
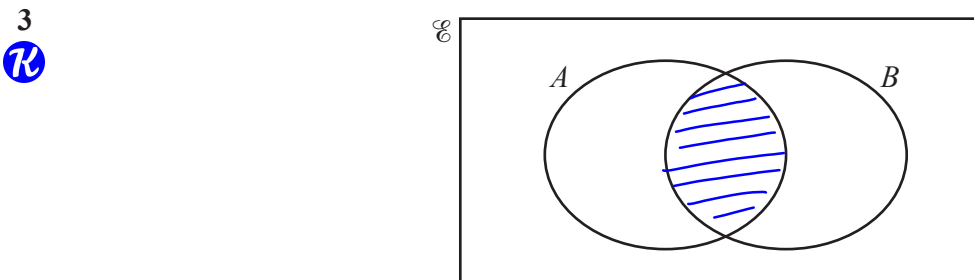



- 1  From the list of numbers, write down
- | | | | | | |
|----|----|----|----|----|----|
| 12 | 15 | 27 | 29 | 91 | 93 |
|----|----|----|----|----|----|
- (a) a cube number 27 [1]
- (b) a prime number. 29 [1]

- 2  $\mathbf{v} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ $\mathbf{y} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$
- Find
- (a) $\mathbf{v} - \mathbf{y}$ $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ [1]
- (b) $2\mathbf{v}$. $\begin{pmatrix} 4 \\ 10 \end{pmatrix}$ [1]



On the Venn diagram, shade the region $A \cap B$. [1]

- 4  23, $\underbrace{\quad}_{-6}$ 17, $\underbrace{\quad}_{-6}$ 11, $\underbrace{\quad}_{-6}$ 5,
- (a) Write down the next number in this sequence. -1 [1]
- (b) Find the n th term of this sequence. $-6n + 29$ [2]

5 Factorise completely.



$$8g - 2g^2$$

$$2g(4 - g) \dots \dots \dots [2]$$

6 Without using a calculator, work out $\frac{4}{7} \div 8$.



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

$$\frac{4}{7} \times \frac{1}{8} = \frac{4 \times 1}{7 \times 4 \times 2} = \frac{1}{7 \times 2}$$

$$\frac{1}{14} \dots \dots \dots [2]$$

7 Solve.



(a) $15t + 8 = 4 - t$

$$15t + t = 4 - 8$$

$$16t = -4$$

$$t = \frac{-4}{16} \dots \dots \dots [2]$$

(b) $\frac{25 - 2u}{3} = 2$

$$25 - 2u = 6$$

$$25 - 6 = 2u$$

$$19 = 2u$$

$$u = \frac{19}{2} \dots \dots \dots [2]$$

8 Calculate 0.3^2 .



Give your answer in standard form.

$$0.3 \times 0.3$$

$$\frac{3}{10} \times \frac{3}{10} = \frac{9}{100} = 0.09$$

$$9 \times 10^{-2} \dots \dots \dots [2]$$

- 9 Solve the simultaneous equations.
 You must show all your working.

$$3x - 2y = 19 \quad (1)$$

$$2 \times (x + y = 3)$$

$$2x + 2y = 6 \quad (2)$$

$$(1) + (2) : \quad 3x + 2x = 19 + 6$$

$$5x = 25$$

$$x = 5$$

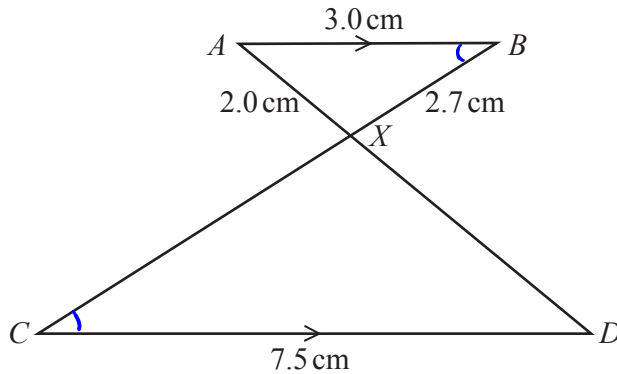
$$5 + y = 3$$

$$\Rightarrow y = -2$$

$$x = \dots 5 \dots$$

$$y = \dots -2 \dots [3]$$

10



NOT TO
SCALE

In the diagram, AB and CD are parallel.
 The lines CB and AD intersect at X .
 $AB = 3.0$ cm, $AX = 2.0$ cm, $BX = 2.7$ cm and $CD = 7.5$ cm.

Find the length of BC .

$$\triangle AXB \sim \triangle DXC$$

$$\frac{AB}{DC} = \frac{XB}{XC} = \frac{3.0}{7.5} = 0.4$$

$$\Rightarrow XC = \frac{2.7}{0.4} = 6.75$$

$$BC = 2.7 + 6.75$$

$$BC = \dots 9.45 \dots \text{ cm } [3]$$

- 11 Find the highest common factor (HCF) of $12x^{12}$ and $16x^{16}$.

7K

$$\text{HCF}(12, 16) = 4$$

$$\text{HCF}(x^{12}, x^{16}) = x^{12}$$

..... $4x^{12}$ [2]

- 12 In a regular polygon, the interior angle and the exterior angle are in the ratio interior : exterior = 11 : 1.

7K

Find the number of sides of this regular polygon.

$$\frac{\text{interior}}{\text{exterior}} = \frac{11}{1}$$

$$\Rightarrow \frac{\text{interior}}{11} = \frac{\text{exterior}}{1} = \frac{\text{interior} + \text{exterior}}{11 + 1} = \frac{180^\circ}{12} = 15^\circ$$

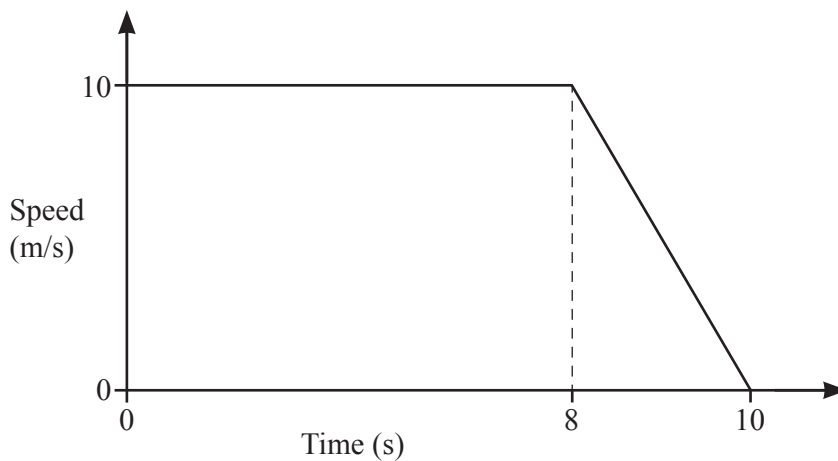
$$\Rightarrow \text{exterior} = 15^\circ$$

$$\Rightarrow n = \frac{360^\circ}{15^\circ} = 24$$

..... 24 [3]

13

7K



NOT TO
SCALE

The diagram shows the speed–time graph for part of a car journey.

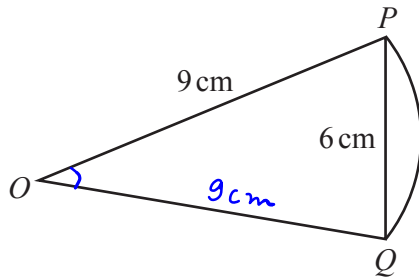
Calculate the total distance travelled during the 10 seconds.

$$\frac{1}{2} (8 + 10) \times 10$$

..... 90 m [2]

14

R

NOT TO
SCALE

The diagram shows a sector of a circle with centre O and radius 9 cm.
The length of the chord PQ is 6 cm.

Calculate the length of the arc PQ .

$$\begin{aligned} \Delta POQ : \quad 6^2 &= 9^2 + 9^2 - 2 \times 9 \times 9 \times \cos \widehat{POQ} \\ -126 &= -162 \cos \widehat{POQ} \\ \cos \widehat{POQ} &= \frac{7}{9} \\ \widehat{POQ} &= 0.67967 \text{ radian} \\ \text{Arc length } PQ &= 9 \times 0.67967 \\ &\approx 6.12 \end{aligned}$$

.....6.12..... cm [3]

15 Simplify $(3125w^{3125})^{\frac{1}{5}}$.

R

$$3125^{\frac{1}{5}} w^{3125 \times \frac{1}{5}}$$

..... $5w^{625}$ [2]

16 y is inversely proportional to x^2 .

R

When $x = 3$, $y = 2$.

Find y when $x = 2$.

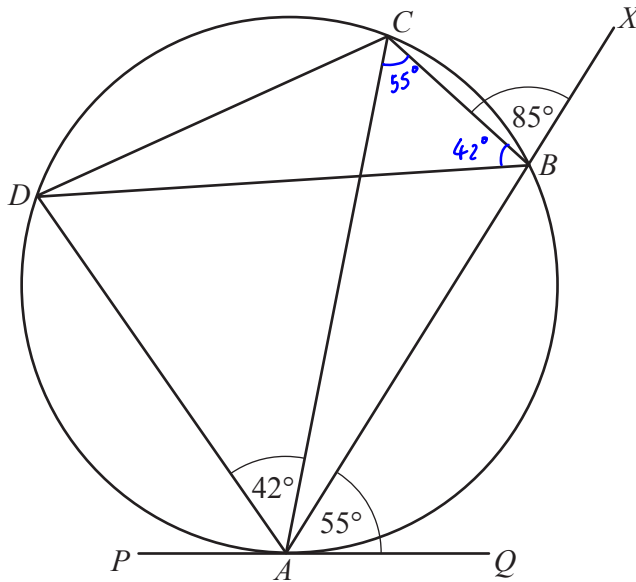
$$y = \frac{k}{x^2}$$

$$2 = \frac{k}{3^2} \Rightarrow k = 2 \times 3^2 = 18$$

$$y = \frac{18}{x^2}$$

$$\text{When } x = 2, \quad y = \frac{18}{2^2} = 4.5$$

$y =$ 4.5..... [3]



NOT TO
SCALE

$ABCD$ is a cyclic quadrilateral, ABX is a straight line and PQ is a tangent to the circle at A .
Angle $CBX = 85^\circ$, angle $BAQ = 55^\circ$ and angle $CAD = 42^\circ$.

Find

(a) angle $CBD = \widehat{DAC}$

Angle $CBD = \dots 42^\circ \dots$ [1]

(b) angle $ACB = \widehat{BAQ}$

Angle $ACB = \dots 55^\circ \dots$ [1]

(c) angle ADC

$$\widehat{ABC} = 180^\circ - 85^\circ = 95^\circ$$

$$\widehat{ADC} = 180^\circ - 95^\circ = 85^\circ$$

Angle $ADC = \dots 85^\circ \dots$ [1]

(d) angle BCD

$$\widehat{ACD} = \widehat{ABD} = 180^\circ - 85^\circ - 42^\circ = 53^\circ$$

$$\widehat{BCD} = 53^\circ + 55^\circ$$

Angle $BCD = \dots 108^\circ \dots$ [2]

(e) angle PAD .

$$\widehat{ABD} = \widehat{ACD} = 53^\circ$$

$$\widehat{PAD} = \widehat{ABD} = 53^\circ$$

Angle $PAD = \dots 53^\circ \dots$ [1]

- 18 Two solids are mathematically similar and have volumes 81 cm^3 and 24 cm^3 .
 The surface area of the smaller solid is 44 cm^2 .

R

Calculate the surface area of the larger solid.

$$\frac{V_{\text{small}}}{V_{\text{large}}} = \left(\frac{\text{side small}}{\text{side large}} \right)^3 \Rightarrow \frac{\text{side small}}{\text{side large}} = \sqrt[3]{\frac{24}{81}} = \frac{2}{3}$$

$$\frac{A_{\text{small}}}{A_{\text{large}}} = \left(\frac{\text{side small}}{\text{side large}} \right)^2 \Rightarrow \frac{44}{A_{\text{large}}} = \left(\frac{2}{3} \right)^2 = \frac{4}{9}$$

$$\Rightarrow A_{\text{large}} = \frac{44 \times 9}{4}$$

$$\dots\dots\dots 99 \dots\dots\dots \text{cm}^2 \quad [3]$$

- 19 Find the values of x when $6x + y = 10$ and $y = x^2 - 3x + 10$.

R

$$y = 10 - 6x$$

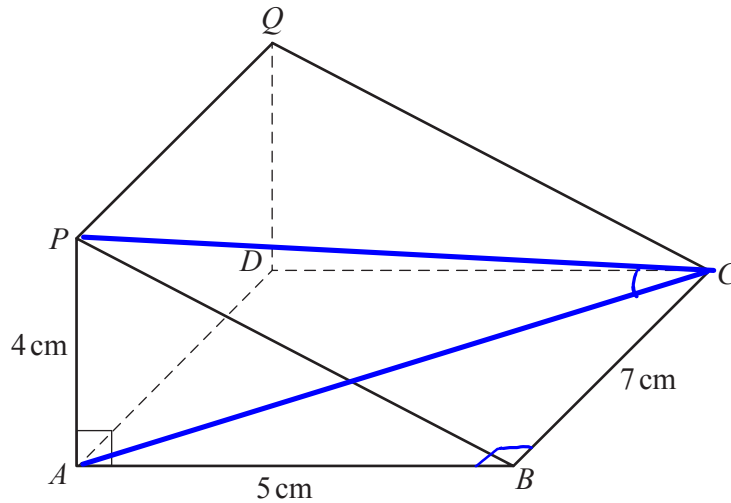
$$10 - 6x = x^2 - 3x + 10$$

$$x^2 + 3x = 0$$

$$x(x + 3) = 0$$

$$x = 0 \quad \text{or} \quad x = -3$$

$$x = \dots\dots\dots 0 \dots\dots\dots \text{or} \quad x = \dots\dots\dots -3 \dots\dots\dots [3]$$



NOT TO
SCALE

The diagram shows a triangular prism $ABCDQP$ of length 7 cm.
The cross-section is triangle PAB with $PA = 4$ cm, $AB = 5$ cm and angle $PAB = 90^\circ$.

Calculate the angle between the line PC and the base $ABCD$.

$$\triangle ABC : \quad AC = \sqrt{5^2 + 7^2} = \sqrt{74}$$

$$\triangle ACP : \quad \tan \widehat{PCA} = \frac{4}{\sqrt{74}}$$

$$\widehat{PCA} \approx 24.9^\circ$$

..... 24.9° [4]

23 Simplify.

R

$$\frac{5x^2 - 19x + 12}{x^2 - 9}$$

$$\frac{5x^2 - 4x - 15x + 12}{x^2 - 3^2}$$

$$\frac{x(5x - 4) - 3(5x - 4)}{(x - 3)(x + 3)}$$

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

$$\frac{(x - 3)(5x - 4)}{(x - 3)(x + 3)}$$

$$\frac{5x - 4}{x + 3}$$

$$\dots\dots\dots \frac{5x - 4}{x + 3} \dots\dots\dots [4]$$

24 The probability of Jamie hitting a target is $\frac{1}{3}$.

R

The probability that he hits the target for the first time on his n th attempt is $\frac{64}{2187}$.Find the value of n .

$$P(\text{not hitting a target}) = 1 - \frac{1}{3} = \frac{2}{3}$$

$(n - 1)$ times before the n^{th} attempt were failed

$$\left(\frac{2}{3}\right)^{n-1} \times \frac{1}{3} = \frac{64}{2187}$$

use trial and error method $\Rightarrow n = 7$

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

25 $f(x) = x^3 + 1$

R

Find $f^{-1}(x)$.

f : cube $\rightarrow + 1$

cube root $\leftarrow - 1 : f^{-1}$

$$f^{-1}(x) = \dots\dots\dots \sqrt[3]{x - 1} \dots\dots\dots [2]$$