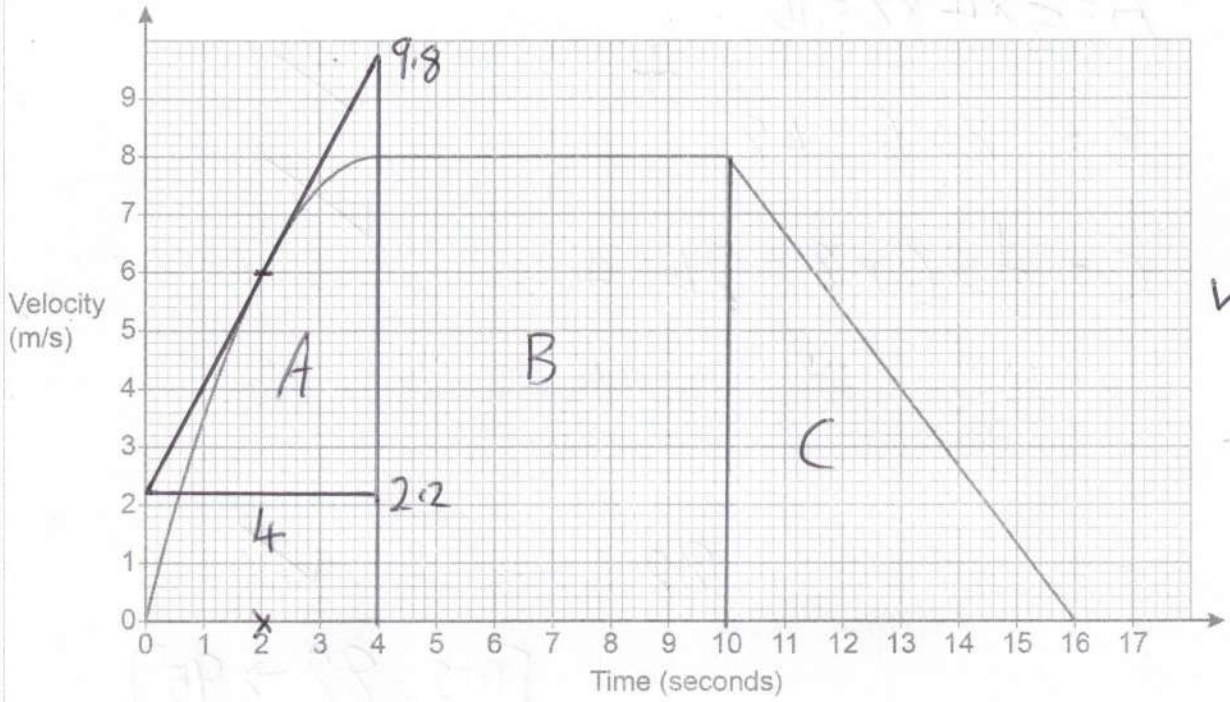
21 The graph represents the velocity of a ball as it rolls along the ground.



21 (a) Work out an estimate for the acceleration of the ball, in m/s^2, after 2 seconds.

You **must** show your working.

[2 marks]

$$\frac{9.8 - 2.2}{4}$$

Answer 1.9 m/s^2

[ms 1.5 → 2.5]

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21 (b) Work out an estimate for the total distance covered by the ball.

[3 marks]

$A = \frac{1}{2} \times 4 \times 8 = 16$ ✓

$+$

$B = 8 \times 6 = 48$ ✓

$C = \frac{1}{2} \times 6 \times 8 = 24$ ✓

$+$

Answer 88 ✓ m

[ms 88 → 95]

21 (c) Is your estimate from part (b) an overestimate or underestimate?

Tick a box.

Overestimate ☐ Underestimate ☑

Give a reason for your answer.

Triangle A is under the curve ✓

[1 mark]

Turn over for the next question

6

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22 The nth term of a sequence is $n^2 - 30n + 236$

By completing the square,

show that all the terms of the sequence have two or more digits.

[3 marks]

$= (n-15)^2 - 225 + 236$ ✓

$= (n-15)^2 + 11$ ✓

min value when $n = 15$ is 11 ✓

so all terms must be ≥ 11

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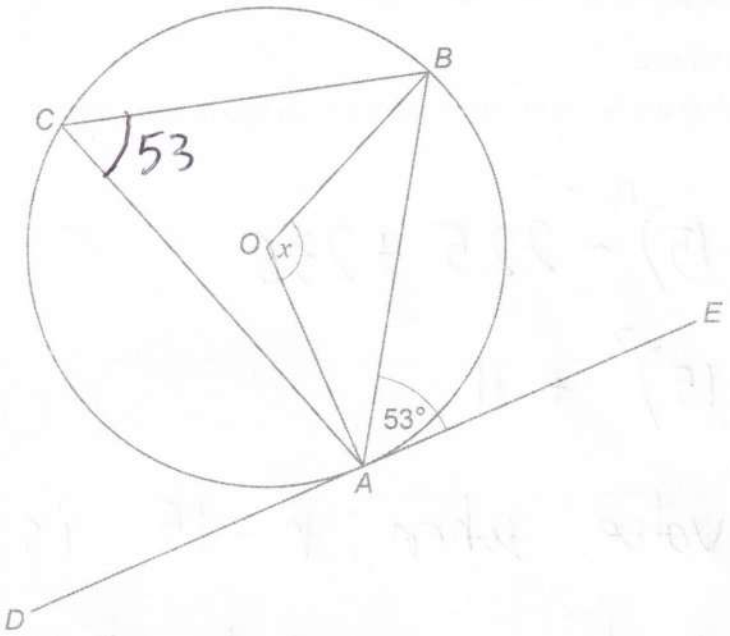
23 (a)



Not drawn accurately

Line *DAE* is a tangent at *A* to the circle with centre *O*.

Work out the size of angle x.

[2 marks]

$x = 2 \times 53$

$x =$ 106 °

Turn over for the next question

5

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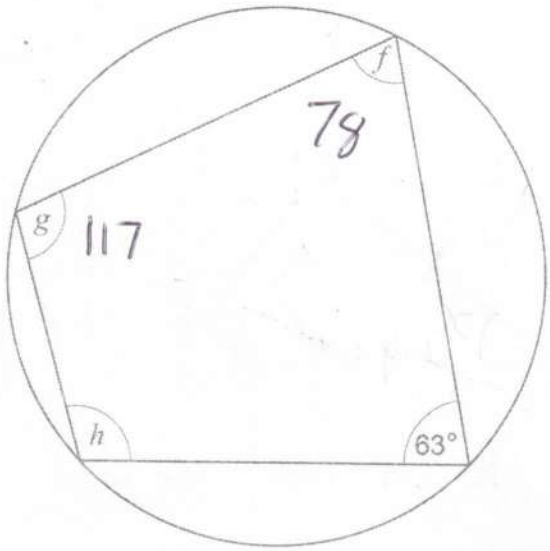
23 (b) Here is a cyclic quadrilateral.



Not drawn accurately

$f : g = 2 : 3$

Work out $f : h$

Give your answer in its simplest form.

[4 marks]

$g = 180 - 63 = 117$ ✓

$f : g$

$2 : 3$

×39

$78 : 117$ ✓

$h = 180 - 78$

$= 102$ ✓

Answer $78 : 102$

$= 13 : 17$ ✓

Do not write outside the box

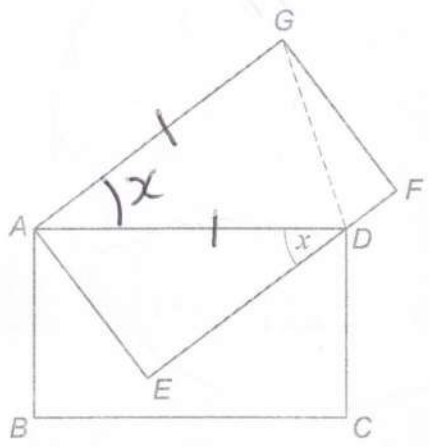
24 In the diagram,

ABCD and *AEFG* are congruent rectangles

D lies on *EF*

angle *ADE* = x

Not drawn accurately



Prove that *GD* bisects angle *ADF*.

[4 marks]

$\angle GAD = x$ (alternate angles are equal)

$\angle ADG = \frac{180 - x}{2}$ (base angles of an isosceles triangle)

$\angle ADF = 180 - x$ (angles on a line sum to 180)

$\angle ADG = \frac{1}{2} \times \angle ADF$ hence bisects

END OF QUESTIONS

8