

- 1 Write down the cube number that is greater than 50 but less than 100.

Ⓜ

SOLVED BY
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..... 64 [1]

- 2 Calculate.

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$$\frac{4}{\sqrt{0.0025}}$$

$$\frac{4}{\sqrt{25 \times 10^{-4}}} = \frac{4}{5 \times 10^{-2}} = \frac{4 \times 100}{5} = \frac{400}{5}$$

..... 80 [1]

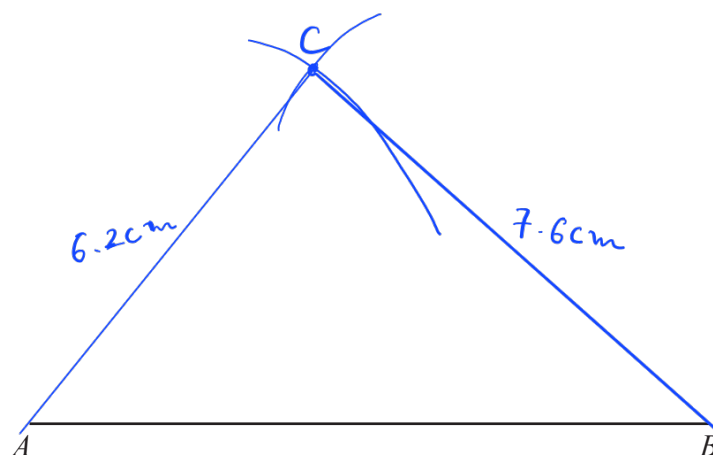
- 3 In triangle ABC , $BC = 7.6$ cm and $AC = 6.2$ cm.

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Using a ruler and compasses only, construct triangle ABC .

Leave in your construction arcs.

The side AB has been drawn for you.



[2]

- 4 Simplify.

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$$a^2 \div a^6$$

$$a^{2-6}$$

..... a^{-4} [1]

- 5 Thor changes 40 000 Icelandic Krona into dollars when the exchange rate is 1 krona = \$0.0099 .

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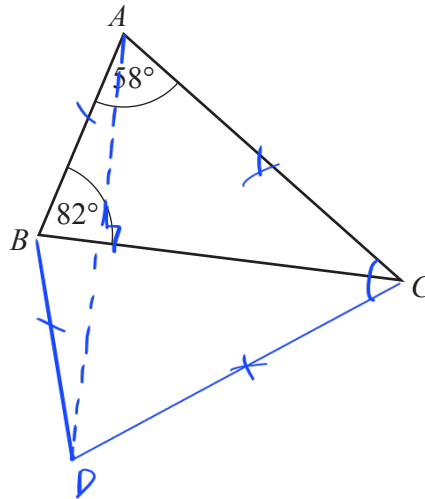
Work out how many dollars he receives.

$$40\,000 \times 0.0099$$

\$ 39.6 [1]

6

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The diagram shows triangle ABC .
The triangle is reflected in the line BC to give a quadrilateral $ABDC$.

- (a) Write down the mathematical name of the quadrilateral $ABDC$.

..... kite [1]

- (b) Find angle ACD .

$$\widehat{ACB} = 180^\circ - 58^\circ - 82^\circ = 40^\circ$$

$$\widehat{ACD} = 2\widehat{ACB} = 2 \times 40^\circ$$

Angle ACD = 80 [2]

- 7 Change 457 000 cm^2 into m^2 .

Ⓚ

$$457\,000 : 10^4$$

..... 45.7 m^2 [1]

8 The length, l cm, of a line is 18.3 cm, correct to the nearest millimetre. 0.1 cm

R Complete this statement about the value of l .

$$18.3 \pm \frac{0.1}{2}$$

$$\dots 18.25 \dots \leq l < \dots 18.35 \dots \quad [2]$$

9 **Without using a calculator**, work out $1\frac{1}{7} \times 2\frac{1}{10}$.

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

$$\frac{8}{7} \times \frac{21}{10}$$

$$\frac{\cancel{2} \times 4 \times 3 \times \cancel{7}}{\cancel{7} \times 2 \times 5} = \frac{12}{5}$$

$$\dots \frac{12}{5} \dots \quad [3]$$

10 Solve the simultaneous equations.

R You must show all your working.

$$\begin{aligned} 3x - 8y &= 22 \\ x + 4y &= 4 \end{aligned}$$

$$\begin{cases} 3x - 8y = 22 \\ 2x + 8y = 8 \end{cases}$$

$$\Rightarrow 5x = 22 + 8 = 30$$

$$x = 6$$

$$6 + 4y = 4$$

$$\Rightarrow 4y = -0.5$$

$$x = \dots 6 \dots$$

$$y = \dots -0.5 \dots \quad [3]$$

11 A bag contains 7 red discs, 5 green discs and 2 pink discs.

7

- (a) Helen takes one disc at random, records the colour and replaces it in the bag. She does this 140 times.

Find how many times she expects to take a green disc.

$$140 \times \frac{5}{7+5+2}$$

.....50..... [2]

- (b) Helen adds 9 green discs and some pink discs to the discs already in the bag.

The probability of taking a green disc is now $\frac{2}{7}$.

Find the number of pink discs that Helen added to the bag.

$$\frac{5+9}{7+5+9+2+p} = \frac{2}{7} p$$

$$14 \times 7 = 2(23+p)$$

$$98 = 46 + 2p$$

$$52 = 2p$$

.....26..... [2]

12 A straight line, l , has equation $y = 5x + 12$.

7

- (a) Write down the gradient of line l .

.....5..... [1]

- (b) Find the coordinates of the point where line l crosses the x -axis.

$$0 = 5x + 12$$

$$5x = -12$$

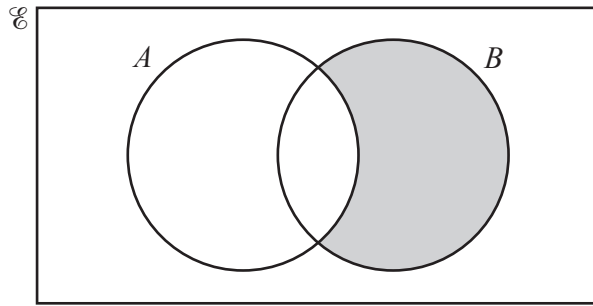
(..... $-\frac{12}{5}$,.....0.....) [2]

- (c) A line perpendicular to line l has gradient k .

Find the value of k .

$k =$ $-\frac{1}{5}$ [1]

13



Use set notation to describe the shaded region.

$$\dots B \cap A' \dots [1]$$

14

$$N = 2^4 \times 3 \times 7^5$$



$PN = K$, where P is an integer and K is a square number.

Find the smallest value of P .

$$P = 3 \times 7$$

$$\Rightarrow K = (2^2 \times 3 \times 7^3)^2 \text{ is a square number}$$

$$P = \dots 21 \dots [2]$$

15

$$m = 2p + \sqrt{\frac{x}{y}}$$



Make x the subject of this formula.

$$m - 2p = \sqrt{\frac{x}{y}}$$

$$(m - 2p)^2 = \frac{x}{y}$$

$$x = y(m - 2p)^2$$

$$x = \dots y \cdot (m - 2p)^2 \dots [3]$$

- 16 A paperweight has height 4 cm and volume 38.4 cm^3 .
 (R) A mathematically similar paperweight has height 7 cm.

Calculate the volume of this paperweight.

$$\text{ratio volume} = \left(\text{ratio side} \right)^3$$

$$\frac{38.4}{V} = \left(\frac{4}{7} \right)^3 = \frac{64}{343}$$

$$V = \frac{38.4 \times 343}{64}$$

.....205.8..... cm^3 [3]

- 17 Adil and Brian are paid the same wage.
 (R) Adil is given a 7% pay decrease and his new wage is \$427.80.
 Brian is given a 7% pay increase.

Work out Brian's new wage.

$$A - 7\% A = 427.80$$

$$0.93A = 427.80$$

$$A = 460 \Rightarrow B_{\text{old}} = 460$$

$$B_{\text{new}} = 460 + 460 \times 7\%$$

$$= 492.2$$

\$492.2..... [3]

- 18 (a) Simplify.

(R) $(4xy^2)^3$

$$4^3 x^3 (y^2)^3$$

..... $64x^3y^6$ [2]

- (b) $25 = 125^k$

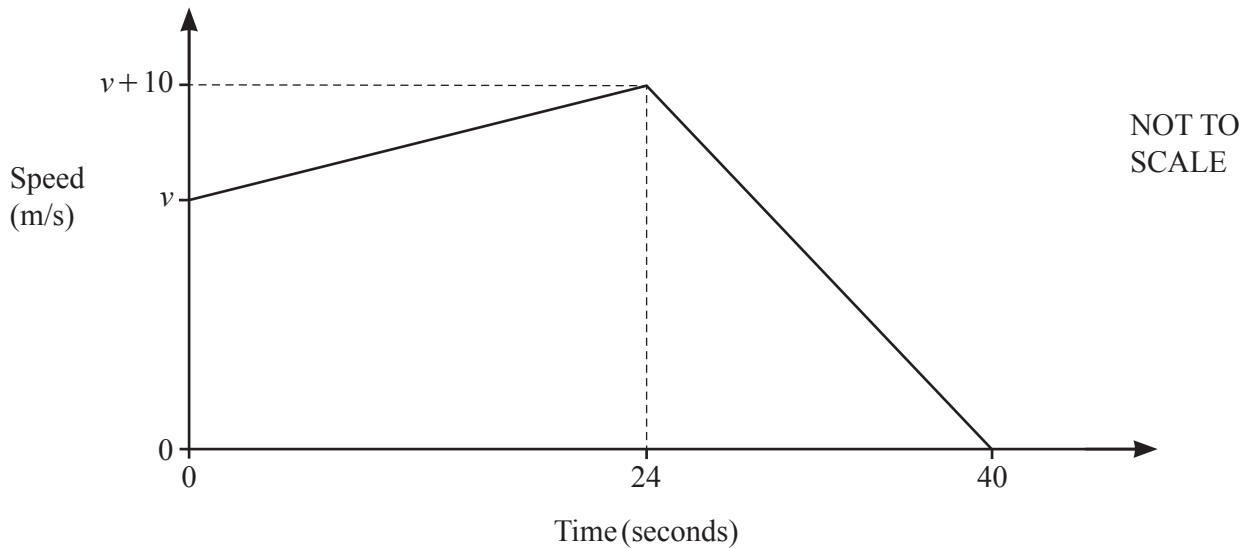
Find the value of k .

$$5^2 = (5^3)^k$$

$$5^2 = 5^{3k} \Rightarrow 2 = 3k$$

$k = \frac{2}{3}$ [1]

19



The diagram shows the speed–time graph for the final 40 seconds of a car journey. At the start of the 40 seconds the speed is v m/s.

- (a) Find the acceleration of the car during the first 24 seconds.

$$\frac{10}{24}$$

$$\dots\dots\dots \frac{10}{24} \dots\dots\dots \text{m/s}^2 \quad [1]$$

- (b) The total distance travelled during the 40 seconds is 1.24 kilometres.

$$1240 \text{ m}$$

Find the value of v .

$$\frac{v + v + 10}{2} \times 24 + \frac{1}{2} (v + 10) (40 - 24) = 1240$$

$$(v + 5) 24 + 8(v + 10) = 1240$$

$$32v + 200 = 1240$$

$$32v = 1040$$

$$v = \dots\dots\dots 32.5 \dots\dots\dots [4]$$

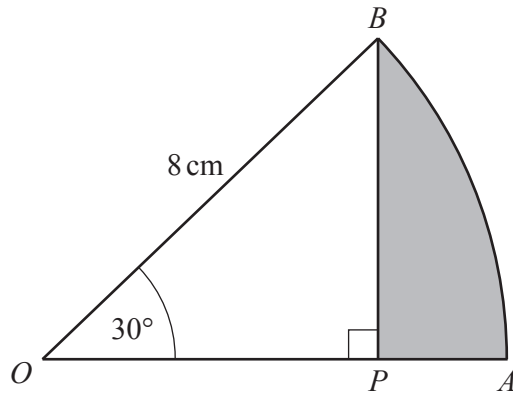
20 Factorise.



$$3x + 8y - 6ax - 16ay$$

$$3x + 8y - 2a(3x + 8y)$$

$$\dots\dots\dots (1 - 2a)(3x + 8y) \dots\dots\dots [2]$$



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OAB is the sector of a circle, centre O .
 $OB = 8$ cm and angle $AOB = 30^\circ$.
 BP is perpendicular to OA .

(a) Calculate AP .

$$\cos 30^\circ = \frac{OP}{OB}$$

$$\Rightarrow OP = \frac{\sqrt{3}}{2} \times 8 = 4\sqrt{3}$$

$$AP = OA - OP = 8 - 4\sqrt{3}$$

$$AP = \dots\dots\dots 1.07 \dots\dots\dots \text{ cm [3]}$$

(b) Work out the area of the shaded region APB .

$$\begin{aligned} A_{\text{shaded } APB} &= A_{\text{sector } OAB} - A_{\Delta OBP} \\ &= \frac{1}{2} \times 8^2 \times \frac{30\pi}{180} - \frac{1}{2} \times 8 + 4\sqrt{3} \sin 30^\circ \\ &\approx 2.90 \end{aligned}$$

$$\dots\dots\dots 2.90 \dots\dots\dots \text{ cm}^2 \text{ [3]}$$

- 22 The table shows information about the times, t seconds, taken by each of 100 students to solve a puzzle.

R

Mid value	5	12.5	17.5	30	57.5
Time (t seconds)	$0 < t \leq 10$	$10 < t \leq 15$	$15 < t \leq 20$	$20 < t \leq 40$	$40 < t \leq 75$
Frequency	9	18	22	30	21

- (a) Calculate an estimate of the mean time.

$$\frac{5 \times 9 + 12.5 \times 18 + 17.5 \times 22 + 30 \times 30 + 57.5 \times 21}{100}$$

.....27.625..... s [4]

- (b) Emmanuel draws a histogram to show this information.

The table shows the heights, in cm, of some of the bars for this histogram.

Complete the table.

Time (t seconds)	$0 < t \leq 10$	$10 < t \leq 15$	$15 < t \leq 20$	$20 < t \leq 40$	$40 < t \leq 75$
Height of bar (cm)	3.6	14.4	17.6	6	24

$$\frac{9}{10-0} = 0.9 \quad \Rightarrow \text{multiplier} = 4$$

$$\frac{30}{40-20} \times 4 = 6$$

$$\frac{21}{75-40} \times 4 = 2.4$$

[3]

23 y is inversely proportional to the square root of x .

(R) When $y = 7$, $x = 2.25$.

Write y in terms of x .

$$y = \frac{k}{\sqrt{x}}$$

$$7 = \frac{k}{\sqrt{2.25}} \quad \Rightarrow \quad k = 7 \sqrt{2.25} = 10.5$$

$$y = \frac{10.5}{\sqrt{x}} \quad [2]$$

24 Simplify.

(R)

$$\frac{x^2 - 25}{x^2 - 17x + 60}$$

$$\frac{(x - 5)(x + 5)}{(x - 12)(x - 5)}$$

$$= \frac{x + 5}{x - 12}$$

$$\frac{x + 5}{x - 12} \quad [4]$$

25 Solve $3 \tan x = -4$ for $0^\circ \leq x \leq 360^\circ$.

(R)

$$\tan x = -\frac{4}{3}$$

$$x = -53.1^\circ \quad \text{or} \quad x = -53.1^\circ + 180^\circ = 126.9^\circ$$

$$\text{or} \quad x = 306.9^\circ$$

$$x = \dots 126.9^\circ \dots \text{ or } x = \dots 306.9^\circ \dots [3]$$