

1 Work out 6.34×5.2

Tip: Ignore the decimals, and count them back in at the end

$$\begin{array}{r} 634 \\ \times 52 \\ \hline 1268 \\ 31700 \\ \hline 32968 \end{array}$$

$$6.34 \times 5.2 = 32.968$$

32.968

(Total for Question 1 is 3 marks)

2 Expand and simplify $(m + 7)(m + 3)$

$$m^2 + 3m + 7m + 21$$

$$= m^2 + 10m + 21$$

.....
(Total for Question 2 is 2 marks)

$$\begin{array}{r} 38 \\ + 38 \\ \hline 76 \\ + \end{array} \qquad \begin{array}{r} 71 \\ 180 \\ - 76 \\ \hline 104 \end{array}$$

$$\begin{array}{r} 104 \\ + 104 \\ \hline 208 \end{array}$$

152

(Total for Question 3 is 3 marks)



- 4 Gary drove from London to Sheffield.
It took him 3 hours at an average speed of 80 km/h.

Lyn drove from London to Sheffield.
She took 5 hours.

Assuming that Lyn

drove along the same roads as Gary
and did not take a break,

- (a) work out Lyn's average speed from London to Sheffield.



Gary

$$S = 80 \text{ km/h}$$

$$D = 240 \text{ km}$$

$$T = 3 \text{ hours}$$

Lyn

$$S = 48 \text{ km/h}$$

$$D = 240 \text{ km}$$

$$T = 5 \text{ hours}$$

..... **48** km/h
(3)

- (b) If Lyn did **not** drive along the same roads as Gary, explain how this could affect your answer to part (a).

She could have driven a different distance and this would change her average speed

(1)

(Total for Question 4 is 4 marks)



- 5 In a company, the ratio of the number of men to the number of women is 3 : 2

40% of the men are under the age of 25 $\frac{4}{10}$

10% of the women are under the age of 25 $\frac{1}{10}$

What percentage of all the people in the company are under the age of 25?

$$\begin{array}{l} M : W \\ 3 : 2 \end{array}$$

$$\begin{array}{l} \text{men} = \frac{3}{5} \\ \text{women} = \frac{2}{5} \end{array}$$

Under 25 :

$$\text{men} - \frac{4}{10} \times \frac{3}{5} = \frac{12}{50}$$

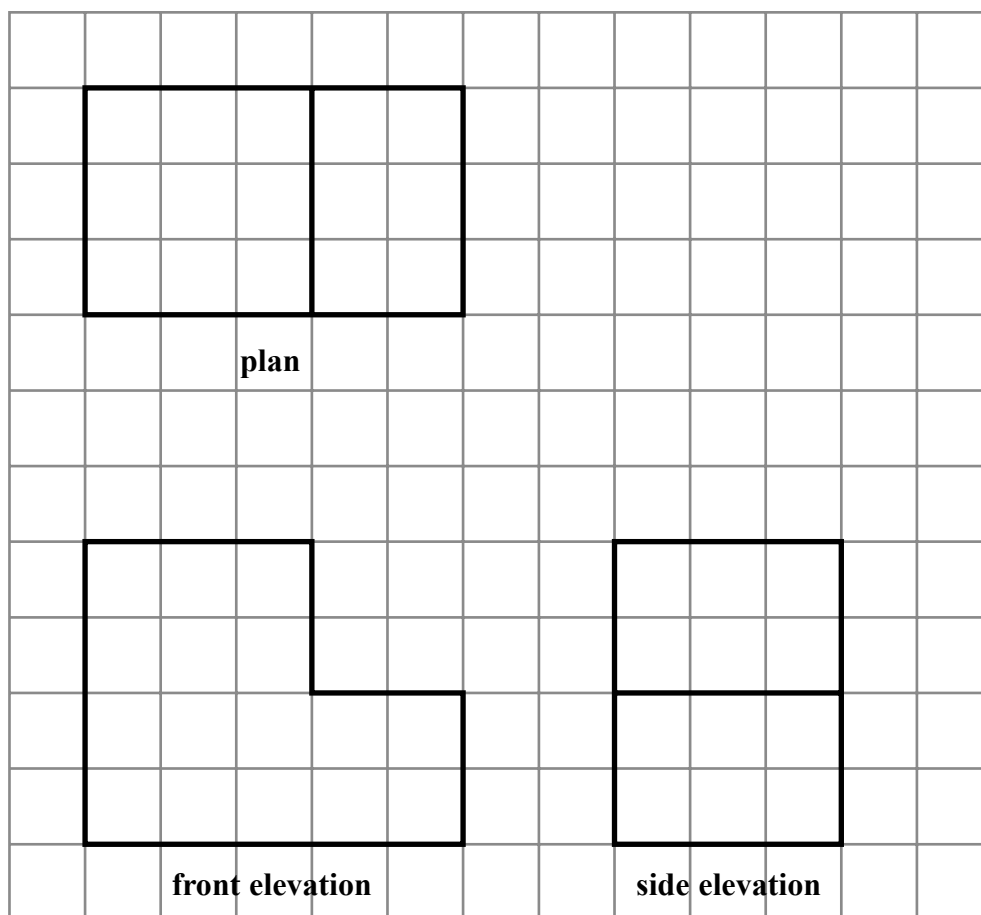
$$\frac{12}{50} + \frac{2}{50} = \frac{14}{50} = \frac{28}{100}$$

$$\text{women} - \frac{1}{10} \times \frac{2}{5} = \frac{2}{50}$$

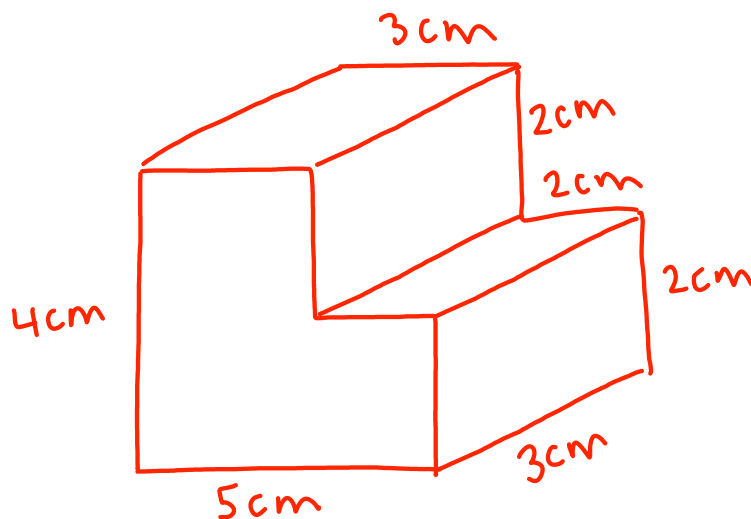
28 %

(Total for Question 5 is 4 marks)

- 6 The plan, front elevation and side elevation of a solid prism are drawn on a centimetre grid.



In the space below, draw a sketch of the solid prism.
Write the dimensions of the prism on your sketch.



(Total for Question 6 is 2 marks)



7 There are 1200 students at a school.

Kate is helping to organise a party.
She is going to order pizza.

Kate takes a sample of 60 of the students at the school.
She asks each student to tell her **one** type of pizza they want.

The table shows information about her results.

Pizza	Number of students
ham	20
salami	15
vegetarian	8
margarita	17

Work out how much ham pizza Kate should order.

Write down any assumption you make **and** explain how this could affect your answer.

$$\frac{20}{60} = \frac{x}{1200}$$

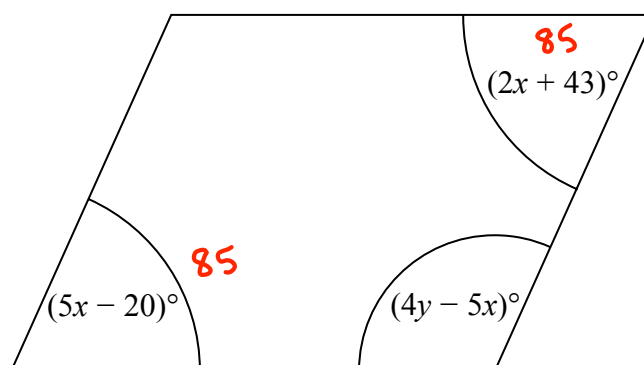
↘
x20

$$20 \times 20 = 400$$

I have assumed that the people in the sample are representative of the 1200 students, if this is not true, my answer would not be accurate

(Total for Question 7 is 3 marks)

8 Here is a parallelogram.



Work out the value of x and the value of y .

Tip: Opposite angles in a parallelogram are equal

$$\begin{array}{rcl}
 5x - 20 & = & 2x + 43 \\
 -2x & & -2x \\
 \hline
 3x - 20 & = & 43 \\
 +20 & & +20 \\
 \hline
 3x & = & 63 \\
 \div 3 & & \div 3 \\
 \hline
 x & = & 21
 \end{array}$$

$$\begin{aligned}
 & 5(21) - 20 \\
 & = 105 - 20 \\
 & = 85
 \end{aligned}$$

$$\begin{array}{r}
 +85 \\
 +85 \\
 \hline
 170
 \end{array}
 \quad
 \begin{array}{r}
 2 \overline{) 360} \\
 \underline{-170} \\
 190
 \end{array}
 \quad
 \begin{array}{r}
 095 \\
 2 \overline{) 190}
 \end{array}$$

$$\begin{array}{rcl}
 4y - 5x & = & 95 \\
 4y - 105 & = & 95 \\
 \hline
 4y & = & 200 \\
 \hline
 y & = & 50
 \end{array}$$

$$x = 21$$

$$y = 50$$

(Total for Question 8 is 5 marks)

- 9 Work out the value of $(9 \times 10^{-4}) \times (3 \times 10^7)$
Give your answer in standard form.

$$= 27 \times 10^3$$

$$2.7 \times 10^4$$

(Total for Question 9 is 2 marks)

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10 (a) Write down the value of $64^{\frac{1}{2}}$

$$\sqrt{64} = 8$$

8

(1)

(b) Find the value of $\left(\frac{8}{125}\right)^{-\frac{2}{3}}$

$$\left(\sqrt[3]{\frac{8}{125}}\right)^{-2}$$

$$= \left(\frac{2}{5}\right)^{-2}$$

$$\frac{25}{4}$$

(2)

(Total for Question 10 is 3 marks)

$$\left(\frac{2}{5}\right)^2 = \frac{4}{25}$$

$$\therefore \left(\frac{2}{5}\right)^{-2} = \frac{25}{4}$$

11 One uranium atom has a mass of 3.95×10^{-22} grams. 4×10^{-22} grams

(a) Work out an **estimate** for the number of uranium atoms in 1 kg of uranium.

$$\begin{aligned}
 &1 \text{ kg} \div 4 \times 10^{-22} \text{ g} \\
 &1000 \div 4 \times 10^{-22} \\
 &(1 \times 10^3) \div (4 \times 10^{-22}) \\
 &= 0.25 \times 10^{25}
 \end{aligned}$$

$$\begin{aligned}
 &2.5 \times 10^{24} \\
 &\text{(3)}
 \end{aligned}$$

(b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

Underestimate as I rounded the number I was dividing by up

(1)

(Total for Question 11 is 4 marks)

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$$1\text{ m} = 100\text{ cm}$$

12 Pressure = $\frac{\text{force}}{\text{area}}$

Find the pressure exerted by a force of 900 newtons on an area of 60 cm². 0.006 m²
 Give your answer in newtons/m².

$$\div 100^2$$

$$P = \frac{900}{0.006} = \frac{900000}{6}$$

$$\begin{array}{r} 150000 \\ 6 \overline{) 900000} \end{array}$$

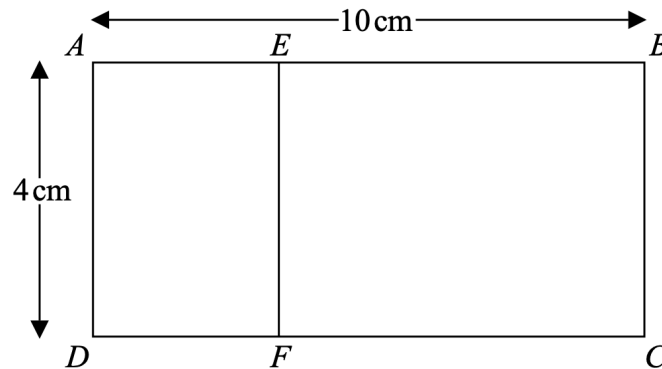
$$150000 \text{ newtons/m}^2$$

(Total for Question 12 is 2 marks)

Tip: If we multiply the top and the bottom of the fraction by 1000, we are finding an equivalent fraction, which will have the same answer. We do this as we are unable to divide by a decimal number!



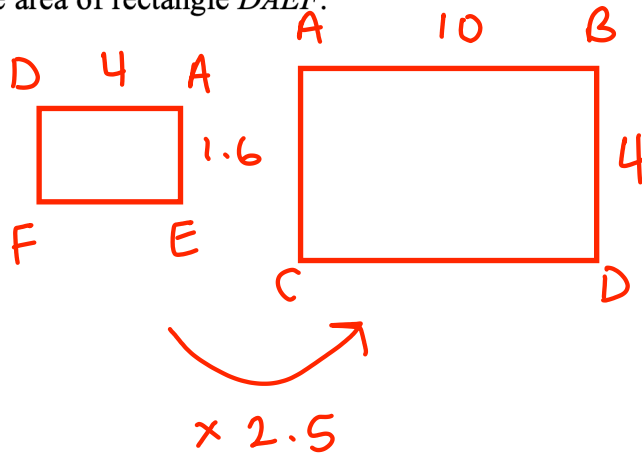
13 Rectangle $ABCD$ is mathematically similar to rectangle $DAEF$.



$$AB = 10 \text{ cm.}$$

$$AD = 4 \text{ cm.}$$

Work out the area of rectangle $DAEF$.



$$6.4 \text{ cm}^2$$

(Total for Question 13 is 3 marks)

$$4 \div 2.5$$

$$\frac{4}{2.5} = \frac{40}{25}$$

$$25 \overline{) 40.0} \begin{array}{r} 0 \\ 1 \\ 6 \end{array}$$

$$4 \times 1.6 = 6.4$$

$$\begin{array}{r} \times 16 \\ 4 \\ \hline 64 \\ 2 \end{array}$$

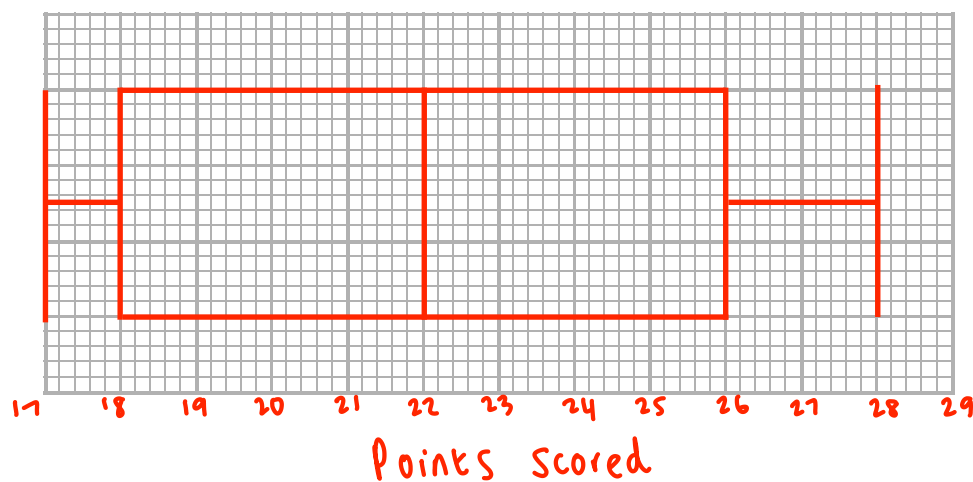
$$\text{Median} = \frac{15+1}{2} = 8^{\text{th}} \quad \text{LQ} = 4^{\text{th}} \quad \text{VQ} = 12^{\text{th}}$$

- 14 Ben played 15 games of basketball.
Here are the points he scored in each game.

17 18 18 18 19 20 20 22 23 23 23 26 27 28 28

LQ
m
VQ

- (a) Draw a box plot for this information.



(3)

Sam plays in the same 15 games of basketball.

The median number of points Sam scored is 23

The interquartile range of these points is 12

The range of these points is 20

- (b) Who is more consistent at scoring points, Sam or Ben?
You must give a reason for your answer.

Ben

$$\text{Range} = 11$$

$$\text{IQR} = 8$$

Ben, both his range and IQR are lower

(2)

(Total for Question 14 is 5 marks)



15 In a shop, all normal prices are reduced by 20% to give the sale price.

The sale price of a TV set is then reduced by 30%.

Mary says,

“ $30 + 20 = 50$, so this means that the normal price of the TV set has been reduced by 50%.”

Is Mary right?

You must give a reason for your answer.

$$0.8 \times 0.7 = 0.56$$

= 44% reduction

Mary is wrong!

(Total for Question 15 is 2 marks)

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16 Factorise fully $20x^2 - 5$

$$= 5(4x^2 - 1)$$

$$= 5(2x - 1)(2x + 1)$$

.....
(Total for Question 16 is 2 marks)

17 Make a the subject of

$$\begin{array}{rcl}
 a + 3 & = & \frac{2a + 7}{r} \\
 \times r & & \times r \\
 ar + 3r & = & 2a + 7 \\
 - ar & & - ar \\
 3r & = & 2a - ar + 7 \\
 - 7 & & - 7 \\
 3r - 7 & = & 2a - ar \\
 3r - 7 & = & a(2 - r) \\
 \frac{3r - 7}{2 - r} & = & a
 \end{array}$$

$$a = \frac{3r - 7}{2 - r} \quad \text{OR} \quad \frac{7 - 3r}{r - 2}$$

(Total for Question 17 is 3 marks)

18 Solid A and solid B are mathematically similar.

The ratio of the surface area of solid A to the surface area of solid B is 4:9

The volume of solid B is 405 cm^3 .

Show that the volume of solid A is 120 cm^3 .

$$\begin{array}{l} A : B \\ 4 : 9 \quad (\text{Area SF}) \\ 2 : 3 \quad (\text{Length SF}) \\ 8 : 27 \quad (\text{Volume SF}) \end{array}$$

$$\begin{array}{l} \text{Volume } A : B \\ \times 15 \quad \left(\begin{array}{l} 8 : 27 \\ \downarrow 120 : 405 \end{array} \right) \times 15 \end{array}$$

$$\begin{array}{r} 015 \\ 27 \overline{)405} \\ \underline{54} \\ 81 \\ \underline{108} \\ 135 \end{array}$$

$$\begin{array}{r} \times 15 \\ 8 \\ \hline 120 \\ 4 \end{array}$$

$$\begin{array}{l} \text{Volume A} = \\ \underline{120 \text{ cm}^3} \end{array}$$

(Total for Question 18 is 3 marks)

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19 Solve $x^2 > 3x + 4$

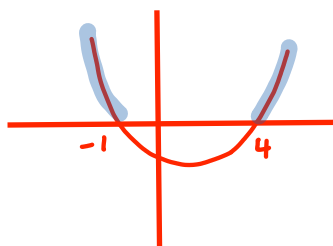
Tip: To solve a quadratic, the equation needs to equal 0

$$\begin{array}{r|l}
 -3x & -3x \\
 x^2 - 3x & > 4 \\
 & -4 \\
 x^2 - 3x - 4 & > 0
 \end{array}$$

$$(x - 4)(x + 1) > 0$$

$$x = 4$$

$$x = -1$$



$$x < -1, x > 4$$

(Total for Question 19 is 3 marks)

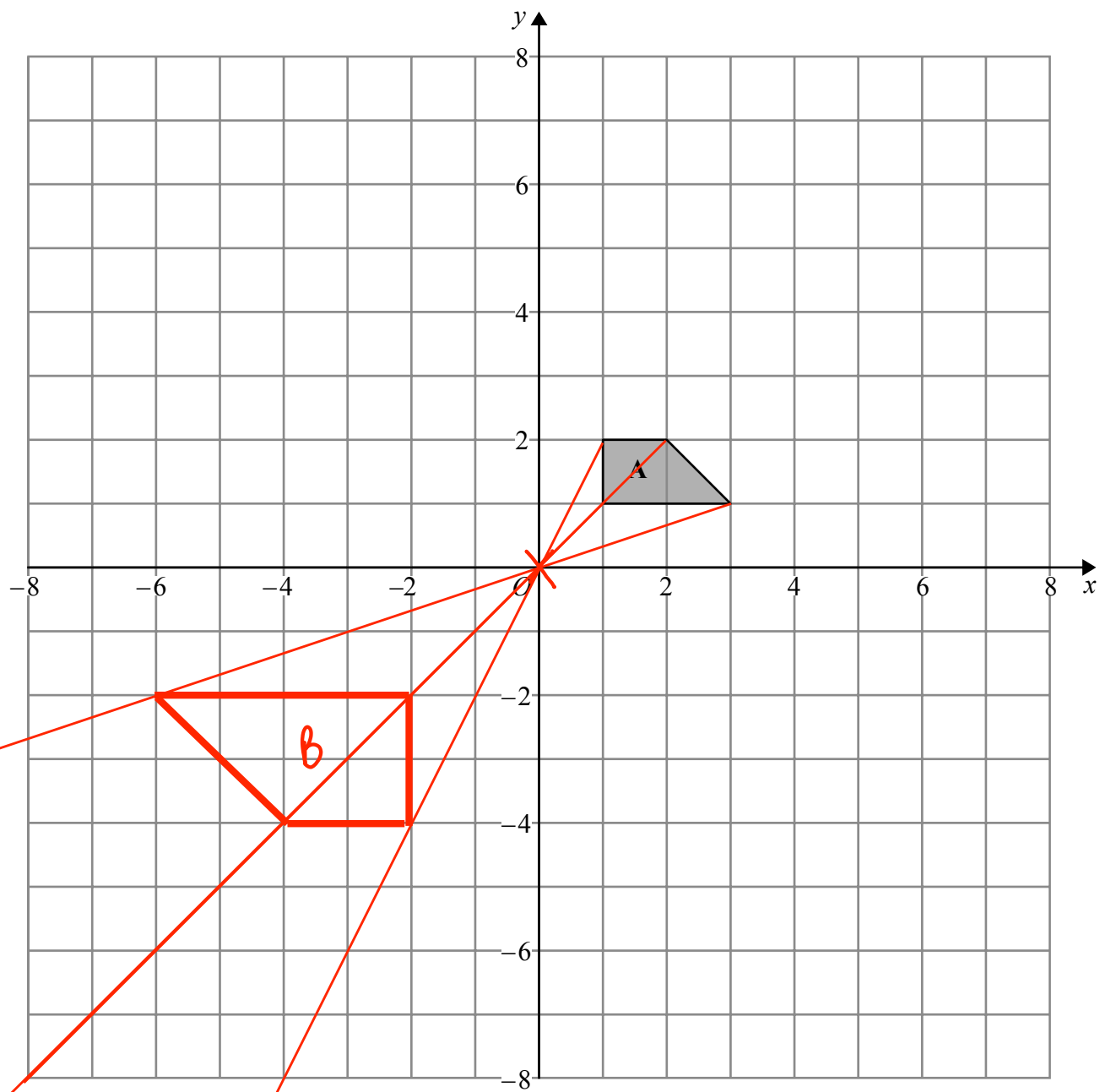
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20



- (a) Enlarge shape **A** by scale factor -2 , centre $(0, 0)$
Label your image **B**.

(2)

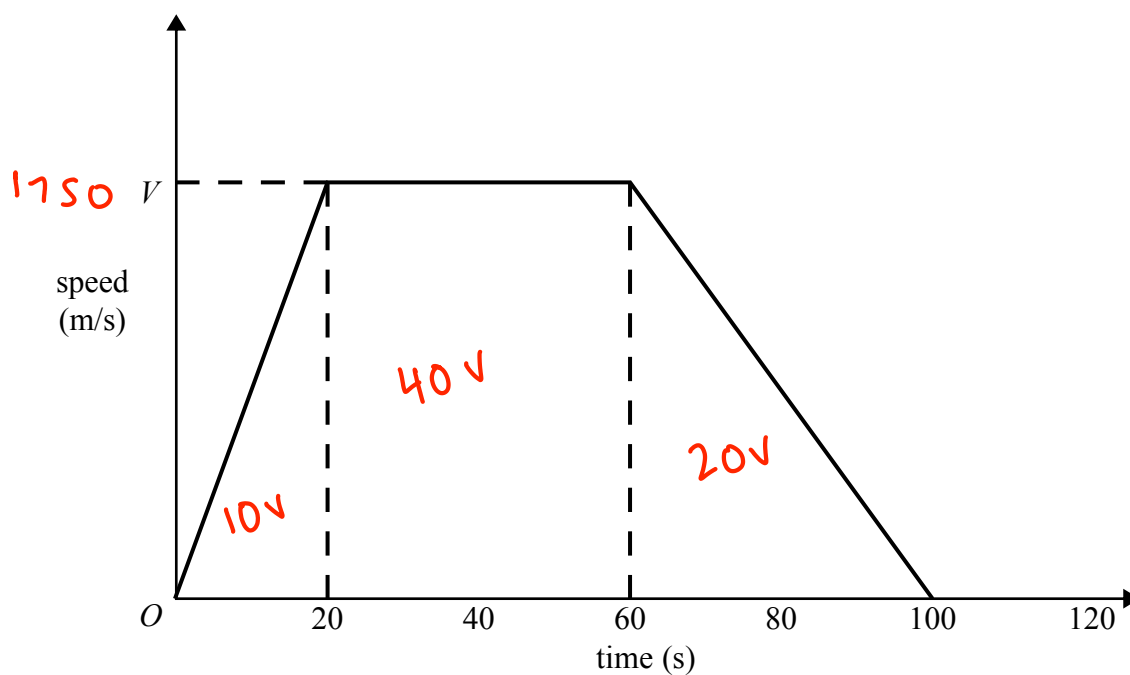
- (b) Describe fully the single transformation that will map shape **B** onto shape **A**.

Enlargement by SF $-1/2$, centre $(0, 0)$

(1)

(Total for Question 20 is 3 marks)

- 21 Here is a speed-time graph for a car journey.
The journey took 100 seconds.



The car travelled 1.75 km in the 100 seconds.

- (a) Work out the value of V .

$$\frac{20 \times V}{2} = 10V$$

$$\frac{40 \times V}{2} = 20V$$

$$40 \times V = 40V$$

$$70V = 1750m$$

$$V = 25$$

25
(3)

- (b) Describe the acceleration of the car for each part of this journey.

First 20 seconds, constant acceleration. 40 seconds with no acceleration. Last 40 seconds constant deceleration

(2)

(Total for Question 21 is 5 marks)

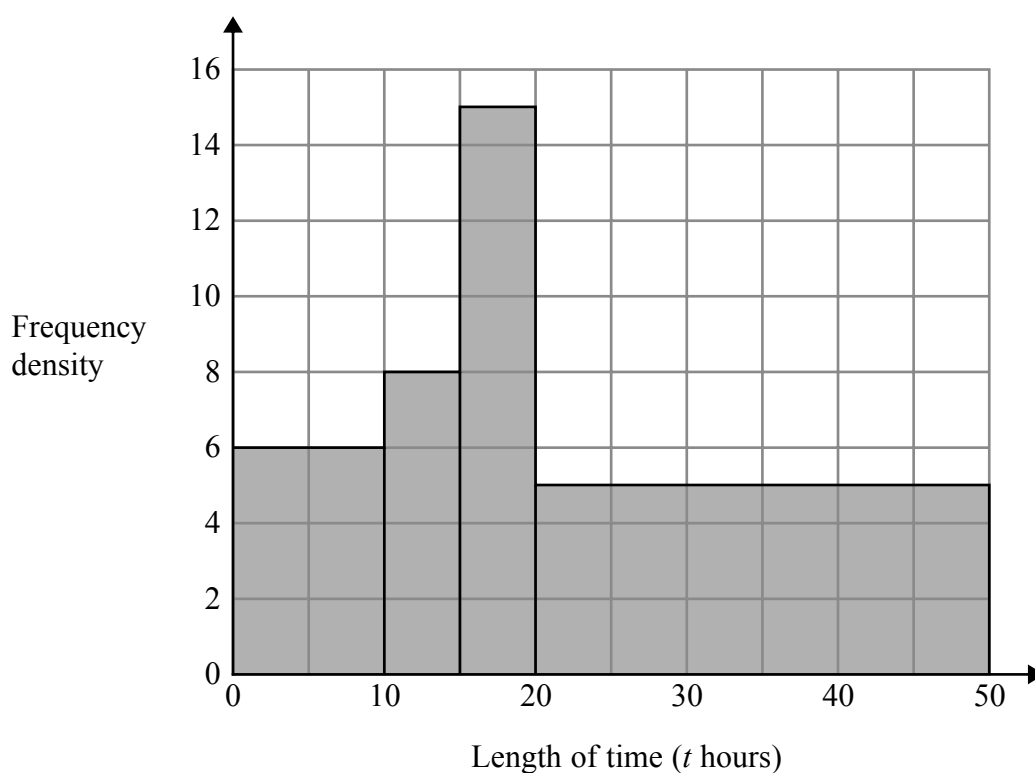


22 Bhavna recorded the lengths of time, in hours, that some adults watched TV last week.

The table shows information about her results.

Length of time (t hours)	Frequency
$0 \leq t < 10$	6
$10 \leq t < 15$	8
$15 \leq t < 20$	15
$20 \leq t < 40$	5

Bhavna made some mistakes when she drew a histogram for this information.



Write down **two** mistakes Bhavna made.

- 1 plotted frequency, not frequency density
- 2 20-50 bar should be 20-40

(Total for Question 22 is 2 marks)

23 Show that $\frac{1}{1 + \frac{1}{\sqrt{2}}}$ can be written as $2 - \sqrt{2}$

$$\frac{1}{(1 + 1/\sqrt{2})} \times \frac{1 - 1/\sqrt{2}}{(1 - 1/\sqrt{2})} = \frac{1 - 1/\sqrt{2}}{1 - 1/\sqrt{2} + 1/\sqrt{2} - 1/2}$$

$$= \frac{1 - 1/\sqrt{2}}{0.5} \times \frac{2}{2}$$

Tip: We know we want the denominator of the fraction to be 1, so we can multiple the top and bottom of the fraction by 2.

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

$$= 2 - \sqrt{2}$$

(Total for Question 23 is 3 marks)

$$\frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$$



24 John has an empty box.

He puts some red counters and some blue counters into the box.

$$\begin{aligned} \text{red} &= x \\ \text{blue} &= 4x \end{aligned}$$

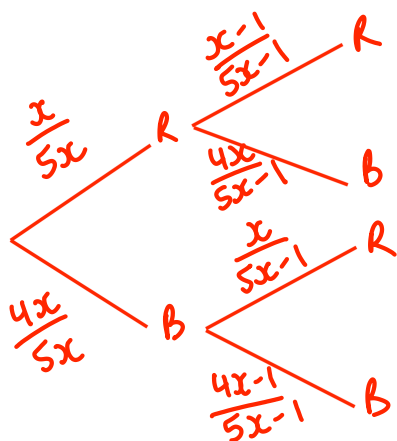
The ratio of the number of red counters to the number of blue counters is 1 : 4

$$\text{Total} = 5x$$

Linda takes at random 2 counters from the box.

The probability that she takes 2 red counters is $\frac{6}{155}$

How many red counters did John put into the box?



$$P(R, R) = \frac{x}{5x} \times \frac{x-1}{5x-1} = \frac{x^2 - x}{25x^2 - 5x}$$

$$\frac{x^2 - x}{25x^2 - 5x} = \frac{6}{155}$$

$$155x^2 - 155x = 150x^2 - 30x$$

$$5x^2 - 125x = 0$$

$$5x(x - 25) = 0$$

$$x = 0 \quad \text{or} \quad x = 25$$

25

(Total for Question 24 is 4 marks)

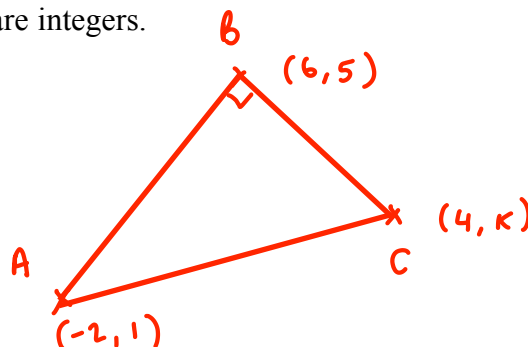
- 25 $A(-2, 1)$, $B(6, 5)$ and $C(4, k)$ are the vertices of a right-angled triangle ABC .
Angle ABC is the right angle.

Find an equation of the line that passes through A and C .

Give your answer in the form $ay + bx = c$ where a , b and c are integers.

$$\text{Gradient } AB = \frac{5-1}{6-(-2)} = \frac{4}{8} = \frac{1}{2}$$

$$\therefore \text{Gradient } BC = -2$$



$$\begin{array}{r|l} 5-k & = -2 \\ 6-4 & \\ \hline 5-k & = -2 \\ 2 & \\ \hline \times 2 & \times 2 \\ 5-k & = -4 \\ +k & +k \\ 5 & = -4+k \\ +4 & +4 \\ 9 & = k \end{array}$$

$$C = (4, 9)$$

$$\text{Grad } AC = \frac{9-1}{4-(-2)} = \frac{8}{6} = \frac{4}{3}$$

$$\begin{array}{l} y = \frac{4}{3}x + C \\ 9 = \frac{4}{3}(4) + C \\ 9 = \frac{16}{3} + C \\ -\frac{16}{3} \quad -\frac{16}{3} \end{array}$$

Tip: 9 can be written as $\frac{27}{3}$

$$\frac{27}{3} - \frac{16}{3} = \frac{11}{3} = C$$

$$\begin{aligned} y &= \frac{4}{3}x + \frac{11}{3} \\ 3y &= 4x + 11 \end{aligned}$$

$$\boxed{3y - 4x = 11}$$

(Total for Question 25 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS