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Answer ALL TWENTY TWO questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Here are five fractions.

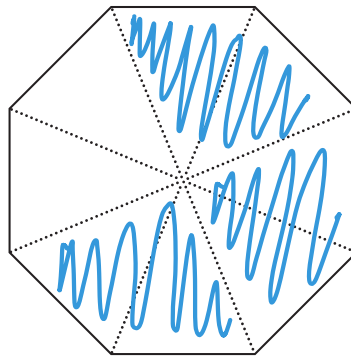
| | | | | |
|-----------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|
| $\frac{2}{8}$ $\frac{1}{4}$ | $\frac{3}{9}$ $\frac{1}{3}$ | $\frac{5}{25}$ $\frac{1}{5}$ | $\frac{7}{28}$ $\frac{1}{4}$ | $\frac{8}{40}$ $\frac{1}{5}$ |
| | | ✓ | | ✓ |

Two of the fractions in the table are equivalent to $\frac{1}{5}$

(a) Put a tick (✓) in the box underneath each of these two fractions.

(2)

The diagram shows an 8-sided polygon and its diagonals.



(b) Write down the mathematical name of an 8-sided polygon.

octagon

(1)

(c) Shade $\frac{3}{4}$ of the polygon shown in the diagram above.

(1)

The area of a polygon is 56 cm^2

(d) Find $\frac{3}{4}$ of 56

$$56 \div 4 = 14$$

$$14 \times 3 = 42$$

42

(2)

(Total for Question 1 is 6 marks)



- 2 The table shows the average number of spectators per match, for each of six Spanish football teams, in one season.

| Team | Average number of spectators per match |
|-----------------|--|
| Real Betis | 46 393 |
| Valencia | 38 699 |
| Barcelona | 65 731 |
| Athletic Bilbao | 37 378 |
| Sevilla | 33 069 |
| Real Madrid | 65 027 |

- (a) Which team had the lowest average number of spectators per match?

Sevilla
.....
(1)

- (b) Write the number 65 731 correct to the nearest thousand.

65000 ↑ 66000
.....
66000
(1)

- (c) Write down the value of the 6 in the number 38 699

600
.....
(1)

In one match, Sevilla played Valencia.

In the match, Sevilla had 8 shots on target and Valencia had 12 shots on target.

- (d) Write the ratio 8:12 in its simplest form.

4:6
2:3
.....
2:3
(1)

In the same match, Valencia had 72% possession of the ball.

- (e) Write 72% as a fraction in its simplest form.

$\frac{72}{100} = \frac{36}{50} = \frac{18}{25}$
.....
 $\frac{18}{25}$
(2)

(Total for Question 2 is 6 marks)

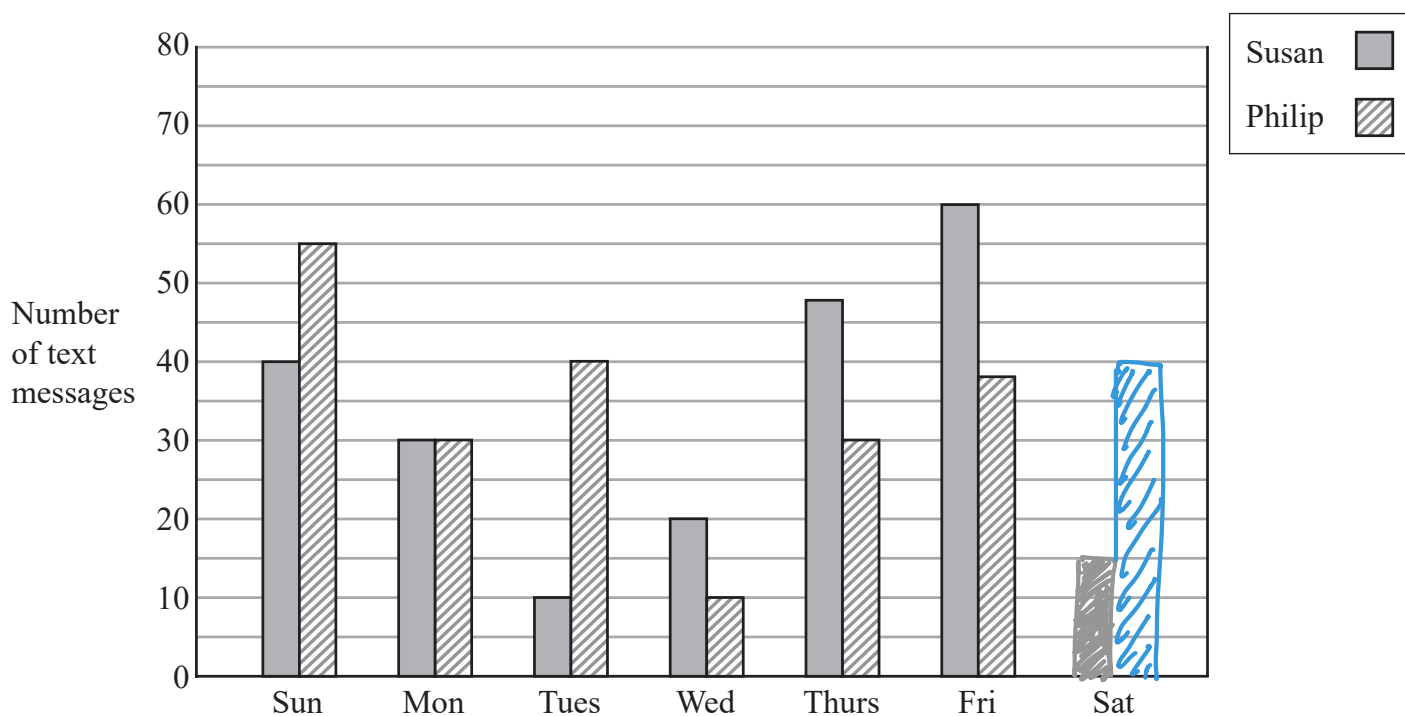


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3 The bar chart shows information about the numbers of text messages that Susan and Philip sent from their mobile phones on each of six days one week.



(a) On which day did Susan send twice as many text messages as Philip?

Wed. (1)

(b) How many text messages did Philip send on Sunday?

55 (1)

On Saturday, Susan sent 15 text messages and Philip sent 40 text messages.

(c) Show this information on the bar chart.

(1)

In the following week, Philip sent a total of 180 text messages. Of these text messages, 25% were sent to Susan.

(d) Work out 25% of 180

50% = 90
25% = 45

45 (2)

(Total for Question 3 is 5 marks)



- 4 The table shows the temperatures recorded at midnight and at midday for each of five North American cities on a Monday one week.

| City | Midnight temperature (°C) | Midday temperature (°C) |
|----------|-----------------------------|---------------------------|
| Boston | -2 | 14 |
| Houston | 11 | 20 |
| Chicago | -8 | 7 |
| Detroit | -7 | -1 |
| New York | 0 | 12 |

- (a) Which city had the lowest midnight temperature?

Chicago (1)

- (b) Find the difference between the midnight temperature and midday temperature for Boston.

-2 → 14

16 °C (1)

From Monday to Thursday, the midday temperature in Detroit increased by 2°C each day.

- (c) Work out the midday temperature in Detroit on Thursday.

-1 1 3 5
M T W T

5 °C (2)

(Total for Question 4 is 4 marks)



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5 James is on holiday in Canada.
The exchange rate is £1 = 1.75 Canadian dollars.

(a) Change £800 into Canadian dollars.

$$800 \times 1.75$$

.....1400.....Canadian dollars
(2)

James buys a watch in Canada.

The price of the watch is 98 Canadian dollars.
In England the price of an identical watch is £60

(b) Work out the difference in the prices of the two watches.
Give your answer in pounds (£)

$$\$ 98 \div 1.75$$

$$= \pounds 56$$

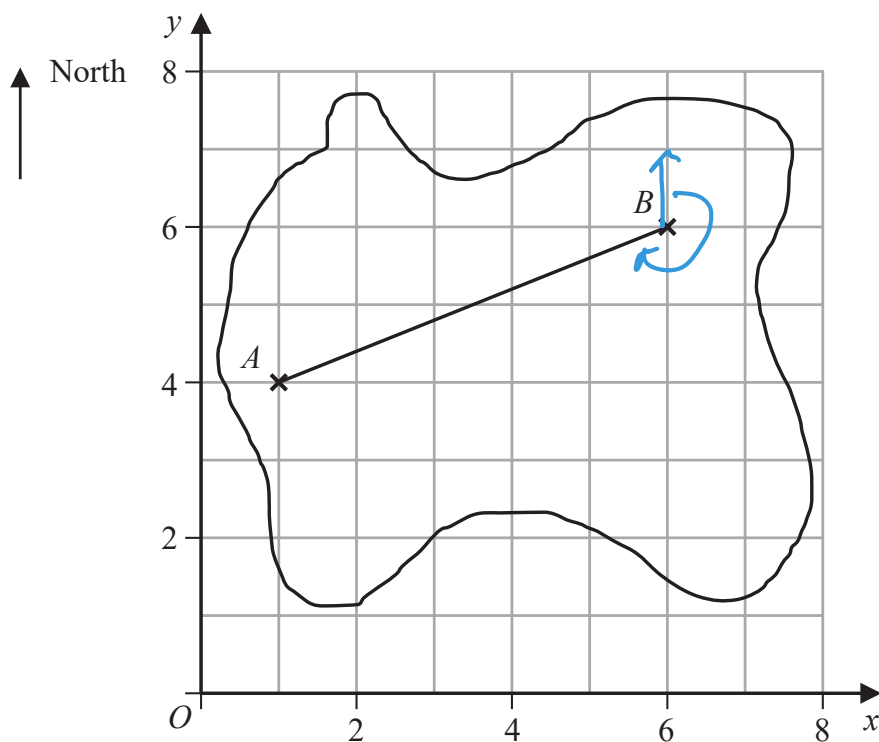
$$\text{Difference} = 60 - 56$$

£.....4.....
(2)

(Total for Question 5 is 4 marks)



6 The accurate scale diagram shows the map of an island drawn on a centimetre grid.



The position of Aaron's house is A .
The position of Bharat's house is B .

(a) Write down the coordinates of A .

(1 , 4)
(1)

(b) By measurement, find the bearing of A from B .

248 °
(2)

(c) Measure the length of the line AB .
Give your answer in centimetres correct to one decimal place.

5.4 cm
(1)

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Aaron cycled along a straight path from his house to Bharat's house.
The scale of the map is 1 cm represents 5 km.

- (d) Work out the distance, in kilometres, that Aaron cycled.

$$5.4 \times 5$$

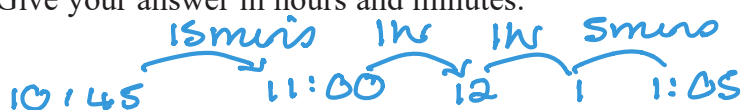
$$\dots\dots\dots 27 \dots\dots\dots \text{km}$$

(1)

Aaron left his house at 10 45 am and arrived at Bharat's house at 1 05 pm.

- (e) How long did Aaron's cycle ride take him?

Give your answer in hours and minutes.



$$2 \text{ hr } 20 \text{ mins}$$

$$\dots\dots\dots 2 \dots\dots\dots \text{hours } \dots\dots\dots 20 \dots\dots\dots \text{minutes}$$

(2)

(Total for Question 6 is 7 marks)

- 7 (a) Solve $5x = 20$

$$x = \frac{20}{5}$$

$$x = \dots\dots\dots 4 \dots\dots\dots$$

(1)

- (b) Simplify $3a \times 8b$

$$3 \times 8 \times a \times b$$

$$\dots\dots\dots 24ab \dots\dots\dots$$

(1)

- (c) Simplify $8w - 4y + w - 3y$

$$8w + w - 4y - 3y$$

$$9w - 7y$$

$$\dots\dots\dots 9w - 7y \dots\dots\dots$$

(2)

- (d) Factorise fully $16 + 12t$

$$\dots\dots\dots 4(4 + 3t) \dots\dots\dots$$

(2)

(Total for Question 7 is 6 marks)



- 8 The table shows information about the grades some Year 9 students gained in a biology test and in a physics test. The highest grade is **A** and the lowest grade is **D**.

| | | Biology | | | |
|---------|--------|---------|---|---|---|
| | | A | B | C | D |
| Physics | Grades | A | B | C | D |
| | A | 8 | 6 | 2 | 1 |
| | B | 3 | 5 | 4 | 0 |
| | C | 4 | 2 | 6 | 2 |
| D | 0 | 0 | 5 | 0 | |

- (a) How many students gained a grade **C** in biology?

$$2 + 4 + 6 + 5$$

17

(2)

- (b) How many students gained the same grade in biology as they gained in physics?

$$8 + 5 + 6 + 0$$

19

(2)

- (c) How many students gained a higher grade in biology than they gained in physics?

$$3 + 4 + 0 + 2 + 0$$

9

(2)

(Total for Question 8 is 6 marks)



10 (a) Show that $\frac{3}{10} \div \frac{1}{4} = \frac{6}{5}$

$$\frac{3}{10} \times \frac{4}{1}$$
$$= \frac{12}{10} \quad \frac{12}{10} = \frac{6}{5} \text{ as required}$$

(2)

(b) Show that $\frac{5}{6} - \frac{3}{4} = \frac{1}{12}$

$$\frac{5}{6} - \frac{3}{4}$$

$\times 2$ \downarrow $\frac{10}{12} - \frac{9}{12}$ $\downarrow \times 3$

$$= \frac{1}{12} \text{ as required}$$

(2)

(Total for Question 10 is 4 marks)

11 (a) Use your calculator to work out the value of $\frac{2.14^3 - 3.76}{\sqrt{1.24}}$

Write down all the figures on your calculator display.

5.424389042

(2)

(b) Write your answer to part (a) correct to 2 significant figures.

5.424...
↑
2 s.f.

5.4

(1)

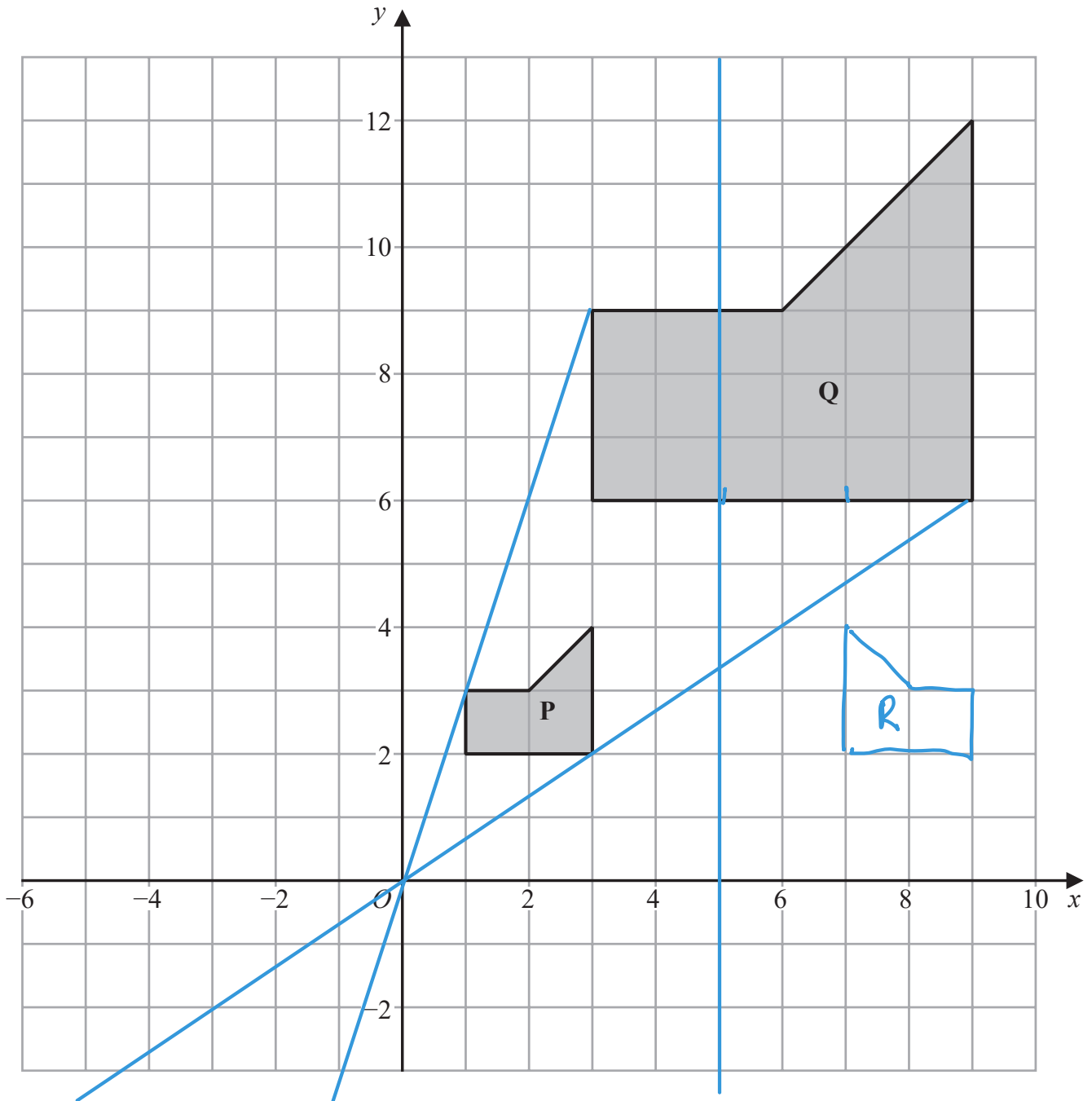
(Total for Question 11 is 3 marks)

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(a) Describe fully the single transformation that maps shape P onto shape Q.

Enlargement, scale factor 3, centre O

(3)

(b) On the grid, reflect shape P in the line with equation $x = 5$
Label your shape R.

(2)

(Total for Question 12 is 5 marks)



13 (a) Simplify $e^8 \div e^2$

$$e^{8-2} = e^6$$

$$e^6$$

(1)

(b) Expand and simplify $(x-3)(x+1)$

$$x \times x = x^2$$

$$x \times 1 = x$$

$$-3 \times x = -3x$$

$$-3 \times 1 = -3$$

$$x^2 - 2x - 3$$

(2)

(Total for Question 13 is 3 marks)

14 Here is a right-angled triangle.

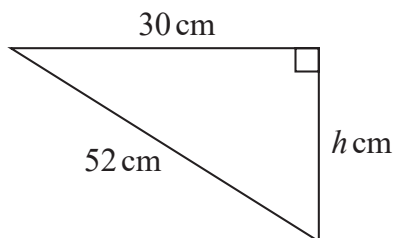


Diagram NOT
accurately drawn

Calculate the value of h .

Give your answer correct to 3 significant figures.

$$\begin{aligned} h &= \sqrt{52^2 - 30^2} \\ &= 42.4735\dots \\ &\quad \uparrow \\ &\quad (3 \text{ sf}) \end{aligned}$$

$$h = 42.5$$

(Total for Question 14 is 3 marks)



16 The diagram shows the front of a wooden door with a semicircular glass window.

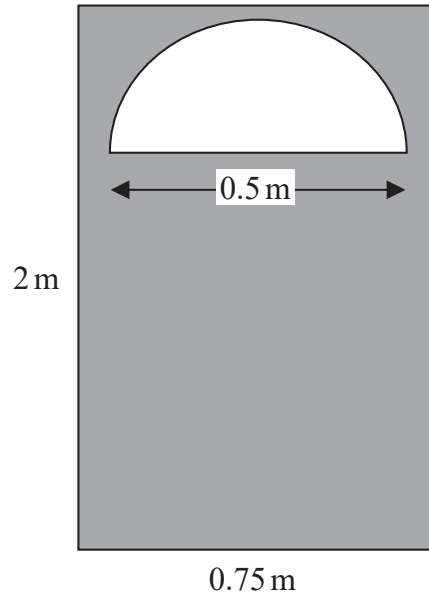


Diagram NOT accurately drawn

$$D = 0.5$$

$$\text{so } r = 0.25 \text{ m}$$

Julie wants to apply 2 coats of wood varnish to the front of the door, shown shaded in the diagram.

250 millilitres of wood varnish covers 4 m^2 of the wood.

Work out how many millilitres of wood varnish Julie will need.
Give your answer correct to the nearest millilitre.

$$\begin{aligned} \text{Door} &\Rightarrow \text{rectangle} - \text{semicircle} \\ &= 2 \times 0.75 - \frac{1}{2} \pi \times 0.25^2 \\ &= 1.401825\dots \end{aligned}$$

$$\begin{aligned} 2 \text{ coats} &= 1.401825\dots \times 2 \\ &= 2.80365\dots \text{ m}^2 \end{aligned}$$

$$\begin{aligned} 250 \text{ ml} &= 4 \text{ m}^2 \\ 62.5 \text{ ml} &= 1 \text{ m}^2 \\ 175.228\dots &= 2.803\dots \end{aligned}$$

\uparrow

..... 175 millilitres

(Total for Question 16 is 5 marks)

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17 Yasmin has some identical rectangular tiles.
Each tile is L cm by W cm.

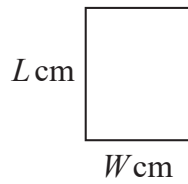


Diagram **NOT** accurately drawn

Using 9 of her tiles, Yasmin makes rectangle $ABCD$ shown in the diagram below.

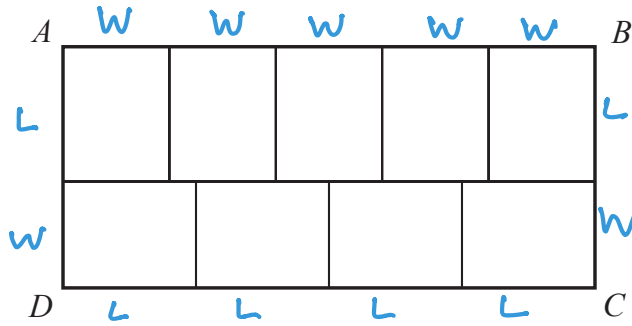


Diagram **NOT** accurately drawn

The area of $ABCD$ is 1620 cm^2

Work out the value of L and the value of W .

$$5W = 4L \quad \text{so} \quad W = \frac{4}{5}L \quad \text{OR} \quad L = \frac{5}{4}W$$

Area

$$1620 = 4L \times (L + W)$$

$$= 4 \times \frac{5}{4}W \left(\frac{5}{4}W + W \right) = 5W \left(\frac{9}{4}W \right)$$

$$= \frac{45}{4}W^2$$

$$\frac{1620 \times 4}{45} = W^2 \quad \rightarrow \quad W^2 = 144 \quad \text{so} \quad W = 12$$

$$\text{using } L = \frac{5}{4} \times 12 = 15$$

$$L = \dots 15 \dots \quad W = \dots 12 \dots$$

(Total for Question 17 is 5 marks)



- 18 Alison buys 5 apples and 3 pears for a total cost of \$1.96
Greg buys 3 apples and 2 pears for a total cost of \$1.22

Michael buys 10 apples and 10 pears.

Work out how much Michael pays for his 10 apples and 10 pears.
Show your working clearly.

$$\begin{array}{r} 5A + 3P = 1.96 \quad \textcircled{1} \times 2 \\ 3A + 2P = 1.22 \quad \textcircled{2} \times 3 \end{array}$$

$$\begin{array}{r} 10A + 6P = 3.92 \\ 9A + 6P = 3.66 \\ \hline A = 0.26 \end{array}$$

sub in $\textcircled{2}$

$$\begin{aligned} 3 \times 0.26 + 2P &= 1.22 \\ 2P &= 1.22 - 0.78 \\ &= 0.44 \\ P &= 0.22 \end{aligned}$$

$$10P + 10A = 2.60 + 2.20 \quad \$ \underline{4.80}$$

(Total for Question 18 is 5 marks)

- 19 Write 3.6×10^3 as a product of powers of its prime factors.
Show your working clearly.

$$3.6 \times 10^3 = 3600$$

$$\begin{aligned} 3600 &= 36 \times 100 \\ &= 6 \times 6 \times 10 \times 10 \\ &= 2 \times 3 \times 2 \times 3 \times 2 \times 5 \times 2 \times 5 \\ &= 2^4 \times 3^2 \times 5^2 \end{aligned}$$

$$\underline{2^4 \times 3^2 \times 5^2}$$

(Total for Question 19 is 3 marks)



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20 In 2018, the population of Sydney was 5.48 million.
This was 22% of the total population of Australia.

Work out the total population of Australia in 2018
Give your answer correct to 3 significant figures.

$$\begin{array}{l}
 22\% = 5.48 \text{ million} \\
 \div 22 \downarrow \quad 1\% = 0.249\dots \\
 \times 100 \downarrow \quad 100\% = 24.9090\dots \\
 \qquad \qquad \qquad \uparrow \\
 \qquad \qquad \qquad (3 \text{ sf.})
 \end{array}$$

..... 24.9 million

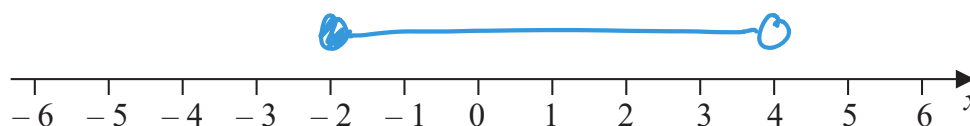
(Total for Question 20 is 3 marks)

21 (i) Solve the inequalities $-7 \leq 2x - 3 < 5$

$$\begin{array}{l}
 +3 \quad +3 \quad +3 \\
 -4 \leq 2x < 8 \\
 \div 2 \quad \div 2 \quad \div 2 \\
 -2 \leq x < 4
 \end{array}$$

$$\underline{-2 \leq x < 4} \quad (3)$$

(ii) On the number line, represent the solution set to part (i)



(2)

(Total for Question 21 is 5 marks)



22 A solid aluminium cylinder has radius 10 cm and height h cm.

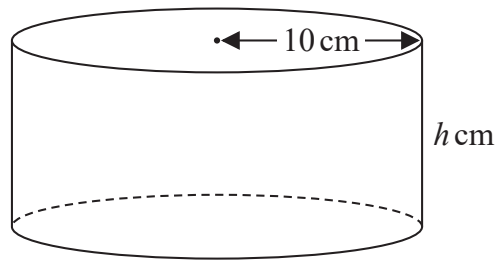


Diagram NOT accurately drawn

The mass of the cylinder is 5.4 kg.
The density of aluminium is 0.0027 kg/cm^3

Calculate the value of h .
Give your answer correct to one decimal place.

$$r = 10 \checkmark$$

$$d = 20$$

$$A = \pi r^2 \checkmark$$

$$C = \pi d$$

$$D = \frac{m}{V}$$

$$V = \frac{m}{D}$$

$$= \frac{5.4}{0.0027} = 2000 \text{ kg}$$

$$\text{Volume} = \pi \times 10^2 \times h$$

$$= 100\pi h$$

$$100\pi h = 2000$$

$$h = \frac{2000}{100\pi}$$

$$= 6.36619\dots$$

↑

(1dp)

$$h = 6.4$$

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

