

1 Write down a common multiple of 18 and 24.



..... 72 [1]

2 A train journey starts at 23 40 and finishes at 06 50.



Work out the time taken for this journey.

23:40 → midnight → 06:50
 0h 20' + 6h 50' = 6h 70' = 7h 10' 7 h 10 min [1]

3 Write 32 cm as a fraction of 2 m. 200cm



Give your answer in its simplest form.

$$\frac{32}{200} = \frac{4}{25}$$

..... $\frac{4}{25}$ [2]

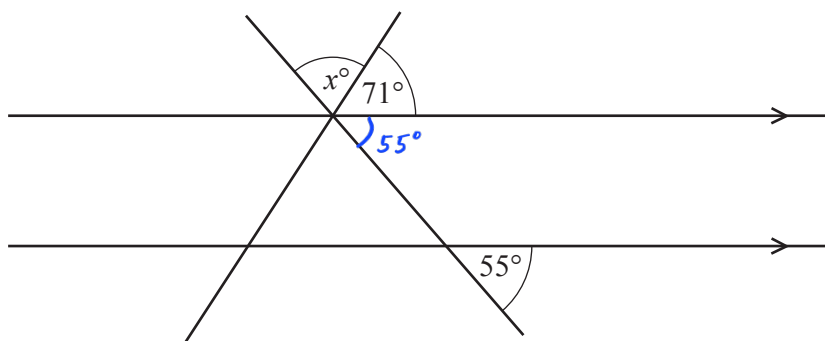
4 Divide \$200 in the ratio 7:3.



$$\frac{200}{7+3} \begin{cases} \times 7 = 140 \\ \times 3 = 60 \end{cases}$$

\$ 140 , \$ 60 [2]

5



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

Find the value of x .

$$x = 180 - 55 - 71 = 54$$

$x =$ 54 [2]

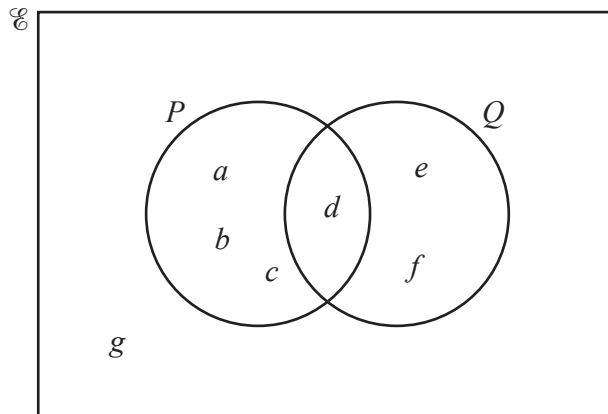
- 6 The price of a computer is \$520.
 This price is reduced by 15% in a sale.

Work out the sale price.

$$520 - 520 \times 15\% = 442$$

\$ 442 [2]

- 7
 R



The Venn diagram shows the elements of the sets \mathcal{E} , P and Q .

Complete the statements.

(a) $P = \{ \dots \underline{a, b, c, d} \dots \}$ [1]

(b) $n(P \cup Q) = \dots \underline{6} \dots$ [1]

- 8
 R

(a) $\overset{1}{3}, \overset{2}{9}, \overset{3}{27}, \overset{4}{81}, \dots$

Write down the next term in this sequence.

243 [1]

(b) 13, +4 17, +4 21, +4 25, ...

Find the n th term of this sequence.

$4n + 9$ [2]

9 Without using a calculator, work out $\frac{1}{3} + \frac{5}{6}$.

R

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

$$\frac{2}{6} + \frac{5}{6} = \frac{7}{6} = 1 \frac{1}{6}$$

$$\dots\dots\dots 1 \frac{1}{6} \dots\dots\dots [2]$$

10 Simplify $18x^{18} \div 9x^9$.

R

$$(18 : 9) (x^{18} : x^9)$$

$$2 x^{18-9}$$

$$\dots\dots\dots 2x^9 \dots\dots\dots [2]$$

11 Solve the simultaneous equations.

R

$$\begin{array}{r} x - 3y = 7 \\ - 2x - 3y = 11 \end{array}$$

$$(x - 2x) = 7 - 11$$

$$-x = -4$$

$$x = 4$$

$$\Rightarrow 4 - 3y = 7$$

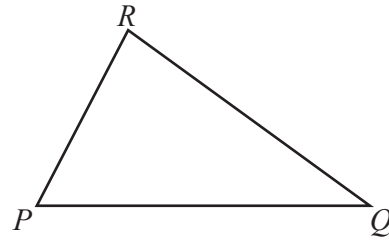
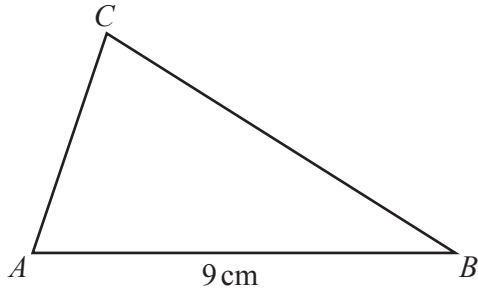
$$\Rightarrow 3y = 4 - 7 = -3$$

$$y = -1$$

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

$$y = \dots\dots\dots -1 \dots\dots\dots [2]$$

12



NOT TO SCALE

Triangle PQR is similar to triangle ABC with $\frac{PR}{AC} = \frac{2}{3}$.

$AB = 9\text{ cm}$ and the area of triangle ABC is 18 cm^2 .

(a) Find the length of PQ .

$$\frac{PQ}{AB} = \frac{PR}{AC} = \frac{2}{3} \Rightarrow PQ = \frac{2}{3} \times 9 = 6$$

..... 6 cm [1]

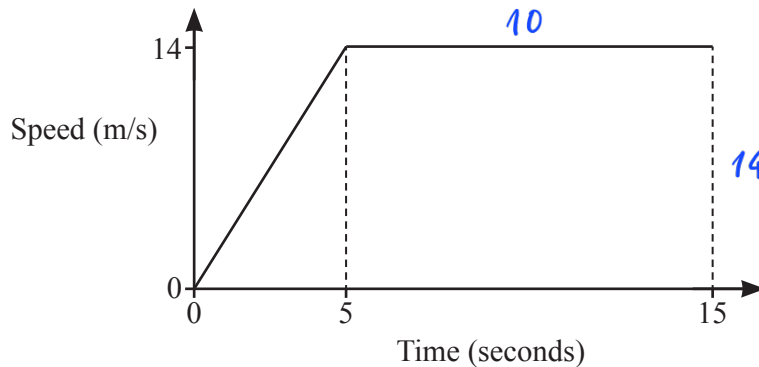
(b) Find the area of triangle PQR .

$$\frac{A_{\Delta ABC}}{A_{\Delta PQR}} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{9}{6}\right)^2 = \frac{9}{4}$$

$$\Rightarrow A_{\Delta PQR} = 18 : \frac{9}{4} = 8$$

..... 8 cm^2 [2]

13



NOT TO SCALE

The diagram shows the speed–time graph of the first 15 seconds of a car journey.

(a) Find the acceleration of the car during the first 5 seconds.

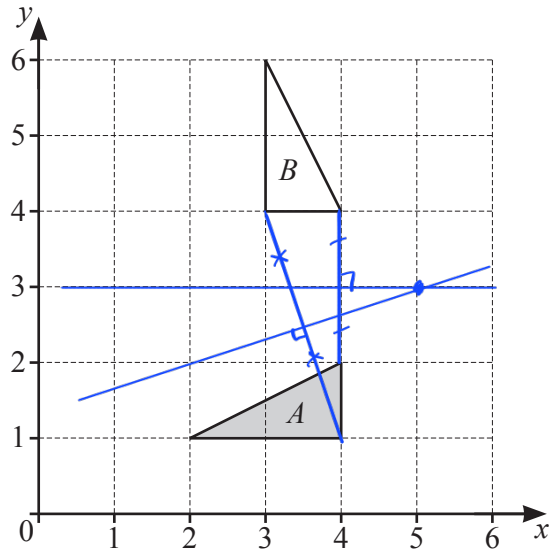
..... $\frac{14}{5}$ m/s^2 [1]

(b) Find the distance travelled during the 15 seconds.

$$\frac{1}{2} (10 + 15) \times 14 = 175$$

..... 175 m [2]

14



Describe fully the **single** transformation that maps triangle A onto triangle B.

Rotation, center (5, 3), clockwise 90°

[3]

15 The perimeter of a sector of a circle with radius 8 cm is 26 cm.

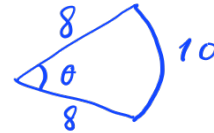


Calculate the angle of this sector.

$$\text{Arc length} = 26 - 8 \times 2 = 10$$

$$\Rightarrow 8\theta = 10$$

$$\theta = \frac{10}{8} \text{ radian}$$

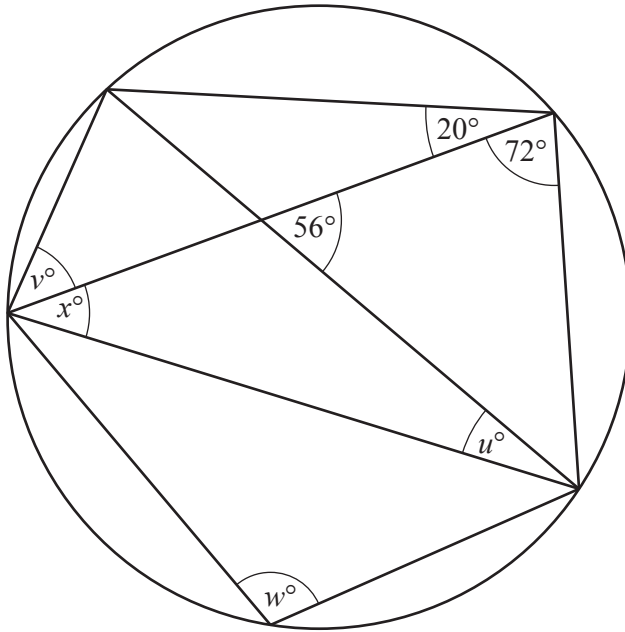


$$\pi \text{ rad} = 180^\circ$$

$$\Rightarrow \theta = \left(180^\circ \times \frac{10}{8}\right) : \pi \approx 71.6^\circ$$

71.6° [3]

16

NOT TO
SCALE

The diagram shows a circle and eight chords.

Calculate the values of u , v , w and x .

$$u = \dots 20 \dots$$

$$v = \dots 52 \dots$$

$$w = \dots 108 \dots$$

$$x = \dots 36 \dots [4]$$

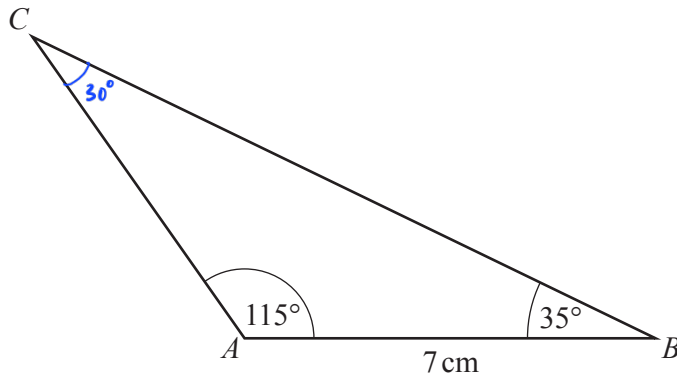
17 Simplify $(3125x^{3125})^{\frac{1}{5}}$.



$$\begin{aligned} & 3125^{\frac{1}{5}} (x^{3125})^{\frac{1}{5}} \\ = & \sqrt[5]{3125} x^{3125 \times \frac{1}{5}} \\ = & 5x^{625} \end{aligned}$$

$$\dots 5x^{625} \dots [2]$$

18


NOT TO
SCALE

Calculate the length BC.

$$180^\circ - 115^\circ - 35^\circ = 30^\circ$$

$$\frac{7}{\sin 30^\circ} = \frac{BC}{\sin 115^\circ}$$

$$\Rightarrow BC = \frac{7 \sin 115^\circ}{\sin 30^\circ} \approx 12.7$$

$$BC = \dots 12.7 \dots \text{ cm [4]}$$

19 Expand and simplify.



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

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

$$2x^3 - 8x^2 + 8x + 3x^2 - 12x + 12$$

$$2x^3 - 5x^2 - 4x + 12 \dots [3]$$

20 Factorise completely.


(a) $1+x-y-xy$

$$(1+x) - y(1+x)$$

$$(1-y)(1+x)$$

$$(1-y)(1+x) \dots [2]$$

(b) $2x^3 - 18xy^2$

$$2x(x^2 - 9y^2)$$

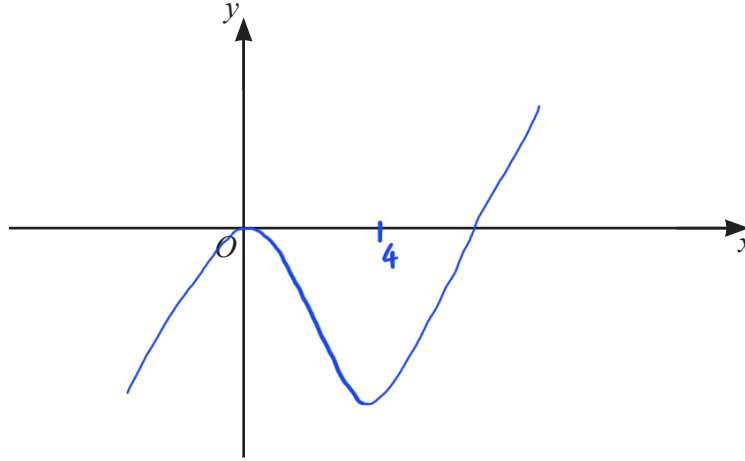
$$2x[x^2 - (3y)^2]$$

$$2x(x-3y)(x+3y)$$

$$2x(x-3y)(x+3y) [3]$$

- 21 The graph of a cubic function has two turning points.
 When $x < 0$ and when $x > 4$ the gradient of the graph is positive.
 When $0 < x < 4$ the gradient of the graph is negative.
 The graph passes through the origin.

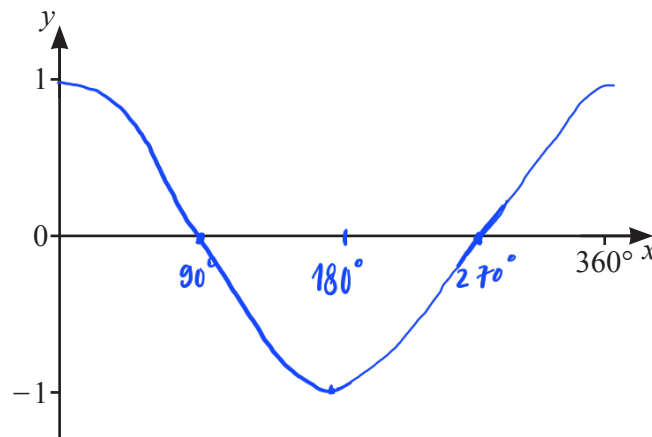
Sketch the graph.



[2]

22

7



- (a) On the diagram, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$. [2]
 (b) Solve the equation $\cos x = -\frac{1}{2}$ for $0^\circ \leq x \leq 360^\circ$.

$$x = 120^\circ \text{ or } x = -120^\circ$$

$$\text{or } x = -120^\circ + 360^\circ = 240^\circ$$

$$x = \dots\dots\dots 120^\circ \dots\dots\dots \text{ or } x = \dots\dots\dots 240^\circ \dots\dots\dots [2]$$

- 23 y is inversely proportional to \sqrt{x} and x is directly proportional to w^2 .
 When $w = 12$, $y = 12$.

7

Find y in terms of w .

$$y \propto \frac{1}{\sqrt{x}}$$

$$x \propto w^2 \Rightarrow \sqrt{x} \propto w$$

$$\Rightarrow y \propto \frac{1}{w}$$

$$y = \frac{k}{w}$$

$$12 = \frac{k}{12} \Rightarrow k = 144$$

$$y = \frac{144}{w} \dots \dots \dots [3]$$

- 24 Violet and Wilfred recorded their times to run 200 m, correct to the nearest second.

7

Violet took 36 seconds and Wilfred took 39 seconds.

1 s

Work out the upper bound of the difference between their times.

$$\text{difference} = \begin{matrix} w & - & v \\ (\text{max}) & & (\text{min}) \end{matrix}$$

$$= \left(39 + \frac{1}{2}\right) - \left(36 - \frac{1}{2}\right)$$

$$\dots \dots \dots 4 \dots \dots \dots \text{ s } [2]$$

Total = 12 11

25 A bag contains 5 red balls, 4 blue balls and 3 green balls.

76

(a) (i) Megan picks a ball at random.

Write down the probability that the ball is red or blue.

$$\frac{5+4}{12} = \frac{3}{4}$$

..... $\frac{3}{4}$ [1]

(ii) Megan replaces the ball.
She picks a ball at random, notes the colour and replaces the ball.
She repeats this 60 times.

Calculate the number of times the ball is expected to be red or blue.

$$60 \times \frac{3}{4} = 45$$

..... 45 [1]

(b) Mick picks 2 of the 12 balls at random, without replacement.

Calculate the probability that the balls are different colours.

$$2P(RG) + 2P(GB) + 2P(BR)$$

$$2 \times \frac{5}{12} \times \frac{3}{11} + 2 \times \frac{3}{12} \times \frac{4}{11} + 2 \times \frac{4}{12} \times \frac{5}{11}$$

..... $\frac{47}{66}$ [4]

(c) Marie picks balls at random, without replacement, from the 12 balls.
When she picks a green ball she stops.

The probability that she picks a green ball on pick n is $\frac{21}{220}$.

Find the value of n .

use trial & error method

$$n = 1: P(1) = \frac{3}{12} \neq \frac{21}{220}$$

$$n = 2: P(2) = \frac{9}{12} \times \frac{3}{11} = \frac{9}{44} \neq \frac{21}{220}$$

$$n = 3: P(3) = \frac{9}{12} \times \frac{8}{11} \times \frac{3}{10} = \frac{9}{55} \neq \frac{21}{220}$$

$$n = 4: P(4) = \frac{9}{12} \times \frac{8}{11} \times \frac{7}{10} \times \frac{3}{9} = \frac{28}{220} \neq \frac{21}{220}$$

$$n = 5: P(5) = \frac{9}{12} \times \frac{8}{11} \times \frac{7}{10} \times \frac{6}{9} \times \frac{3}{8} = \frac{21}{220}$$

..... 5 [2]