AQA - H Jun '23 P1

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

Do not write outside the box

1 (a) Work out 0.7×0.5 **[1 mark]**

$7 \times 5 = 35$

Answer 0.35

1 (b) Work out $\frac{5}{6} \div 3$ **[1 mark]**

$\frac{5}{6} \times \frac{1}{3}$

Answer $\frac{5}{18}$

1 (c) Work out $27 \div 0.6$ **[1 mark]**

$6 \overline{)270}$ 45

Answer 45

Do not write outside the box

2 Solve $2x < 26$ **[1 mark]**

$x < 26/2$

Answer $x < 13$

3 Work out the value of $\left(\frac{3}{2}\right)^2$ **[1 mark]**

Give your answer as a mixed number.

$\frac{3}{2} \times \frac{3}{2} = \frac{9}{4}$

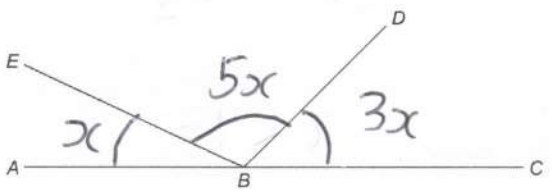
Answer $2\frac{1}{4}$

Turn over for the next question

5

Do not write outside the box

4 *ABC*, *BD* and *BE* are straight lines.



Not drawn accurately

angle *EBD* = 5 × angle *ABE*

angle *DBC* = 3 × angle *ABE*

Work out the size of angle *EBD*.

$9x = 180$

$x = 20$

[3 marks]

EBD = 5x = 5 × 20

Answer 100 °

Do not write outside the box

5 Two prime numbers are multiplied together.

The answer is an **even** number between 50 and 60

Complete the calculation.

[3 marks]

2	×	29	=	58

2, ~~3~~, ~~5~~, ~~7~~, ~~11~~, ~~13~~, ~~17~~, ~~19~~,

~~23~~, 29, ~~31~~ ...

6 Andrew and Bruce share some money in the ratio 5 : 6

Bruce gets £96

Andrew gives $\frac{1}{4}$ of his share to Carl. $\frac{1}{4}$ of 80 = 20

Bruce gives $\frac{2}{3}$ of his share to Carl. $\frac{1}{3}$ of 96 = 32

How much money does Carl receive?

[4 marks]

A : B

5 : 6 ×16

80 96 ×16

C = 20 + 64

Answer £ 84

10

Turn over ►

Do not write outside the box

7 $2^a \times 3 \times 5^2 = 600$

$3 \times 25 = 75$

Work out the value of a.

You **must** show your working.

[3 marks]

$75 \times 2 = 150$

$150 \times 2 = 300$

$300 \times 2 = 600$

2^3

$a =$ 3

8 Expand and simplify fully $5(3x + 4) - 2(x - 1)$

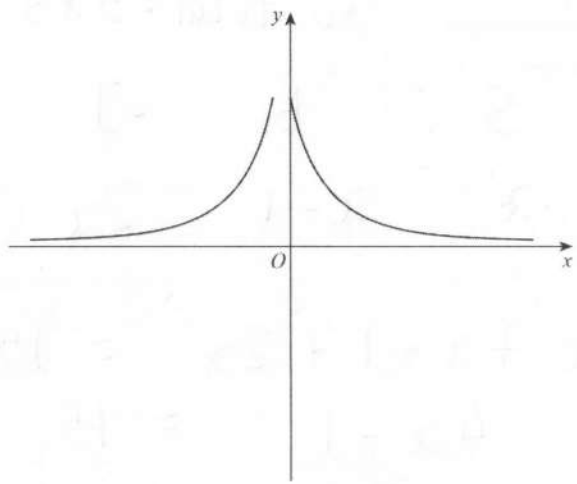
[2 marks]

$15x + 20 - 2x + 2$

Answer $13x + 22$

Do not write outside the box

9 Erika tries to sketch the graph $y = \frac{1}{x}$ with $x \neq 0$



Make **two** different criticisms of her sketch.

[2 marks]

Criticism 1 Shouldn't touch y-axis

Criticism 2 Left portion should be below x-axis

7

Turn over ▶

Do not write outside the box

10 Sunita is x years old.

Beth is one year younger than Sunita.

Joel is double Sunita's age.

The mean of their ages is 5 so total = 5 x 3 = 15

How old is **Joel**? **[5 marks]**

S B J

x x-1 2x

x + x - 1 + 2x = 15

4x - 1 = 15

4x = 16

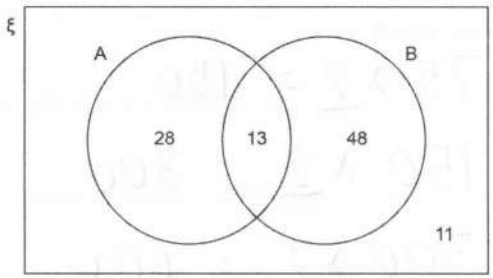
x = 4

Joel = 2x = 2 x 4

Answer 8

Do not write outside the box

11 The Venn diagram represents 100 items.



11 (a) Write down $P(A \cap B)$ **[1 mark]**

Answer 13/100

11 (b) Work out $P(A')$ **[1 mark]**

48 + 11 = 59

Answer 59/100

11 (c) Work out $P(A \cup B)$ **[1 mark]**

48 + 13 + 28 = 89

Answer 89/100

8

Do not write outside the box

12 (a) $a \times 10^n$ is a number in standard form.

Complete the inequality for the value of a.

[1 mark]

$1 \leqslant a < 10$ (9.9)

12 (b) $b \times 10^n$ is the number 7200 written in standard form.

Work out $b \times 10^{-n}$

Write your answer as an ordinary number.

[2 marks]

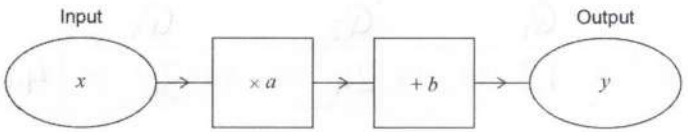
$7200 = 7.2 \times 10^3$

7.2×10^{-3}

Answer 0.0072

Do not write outside the box

13 (a) Here is a number machine.



Show that when the input increases by 2 the output increases by $2a$.

[2 marks]

$x \times a = xa$

$xa + b = y$

$(x + 2) \times a = xa + 2a$

$y = xa + 2a + b$ → extra

13 (b) $f(x) = kx^2$ where k is a constant.

Kai says that $\frac{f(6)}{f(2)}$ is equal to f(3) because $\frac{6}{2} = 3$

Is he correct? NO

Show working to support your answer.

[2 marks]

$f(6) = K \times 6^2 = 36K$

$f(2) = K \times 2^2 = 4K$

$\frac{36K}{4K} = 9$

f(3) = 9k

7

Turn over ▶

Do not write outside the box

14 Here is a list of 11 whole numbers in numerical order.

The lower quartile, median, upper quartile and highest value are missing.

		Q_1			Q_2			Q_3		
5	8	12	13	19	24	25	28	30	34	41

- median = 2 × lower quartile
- upper quartile = 2.5 × lower quartile
- range = 2 × interquartile range

Complete the list.

[2 marks]

$Q_1 = 8\ 9\ 10\ 11\ 12\ 13$

$Q_2 = 19\ 20\ 21\ 22\ 23\ 24\ 25$

$Q_3 = 28\ 29\ 30\ 31\ 32\ 33\ 34$

$IQR = 18$

$R = 36$

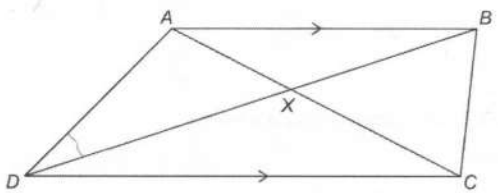
Do not write outside the box

15 *ABCD* is a trapezium.

All four sides are different lengths.

AB is parallel to *CD*.

The diagonals intersect at *X*.



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For each statement, tick the correct box.

[4 marks]

	True	May be true	Not true
Triangles *AXB* and *CXD* are similar	✓		
Triangles *AXD* and *BXC* are congruent			✓
Angle *ADB* = angle *BDC*			✓
Area of triangle *ABC* = area of triangle *ABD*	✓		

Turn over for the next question

6

Do not write outside the box

16 Solve the simultaneous equations

① $2x - 5y = 13$

② $3x + 4y = 8$

[4 marks]

① × 3 $\quad 6x - 15y = 39$ −

② × 2 $\quad 6x + 8y = 16$

$-23y = 23$

$y = -1$

① ⇒ $2x + 5 = 13$

$2x = 8$

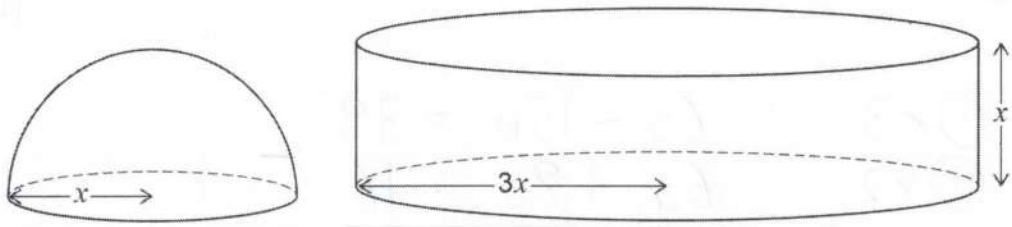
$x = 4$

$x =$ 4 $\quad y =$ −1

Do not write outside the box

17 A solid hemisphere has radius x.

A solid cylinder has radius $3x$ and height x.



Surface area of a sphere $= 4\pi r^2$
where r is the radius

Work out the ratio

total surface area of the hemisphere : total surface area of the cylinder

Give your answer in its simplest form.

You **must** show your working.

[3 marks]

$H = 2 \times \pi \times x^2 + \pi \times x^2 = 3\pi x^2$

$C = 2 \times \pi \times (3x)^2 + (2 \times \pi \times 3x) \times x$

$= 18\pi x^2 + 6\pi x^2$

$= 24\pi x^2$

H : C

$3\pi x^2 : 24\pi x^2$

3 : 24

Answer 1 : 8

7

Turn over ▶

Do not write outside the box

18 $6 < \sqrt[3]{x} < 7$

Circle the possible value of x.

[1 mark]

1.9 20 45 290

19 Work out how many 5-digit **odd** numbers can be made using these digits **once** each.

2 4 6 7 9

Do **not** list them.

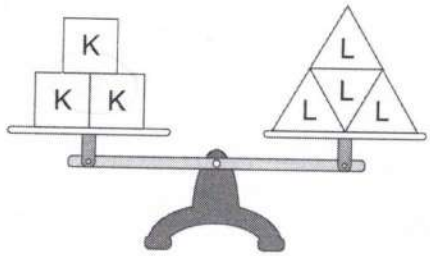
[2 marks]

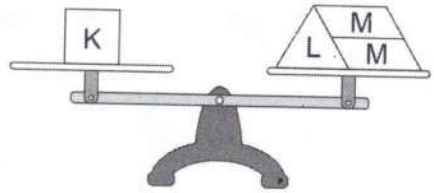
$4 \times 3 \times 2 \times 1 \times 2$

Answer 48

20 K, L and M are weights.

Both of the scales balance exactly.





How many M weights are needed to balance **one** L weight?

[3 marks]

$3K = 4L$ $\quad K = L + 2M$

$\Downarrow$

$K = \frac{4}{3}L$ $\quad$ ~~$L = K - 2M$~~

so $\frac{4}{3}L = L + 2M$

$\frac{1}{3}L = 2M$

$L = 6M$

Answer 6

Turn over for the next question

6

Do not write outside the box

21 Express $x^2 - 6x - 15$ in the form $(x-a)^2 - b$ where a and b are integers.

[2 marks]

$(x-3)^2 - 9 - 15$

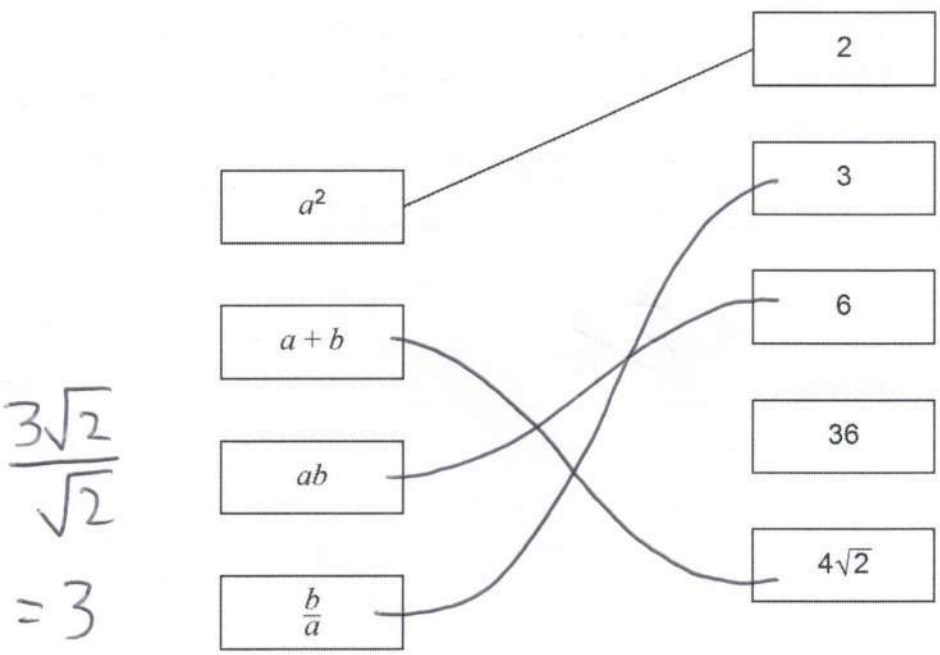
Answer $(x-3)^2 - 24$

22 $a = \sqrt{2}$ and $b = \sqrt{18}$ $= \sqrt{9}\sqrt{2} = 3\sqrt{2}$

Match each expression to its value.

One has been done for you.

[3 marks]



$\frac{3\sqrt{2}}{\sqrt{2}}$

$= 3$

$\sqrt{2} \times \sqrt{18} = \sqrt{36} = 6$

Do not write outside the box

23 Write $0.1\dot{3}$ as a fraction in its simplest form.

[3 marks]

$x = 0.1\dot{3}$

$10x = 1.\dot{3}$

$100x = 13.\dot{3}$

$90x = 12$

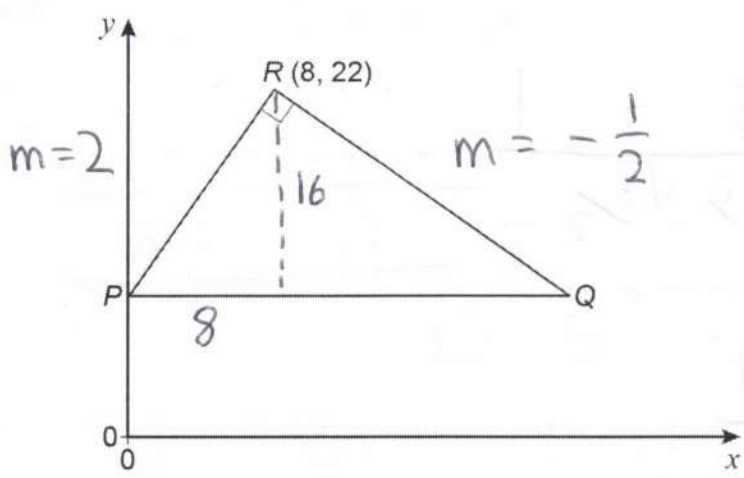
$x = \frac{12}{90} = \frac{6}{45} = \frac{2}{15}$

Answer $\frac{2}{15}$

8

Do not write outside the box

24 Points P, Q and R (8, 22) form a triangle.



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PQ is a horizontal line, with P on the y-axis.

Angle PRQ is a right angle.

The gradient of PR is 2

Work out the coordinates of Q.

[5 marks]

$P(0, 6)$

$RQ: \quad y = mx + c$

$22 = -\frac{1}{2}(8) + c$

$26 = c$

so $y = -\frac{1}{2}x + 26$

At Q, $y = 6 = -\frac{1}{2}x + 26$

$-20 = -\frac{1}{2}x$

$40 = x$

Answer (40 , 6)

Do not write outside the box

25 Show that $\dfrac{4\sin 30^\circ - \tan 45^\circ}{2\cos 30^\circ}$ can be written as $\tan x$, where x is an acute angle.

[4 marks]

$$= \frac{4 \times \frac{1}{2} - 1}{2 \times \sqrt{3}/2}$$

$$= \frac{2 - 1}{\sqrt{3}}$$

$$= \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

or

$$= \tan 30$$

$$x = 30$$

Turn over for the next question

9

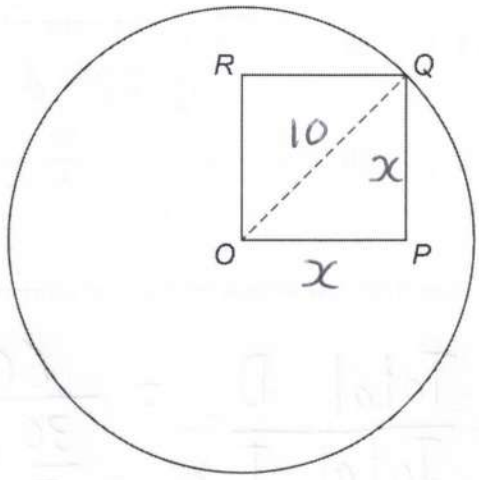
Do not write outside the box

26 A circle, centre O, has circumference 20π cm

Q is a point on the circle.

$OPQR$ is a **square**.

Not drawn accurately



P C

perimeter of the square : circumference of the circle = $\sqrt{a}$: π where a is an integer.

Work out the value of a.

You **must** show your working.

[4 marks]

Circumference $= 2\pi r = 20\pi$

$r = 10$

$x^2 + x^2 = 10^2$

$2x^2 = 100$

$x = \sqrt{50} = \sqrt{25}\sqrt{2} = 5\sqrt{2}$

$P : C = 4 \times 5\sqrt{2} : 20\pi$

$20\sqrt{2} : 20\pi$

a

$a =$ 2

Do not write outside the box

27 A journey has two stages.

	Distance (km)	Average speed (km/h)	Time (h)
Stage 1	30	a	$\frac{30}{a}$
Stage 2	30	b	$\frac{30}{b}$

Show that the average speed for the **whole** journey, in km/h, is $\frac{2ab}{a+b}$

[3 marks]

$$\text{Ave. } S = \frac{\text{Total } D}{\text{Total } T} = \frac{60}{\frac{30}{a} + \frac{30}{b}}$$

$$= \frac{60}{\frac{30b}{ab} + \frac{30a}{ab}}$$

$$= \frac{60}{\frac{30b + 30a}{ab}}$$

$$= 60 \times \frac{ab}{30a + 30b} = \frac{60ab}{30a + 30b}$$

$$= \frac{2ab}{a+b}$$

END OF QUESTIONS

7