



- 1 P is a prime number where $60 < P < 80$.

P is 2 less than a square number.

Find the value of P .

$$P = \dots 79 \dots [2]$$

- 2 Hank flies from Los Angeles to Shanghai.

\mathcal{R}

- (a) The flight departs on Friday 22 July at 21 40.
The flight takes 13 hours 35 minutes.
The local time in Shanghai is 15 hours ahead of the local time in Los Angeles.

Find the day, date and time in Shanghai when Hank's flight arrives.

$$\begin{array}{l} \text{Los} \xrightarrow{\hspace{2cm}} \text{Shanghai} \\ 21:40 + 13\text{h } 35' = 34\text{h } 75' = 35\text{h } 15' = 11\text{h } 15' \\ \hspace{15em} (\text{next day}) \text{ (time in Los)} \\ 11\text{h } 15' + 15\text{h} = 26\text{h } 15' = 2\text{h } 15' (\text{next 2 days}) \text{ (time in Shanghai)} \end{array}$$

Day Sunday....., Date 24 July....., Time 02:15..... [3]

- (b) The cost of the flight is \$920.
The exchange rate is \$1 = 6.87 Chinese yuan.

Find the cost of the flight in yuan.

$$920 \times 6.87 = 6320.4$$

.....6320.4..... yuan [1]

- 3 Calculate.

\mathcal{R}

$$\frac{4.87 - 2.7}{-0.2 + \sqrt[3]{0.729}}$$

.....3.1..... [1]

- 4 The number of items that each of 22 people buy in a supermarket is shown in the stem-and-leaf diagram.

\mathcal{R}

1	1 3 6 6
2	0 2 2 2 4 8 9
3	1 1 5 8 9 9
4	2 4 6 7 8

Key: 1 | 1 represents 11 items

- (a) Find the mode.

.....22..... [1]

- (b) Find the median.

.....30..... [1]

- 5 The table shows the relative frequency of the games won by a football team.

\mathcal{R}

Result of game	won	lost	drawn
Relative frequency	0.1	0.6	0.3

The number of games $\frac{l}{d}$ lost is twice the number of games $\frac{d}{d}$ drawn.

Complete the table.

$$l + d = 1 - 0.1 = 0.9$$

$$2d + d = 0.9$$

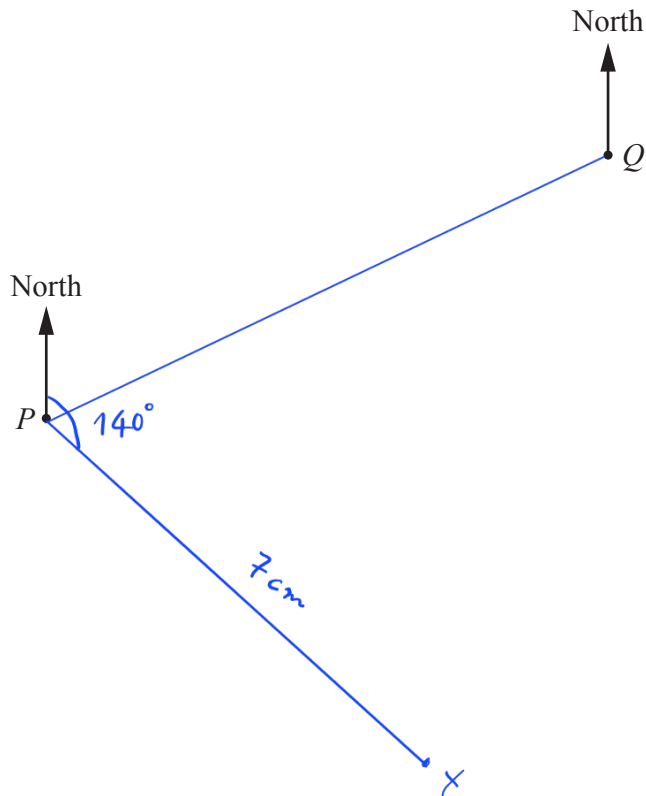
$$3d = 0.9$$

$$d = 0.3$$

$$l = 0.9 - 0.3 = 0.6$$

[3]

- 6 The scale drawing shows the positions of two towns, P and Q .
 The scale is 1 cm represents 4 km.



Scale: 1 cm to 4 km

- (a) Find the actual distance between town P and town Q .

8.2 cm represents $8 \times 4 = 32.8 \text{ km}$

..... 32.8 km [2]

- (b) Measure the bearing of town Q from town P .

..... 065° [1]

- (c) Town X is 28 km from town P on a bearing of 140° .

On the scale drawing, mark the position of town X .

[2]

7 Without using a calculator, work out $1\frac{5}{6} + \frac{2}{5}$.

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

$$\begin{aligned} & \frac{11}{6} + \frac{2}{5} \\ = & \frac{11 \times 5 + 2 \times 6}{6 \times 5} \\ = & \frac{67}{30} = 2 \frac{7}{30} \end{aligned}$$

$$\dots\dots\dots 2 \frac{7}{30} \dots\dots\dots [3]$$

8 Solve the simultaneous equations.

R You must show all your working.

$$\begin{aligned} 2 \times (4x - 2y &= -13) \\ -3x + 4y &= 11 \end{aligned}$$

$$\begin{aligned} + \quad 8x - 4y &= -26 \\ -3x + 4y &= 11 \end{aligned}$$

$$5x = -15$$

$$x = -3$$

$$4(-3) - 2y = -13$$

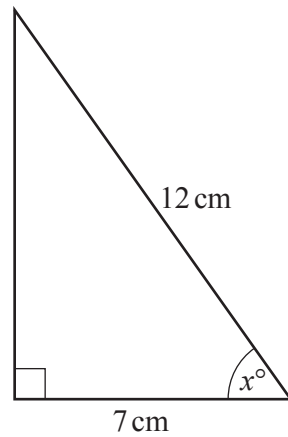
$$1 = 2y$$

$$y = \frac{1}{2}$$

$$x = \dots\dots\dots -3 \dots\dots\dots$$

$$y = \dots\dots\dots \frac{1}{2} \dots\dots\dots [3]$$

9

NOT TO
SCALECalculate the value of x .

$$\cos x = \frac{7}{12}$$

$$x \approx 54.3^\circ$$

$$x = \dots 54.3^\circ \dots [2]$$

10 A regular polygon has an interior angle of 174° .

Find the number of sides of this polygon.

$$\frac{(n-2)180}{n} = 174$$

$$180n - 360 = 174n$$

$$6n = 360$$

$$n = 60$$

$$\dots 60 \dots [2]$$

11 Line L has equation $y = 4 - 5x$.

Find the equation of a line that is perpendicular to line L and passes through the point $(0, 6)$.

$$m_L = -5$$

$$m_P = -1 : (-5) = \frac{1}{5}$$

$$\text{Equation of line } P : y - 6 = \frac{1}{5}(x - 0)$$

$$y - 6 = \frac{1}{5}x \dots [3]$$

12 Chai invests some money. C

- (R) By the end of the first year, the value of the investment has decreased by 35%.
By the end of the second year, the value of the investment has increased by 40% of its value at the end of the first year.

Find the overall percentage change in the value of the investment.

$$\begin{aligned} \text{Value of invest end of 1st year: } & C - 35\% C = 0.65C \\ \text{2nd year: } & 0.65C + 0.65C \times 40\% \\ & = 0.91C \\ \text{overall percentage change} & = \frac{C - 0.91C}{C} \times 100 = 9\% \end{aligned}$$

.....9..... % [3]

13 Solve.

(R)

$$4 - 3x \geq \frac{6-x}{5}$$

$$5(4 - 3x) \geq 6 - x$$

$$20 - 15x \geq 6 - x$$

$$20 - 6 \geq -x + 15x$$

$$14 \geq 14x$$

$$1 \geq x$$

..... $x \leq 1$ [3]

14 y is inversely proportional to the square root of $(x-2)$.

(R) When $x = 4.25$, $y = 12$.

Find x when $y = 3$.

$$y \propto \frac{1}{\sqrt{x-2}} \Rightarrow y = \frac{k}{\sqrt{x-2}}$$

$$12 = \frac{k}{\sqrt{4.25-2}} = \frac{k}{1.5}$$

$$k = 12 \times 1.5 = 18$$

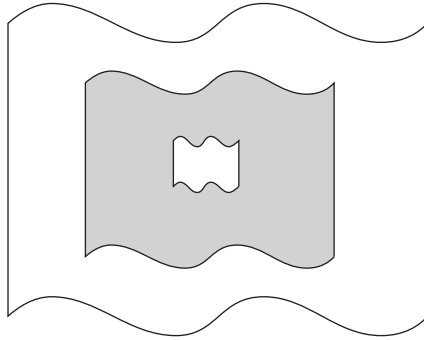
$$y = \frac{18}{\sqrt{x-2}}$$

$$\text{when } y = 3 : 3 = \frac{18}{\sqrt{x-2}} \Rightarrow \sqrt{x-2} = 6 \Rightarrow x-2 = 36$$

$x = \dots 38 \dots$ [3]

15

K

NOT TO
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The diagram shows three shapes that are mathematically similar.

The heights of the shapes are in the ratio small : medium : large = 1 : 5 : 8.

Find the ratio shaded area : total unshaded area.

Give your answer in its simplest form.

$$\begin{aligned}
 A_{\text{small}} : A_{\text{medium}} : A_{\text{large}} &= (1 : 5 : 8)^2 = 1 : 25 : 64 \\
 \Rightarrow A_{\text{medium}} &= 25 A_{\text{small}} \quad , \quad A_{\text{large}} = 64 A_{\text{small}} \\
 A_{\text{shaded area}} &= 24 A_{\text{small}} \\
 A_{\text{unshaded area}} &= 64 A_{\text{small}} - 24 A_{\text{small}} = 40 A_{\text{small}} \\
 24 : 40 &= 3 : 5 \quad \dots\dots\dots 3 \quad : \quad 5 \quad \dots\dots\dots [4]
 \end{aligned}$$

16 Find the n th term of each sequence.

K

$$\begin{aligned}
 \text{(a)} \quad & 8, \quad 15, \quad 34, \quad 71, \quad 132, \quad \dots \\
 & \quad \quad \quad \underbrace{\quad} \quad \underbrace{\quad} \quad \underbrace{\quad} \quad \underbrace{\quad} \\
 & \quad \quad \quad +7 \quad +19 \quad +37 \quad +61 \\
 & \quad \quad \quad \underbrace{\quad} \quad \underbrace{\quad} \quad \underbrace{\quad} \\
 & \quad \quad \quad +12 \quad +18 \quad +24 \\
 & \quad \quad \quad \underbrace{\quad} \quad \underbrace{\quad} \\
 & \quad \quad \quad +6 \quad +6
 \end{aligned}$$

$$\dots\dots\dots n^3 + 7 \quad \dots\dots\dots [2]$$

$$\text{(b)} \quad \frac{2}{1}, \quad \frac{3}{4}, \quad \frac{4}{16}, \quad \frac{5}{64}, \quad \frac{6}{256}, \quad \dots$$

$$\dots\dots\dots \frac{n+1}{2^{n-1}} \quad \dots\dots\dots [3]$$

17

$$y = \frac{3x-2}{1-x}$$

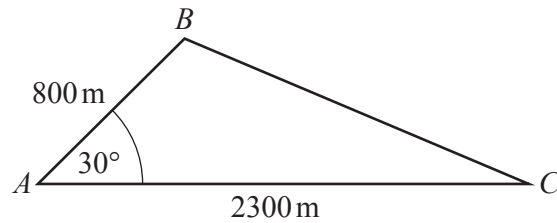
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Make x the subject of the formula.

$$\begin{aligned}
 y(1-x) &= 3x-2 \\
 y-xy &= 3x-2 \\
 y+2 &= 3x+xy \\
 y+2 &= x(3+y) \\
 \frac{y+2}{3+y} &= x
 \end{aligned}$$

$$x = \frac{y+2}{3+y} \quad \dots\dots\dots [4]$$

18

NOT TO
SCALE

The diagram shows some land in the shape of a triangle ABC .
Houses are built on this land.
Each house requires 400 m^2 of land.

Find the greatest number of houses that can be built on this land.

$$\begin{aligned} A \quad \Delta ABC &= \frac{1}{2} \times 800 \times 2300 \sin 30^\circ \\ &= 460\,000 \text{ m}^2 \end{aligned}$$

$$\frac{460\,000}{400} = 1150$$

.....1150..... [3]

19 Write as a single fraction in its simplest form.



$$\frac{2}{x+3} - \frac{x+2}{7}$$

$$\frac{2 \times 7 - (x+2)(x+3)}{7(x+3)}$$

$$\frac{14 - (x^2 + 5x + 6)}{7(x+3)}$$

$$\frac{14 - x^2 - 5x - 6}{7(x+3)}$$

$$\frac{-x^2 - 5x + 8}{7(x+3)} \dots\dots\dots [3]$$

20 Solve $3(2 + \cos x) = 5$ for $0^\circ \leq x \leq 360^\circ$.

(R)

$$2 + \cos x = \frac{5}{3}$$

$$\cos x = \frac{-1}{3}$$

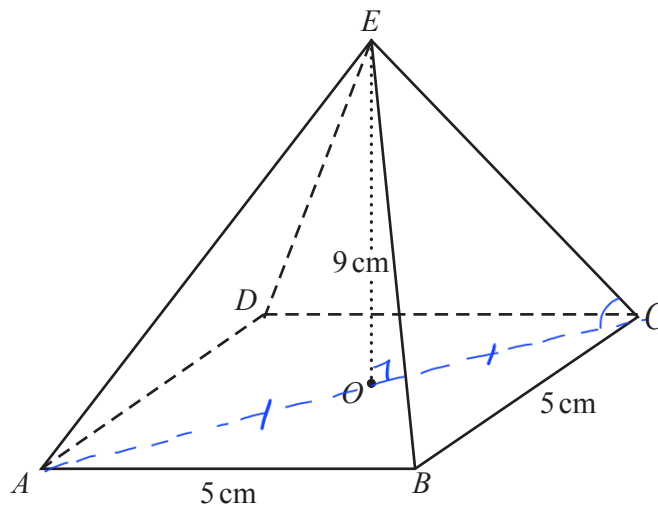
$$x = 109.5^\circ \quad \text{or} \quad x = -109.5^\circ$$

$$\quad \quad \quad \text{or} \quad x = 250.5^\circ$$

$109.5^\circ, 250.5^\circ$ [3]

21

(R)



NOT TO
SCALE

The diagram shows a pyramid $ABCDE$.
The pyramid has a square horizontal base $ABCD$ with side 5 cm.
The vertex E is vertically above the centre O of the base.
The height OE of the pyramid is 9 cm.

Calculate the angle that EC makes with the base $ABCD$.

$$AC = 5\sqrt{2}$$

$$OC = \frac{5\sqrt{2}}{2}$$

$$\tan \widehat{ECO} = 9 : \frac{5\sqrt{2}}{2} = \frac{9\sqrt{2}}{5}$$

$$\widehat{ECO} \approx 68.6^\circ$$

68.6° [4]

22 (a) Simplify.

7

$$\frac{x^{\frac{2}{3}}}{x^{\frac{8}{3}}} = x^{\frac{2}{3} - \frac{8}{3}} = x^{\frac{-6}{3}} = x^{-2}$$

$$\dots\dots\dots x^{-2} \dots\dots\dots [1]$$

(b) $16 = 64^k$ Find the value of k .

$$4^2 = (4^3)^k = 4^{3k}$$

$$2 = 3k$$

$$\frac{2}{3} = k$$

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

(c) Solve.

$$3^{3x} \times \left(\frac{1}{9}\right)^{4-3x} = 3$$

$$3^{3x} \times (3^{-2})^{4-3x} = 3$$

$$3^{3x} \times 3^{-8+6x} = 3^1$$

$$3x - 8 + 6x = 1$$

$$9x = 9$$

$$x = 1$$

$$x = \dots\dots\dots 1 \dots\dots\dots [3]$$