



October/November 2020

- 1 Simplify.
 $3a + 7b - 4a + b$

..... $-a + 8b$ [2]

- 2 A field, ABC , is in the shape of a triangle.
 $AC = 500$ m and $BC = 650$ m.

Using a ruler and compasses only, complete the scale drawing of the field ABC .

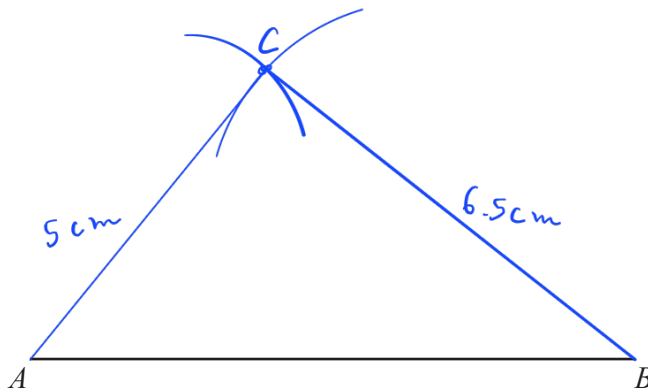
Leave in your construction arcs.

Use a scale of 1 cm to represent 100 m.

The side AB has been drawn for you.

$$AC = \frac{500}{100} = 5 \text{ (cm)}$$

$$BC = \frac{650}{100} = 6.5 \text{ (cm)}$$



Scale: 1 cm to 100 m

[3]

- 3 Rangan buys 3.6 kg of potatoes and 2.8 kg of leeks.
 The total cost is \$13.72.
 Leeks cost \$2.65 per kilogram.

Find the cost of 1 kg of potatoes.

p

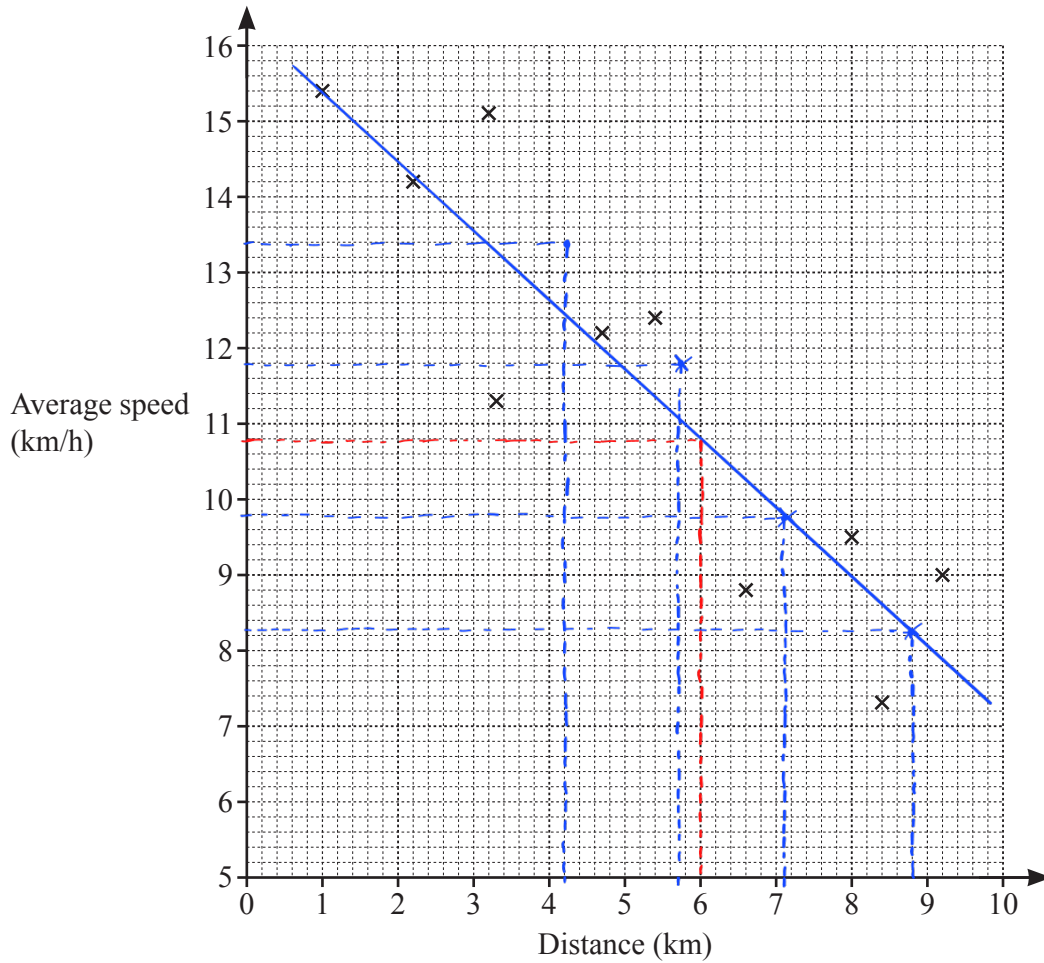
$$3.6p + 2.8 \times 2.65 = 13.72$$

$$3.6p = 6.3$$

$$p = 1.75$$

\$ 1.75 [3]

- 4 Aisha records the distance she runs and her average speed.
 The results are shown in the scatter diagram.



- (a) The table shows the results of four more runs.

Distance (km)	4.2	5.7	7.1	8.8
Average speed (km/h)	13.4	11.8	9.8	8.3

On the scatter diagram, plot these points.

[2]

- (b) What type of correlation is shown in the scatter diagram?

..... *negative* [1]

- (c) On the scatter diagram, draw a line of best fit.

[1]

- (d) Use your line of best fit to estimate her average speed when she runs a distance of 6 km.

..... *10.8* km/h [1]

5

$$T = \frac{49.2 - 9.59}{4.085 \times 2.35}$$



By writing each number correct to 1 significant figure, work out an estimate for T .
You must show all your working.

$$T \approx \frac{50 - 10}{4 \times 2} = \frac{40}{8} = 5$$

.....5..... [2]

6 Without using a calculator, work out $2\frac{2}{3} \times 2\frac{3}{4}$.



You must show all your working and give your answer as a mixed number in its simplest form.

$$\begin{aligned} & \frac{8}{3} \times \frac{11}{4} \\ = & \frac{4 \times 2 \times 11}{3 \times 4} \\ = & \frac{22}{3} \end{aligned}$$

..... $7\frac{1}{3}$ [3]

7 Make x the subject of this formula.



$$2y = 5x - 7$$

$$2y + 7 = 5x$$

$$\frac{2y + 7}{5} = x$$

$x = \frac{2y + 7}{5}$ [2]

- 8 (a) 1, 2, 3, 5 and 7 are all common factors of two numbers.

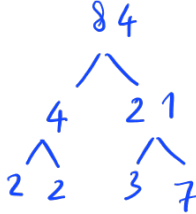
R

Write down the digit that the two numbers must end in.

$$\begin{aligned} \therefore 5 &\Rightarrow \text{ending } 0 \text{ or } 5 \\ \therefore 2 &\Rightarrow \text{ending } 0 \text{ or } 2 \end{aligned}$$

.....0..... [1]

- (b) Write 84 as a product of its prime factors.



..... $2^2 \times 3 \times 7$ [2]

- 9 (a) Ahmed increases 40 by 300%.

R

From this list, put a ring around the correct calculation.

40×1.300

40×3

40×400

40×4

40×300

[1]

- (b) Ahmed finds the magnitude of the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

From this list, put a ring around the correct calculation.

$\sqrt{2^2 + -3^2}$

$2^2 - 3^2$

$\sqrt{2^2 - 3^2}$

$2^2 + (-3)^2$

$\sqrt{2^2 + (-3)^2}$

[1]

- 10 A town has a population of 45 000.

R

This population increases exponentially at a rate of 1.6% per year.

Find the population of the town at the end of 5 years.

Give your answer correct to the nearest hundred.

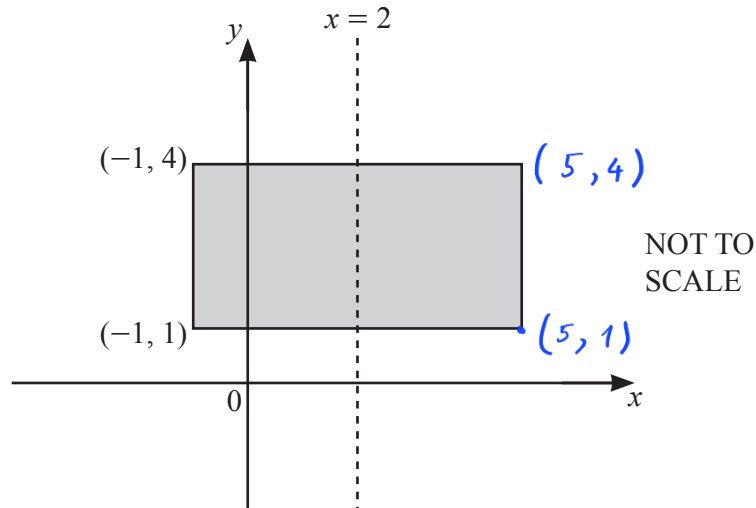
$$45\,000 \left(1 + \frac{1.6}{100} \right)^5$$

$\approx 48\,717$

$\approx 48\,700$

.....48.700..... [3]

11



The diagram shows a rectangle with a line of symmetry at $x = 2$.
Two vertices of the rectangle are at $(-1, 1)$ and $(-1, 4)$.

The shaded region is defined by the inequalities $a \leq x \leq b$ and $c \leq y \leq d$.

Find the values of a , b , c and d .

$$a = \dots -1 \dots$$

$$b = \dots 5 \dots$$

$$c = \dots 1 \dots$$

$$d = \dots 4 \dots \quad [2]$$

12 The interior angle of a regular polygon with n sides is 156° .

Work out the value of n .

$$\frac{(n-2)180}{n} = 156$$

$$180n - 360 = 156n$$

$$24n = 360$$

$$n = \dots 15 \dots \quad [2]$$

13 Write the recurring decimal $0.1\dot{7}$ as a fraction in its simplest form.

You must show all your working.

$$x = 0.1777\dots$$

$$10x = 1.777\dots$$

$$100x = 17.777\dots$$

$$90x = 17 - 1 = 16$$

$$x = \frac{16}{90}$$

$$\dots \frac{8}{45} \dots \quad [3]$$

14 Find the gradient of a line that is perpendicular to $8y + 4x = 5$.

(R)

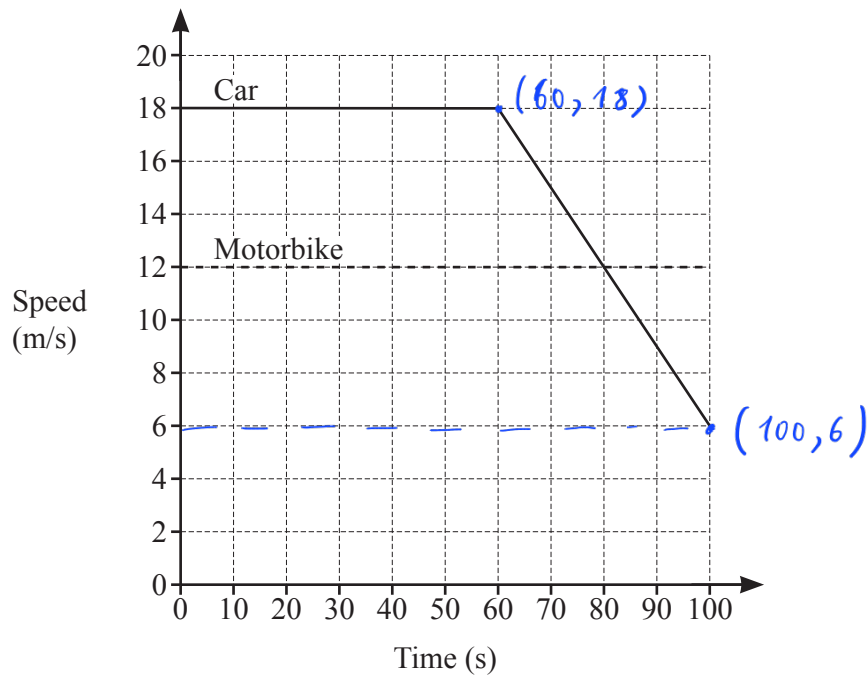
$$8y = -4x + 5$$

$$y = -\frac{4}{8}x + \frac{5}{8}$$

$$-1 : \left(-\frac{4}{8}\right) = 2 \quad \dots\dots\dots 2 \quad \dots\dots\dots [2]$$

15

(R)



The diagram shows the speed–time graph for 100 seconds of the journey of a car and of a motorbike.

(a) Find the deceleration of the car between 60 and 100 seconds.

$$\text{acceleration} = \frac{6 - 18}{100 - 60} = -0.3$$

$$\Rightarrow \text{deceleration} = 0.3 \quad \dots\dots\dots 0.3 \quad \dots\dots\dots \text{m/s}^2 [1]$$

(b) Calculate how much further the car travelled than the motorbike during the 100 seconds.

$$\text{Distance travelled by motorbike} : 12 \times 100 = 1200$$

Distance travelled by car :

$$\frac{1}{2}(60 + 100)(18 - 6) + 100 \times 6 = 1560$$

$$1560 - 1200 = 360$$

$$\dots\dots\dots 360 \quad \dots\dots\dots \text{m} [3]$$

16 Factorise $6x^2 + 7x - 20$.

7

$$6x^2 - 8x + 15x - 20$$

$$2x(3x - 4) + 5(3x - 4)$$

$$(3x - 4)(2x + 5)$$

$$\dots(3x - 4)(2x + 5)\dots [2]$$

17 (a) $f(x) = 3x^2 + a$ where a is an integer.
 $f(-2) = 19$

7

Find the value of a .

$$3(-2)^2 + a = 19$$

$$12 + a = 19$$

$$a = 7$$

$$a = \dots 7 \dots [2]$$

(b) $g(x) = 2x + 7$ $h(x) = 3x - 8$

(i) Find $gh(x)$ in its simplest form.

$$g h(x) = 2(3x - 8) + 7$$

$$= 6x - 16 + 7$$

$$\dots 6x - 9 \dots [2]$$

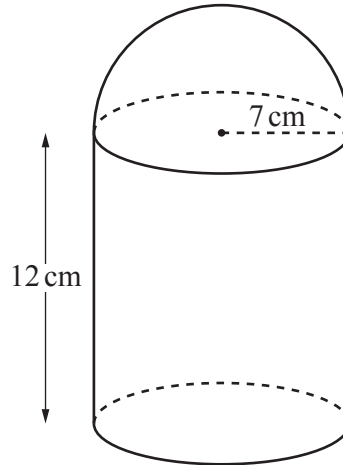
(ii) Find $g^{-1}(x)$.

$$\times 2 \rightarrow + 7$$

$$: 2 \leftarrow - 7$$

$$g^{-1}(x) = \dots \frac{x - 7}{2} \dots [2]$$

18

NOT TO
SCALE

The diagram shows a solid made from a cylinder and a hemisphere, both of radius 7 cm.
The cylinder has length 12 cm.

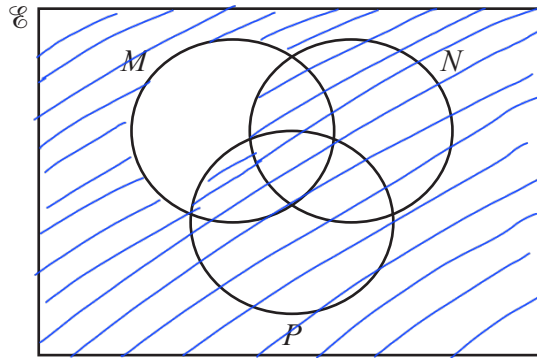
Work out the total surface area of the solid.

$$\begin{aligned}
 \text{Total} &= \frac{1}{2} \text{ area}_{\text{sphere}} + \text{curved area}_{\text{cylinder}} + \text{area}_{\text{base}} \\
 &= \frac{1}{2} \times 4\pi 7^2 + 2\pi 7 \times 12 + \pi \times 7^2 \\
 &= 98\pi + 168\pi + 49\pi \\
 &= 315\pi
 \end{aligned}$$

.....990..... cm² [4]

- 19 In this Venn diagram, shade the region $M'UNUP$.

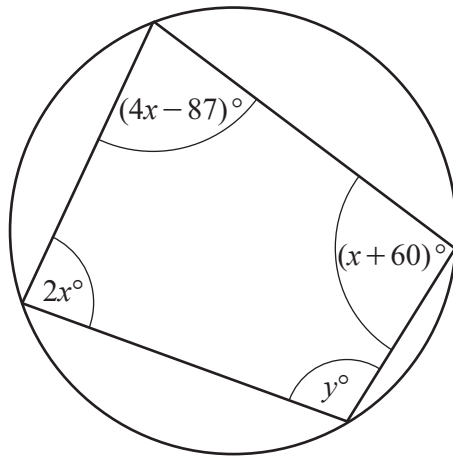
7



[1]

20

7



NOT TO
SCALE

The diagram shows a cyclic quadrilateral.

Find the value of y .

$$2x + (x + 60) = 180$$

$$3x + 60 = 180$$

$$3x = 120$$

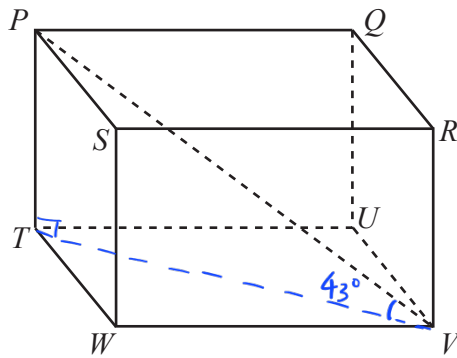
$$x = 40$$

$$y + (4x - 87) = 180$$

$$y + 73 = 180$$

$$y = \dots\dots\dots 107 \dots\dots\dots [4]$$

21


NOT TO
SCALE

The diagram shows a cuboid $PQRSTUW$.

$PV = 17.2$ cm

The angle between the line PV and the base $TUVW$ of the cuboid is 43° .

Calculate PT .

$$\sin 43^\circ = \frac{PT}{PV}$$

$$PT = 17.2 \sin 43^\circ$$

$$PT \approx 11.7$$

$$PT = \dots\dots 11.7 \dots\dots \text{ cm [3]}$$

22 Simplify.



$$\frac{x^2 - 5x}{2x^2 - 50}$$

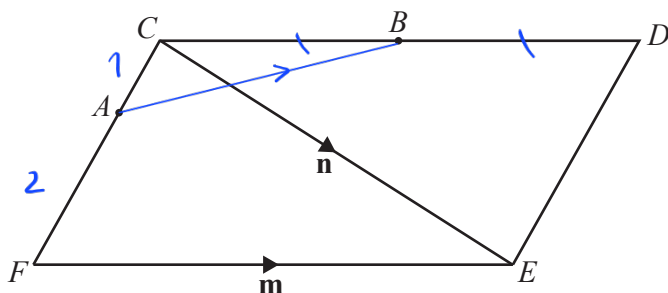
$$\frac{x(x-5)}{2(x^2-25)}$$

$$\frac{x(x-5)}{2(x-5)(x+5)}$$

$$\dots\dots \frac{x}{2(x+5)} \dots\dots \text{ [4]}$$

23 (a)

7

NOT TO
SCALE

The diagram shows a parallelogram $CDEF$.

$\overrightarrow{FE} = \mathbf{m}$ and $\overrightarrow{CE} = \mathbf{n}$.

B is the midpoint of CD .

$FA = 2AC$

Find an expression, in terms of \mathbf{m} and \mathbf{n} , for \overrightarrow{AB} .

Give your answer in its simplest form.

$$\begin{aligned}\overrightarrow{CF} &= \overrightarrow{CE} + \overrightarrow{EF} = \mathbf{n} - \mathbf{m} \\ \overrightarrow{CA} &= \frac{1}{3} \overrightarrow{CF} = \frac{1}{3} (\mathbf{n} - \mathbf{m}) \\ \overrightarrow{CB} &= \frac{1}{2} \overrightarrow{CD} = \frac{1}{2} \overrightarrow{FE} = \frac{1}{2} \mathbf{m} \\ \overrightarrow{AB} &= \overrightarrow{AC} + \overrightarrow{CB} \\ &= -\frac{1}{3} (\mathbf{n} - \mathbf{m}) + \frac{1}{2} \mathbf{m} = -\frac{1}{3} \mathbf{n} + \frac{1}{3} \mathbf{m} + \frac{1}{2} \mathbf{m} \\ \overrightarrow{AB} &= \frac{5}{6} \mathbf{m} - \frac{1}{3} \mathbf{n} \dots \dots \dots [3]\end{aligned}$$

(b) $\overrightarrow{GH} = \frac{5}{6}(2\mathbf{p} + \mathbf{q})$ $\overrightarrow{JK} = \frac{5}{18}(2\mathbf{p} + \mathbf{q})$

Write down **two** facts about vectors \overrightarrow{GH} and \overrightarrow{JK} .

$$\begin{aligned}\overrightarrow{GH} &= 3 \overrightarrow{JK} \\ \overrightarrow{GH} \text{ and } \overrightarrow{JK} &\text{ are parallel} \dots \dots \dots [2]\end{aligned}$$