1 At noon, the temperature is 4 °C.
At midnight, the temperature is −9 °C.

Work out the difference in temperature between noon and midnight.

$4 - (-9)$

.....13..... °C [1]

2 Thibault records the number of cars of each colour in a car park.

Colour	Black	White	Silver	Red
Number of cars	8	5	4	3

He draws a pie chart to show this information.

Calculate the sector angle for the red cars.

$\frac{360^\circ}{8+5+4+3} \times 3 = 54^\circ$

.....54°..... [2]

3 Figs cost 43 cents each.
Lyra has $5 to buy some figs.

500 cents

Calculate the largest number of figs Lyra can buy and the amount of change, in cents, she receives.

$500 : 43 = 11 \text{ r } 27$

.....11..... figs and .....27..... cents change [3]

4 Find the value of $\sqrt{68} \times \sqrt{153}$.

$\sqrt{4 \times 17} \times \sqrt{9 \times 17}$

$2\sqrt{17} \times 3\sqrt{17}$

$(2 \times 3)(\sqrt{17} \times \sqrt{17}) = 6 \times 17$

.....102..... [1]

5 Find the total surface area of a cuboid with length 8 cm, width 6 cm and height 3 cm.

$2(8\times6 + 6\times3 + 8\times3)$

.....180..... cm^2 [3]

6 Some cards have either a square, a circle or a triangle drawn on them.
Piet chooses one of the cards at random.

Complete the table to show the probability of choosing a card with each shape.

Shape	Square	Circle	Triangle
Probability	0.2	0.32	0.48

$1 - 0.2 - 0.32$

[2]

7 The price of a coat is $126.
In a sale, this price is reduced by 18%.

Find the sale price of the coat.

$126 - 126 \times 18\%$

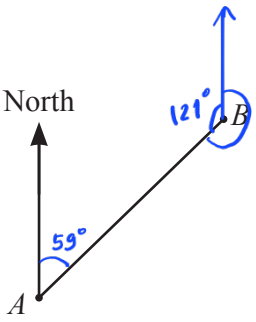
$ .....103.32..... [2]

8 The nth term of a sequence is $n^2 + 12$.

Find the first three terms of this sequence.

.....13..... , ...16..... , ...21..... [2]

9



NOT TO SCALE

The bearing of B from A is 059°.

Work out the bearing of A from B.

$180° - 59° = 121°$

$360° - 121° = 239°$

239° [2]

10

$\mathbf{p} = \begin{pmatrix} 2 \\ 8 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$

(a) Find

(i) $\mathbf{p} - \mathbf{q}$,

$\begin{pmatrix} 2-(-1) \\ 8-4 \end{pmatrix}$

$\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ [1]

(ii) $6\mathbf{p}$.

$\begin{pmatrix} 6\times 2 \\ 6\times 8 \end{pmatrix}$

$\begin{pmatrix} 12 \\ 48 \end{pmatrix}$ [1]

(b) Find $|\mathbf{p} - \mathbf{q}|$.

$p - q = \begin{pmatrix} 2-(-1) \\ 8-4 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$

$|p-q| = \sqrt{3^2 + 4^2} = 5$

5 [2]

11 Find the value of p when $6^p \times 6^4 = 6^{28}$.

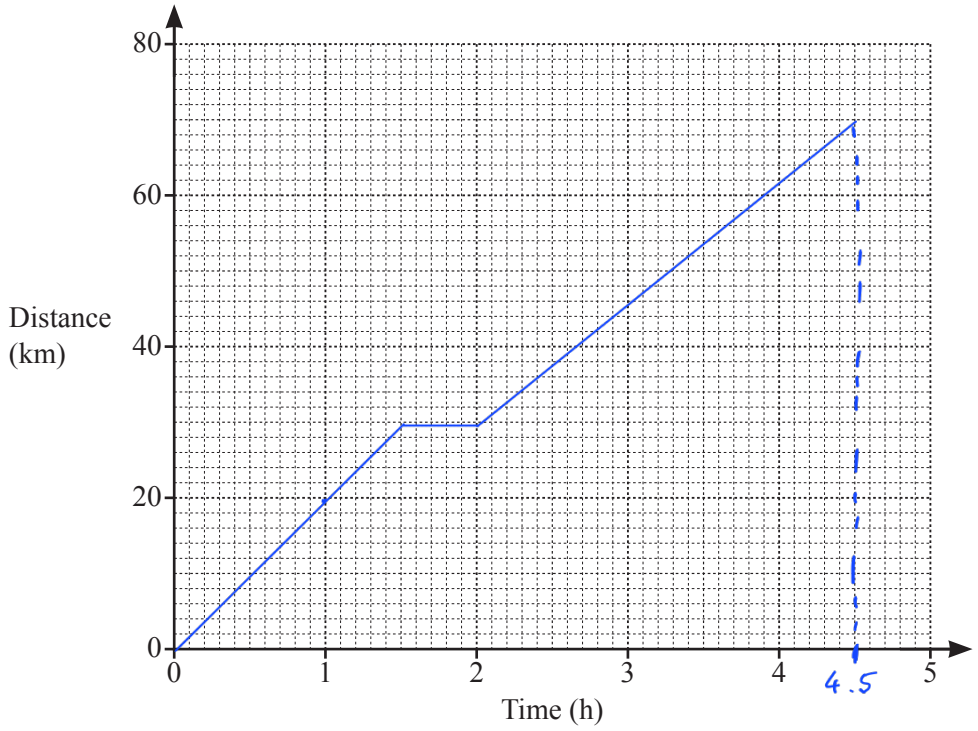
$6^{p+4} = 6^{28}$

$p + 4 = 28$

$p = 24$

$p =$ ....24..... [1]

12 Annette cycles a distance of 70 km from Midville to Newtown.
Leaving Midville, she cycles for 1 hour 30 minutes at a constant speed of 20 km/h and then stops for 30 minutes.
She then continues the journey to Newtown at a constant speed of 16 km/h.



(a) On the grid, draw the distance–time graph for the journey. [3]

(b) Calculate the average speed for the whole journey.

average speed $= \frac{\text{distance}}{\text{time}}$

$= \frac{70 \text{ km}}{4.5 \text{ h}} = \frac{140}{9}$ km/h

..... $\frac{140}{9}$ ..... km/h [3]

13 **Without using a calculator**, work out $4\frac{1}{8} - 2\frac{5}{6}$.

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

$\frac{33}{8} - \frac{17}{6}$

$= \frac{99}{24} - \frac{68}{24}$

$= \frac{99 - 68}{24}$

$= \frac{31}{24} = 1\frac{7}{24}$

.....$1\frac{7}{24}$..... [3]

14 Carlos invests \$4540 at a rate of r% per year compound interest.
At the end of 10 years he has earned \$1328.54 in interest.

Calculate the value of r.

$4540 + 1328.54 = 4540\left(1 + \frac{r}{100}\right)^{10}$

$\frac{293\,427}{227\,000} = \left(1 + \frac{r}{100}\right)^{10}$

$1 + \frac{r}{100} = 1.02600$

$\frac{r}{100} = 0.02600$

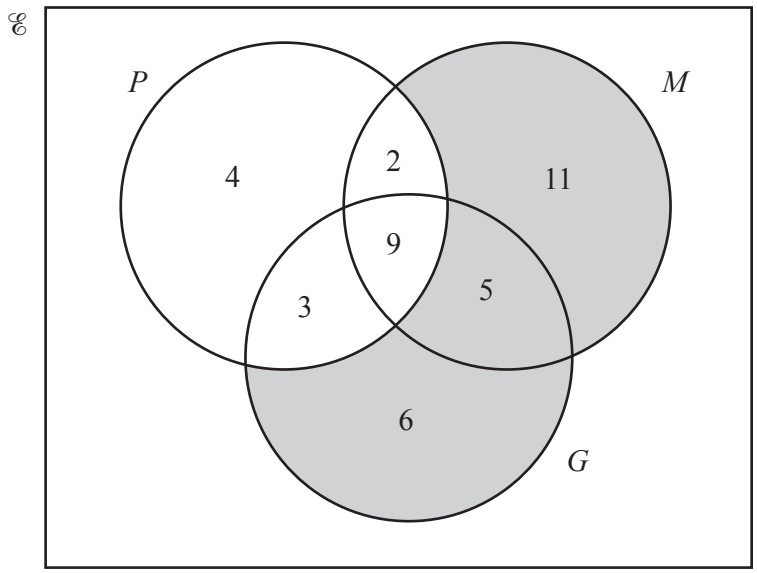
$r =$ ...2.6..... [3]

15 Find the highest common factor (HCF) of $12a^3b$ and $20a^2b^2$.

HCF(12, 20) = 4

.....$4a^2b$..... [2]

16 The Venn diagram shows the number of students in a class of 40 who study physics (P), mathematics (M) and geography (G).



(a) Use set notation to describe the shaded region.

$(M \cup G) \cap P'$ [1]

(b) Find $n((P \cap G) \cup M')$.

22 [1]

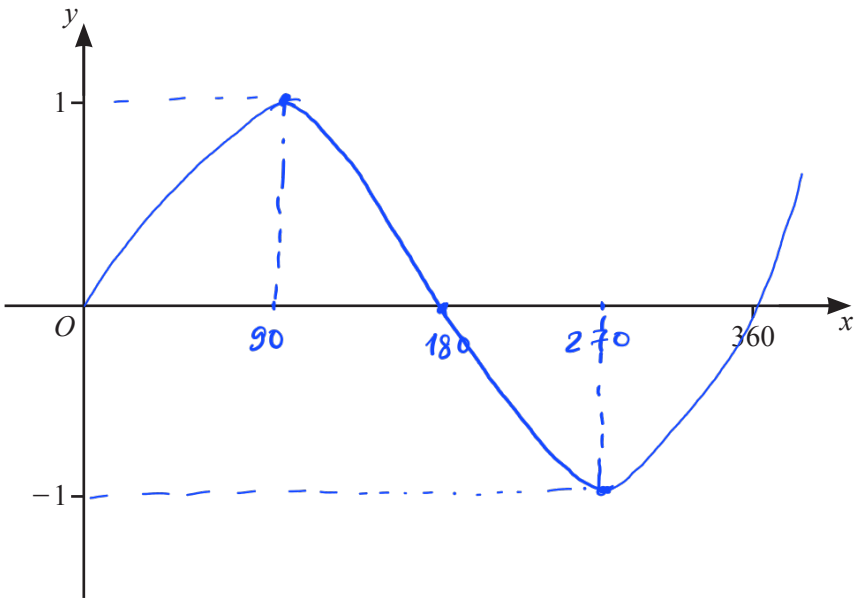
(c) A student is chosen at random from those studying geography.

Find the probability that this student also studies physics or mathematics but not both.

$\frac{3}{3+9+5+6} + \frac{5}{3+9+5+6} = \frac{8}{23}$

$\frac{8}{23}$ [2]

17 **(a)** Sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

(b) Solve the equation $3\sin x + 1 = 0$ for $0° \leqslant x \leqslant 360°$.

$3\sin x = -1$

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

$x = -19.5°$ or $x = 180° - (-19.5°) = 199.5°$

or $x = -19.5° + 360° = 340.5°$

$x =$ ....199.5°.... or $x =$ ....340.5°.... [3]

18 **(a)** y is directly proportional to the cube root of $(x+1)$.
When $x = 7$, $y = 1$.

Find the value of y when $x = 124$.

$y = k\sqrt[3]{x+1}$

$1 = k\sqrt[3]{7+1} = 2k \Rightarrow k = 0.5$

$y = 0.5\sqrt[3]{x+1}$

when $x = 124$, $y = 0.5\sqrt[3]{124+1} = 2.5$

$y =$ ....2.5.... [3]

(b) F is inversely proportional to the square of d.

Explain what happens to F when d is halved.

$F = \frac{k}{d^2}$ $\quad F_{new} = \frac{k}{d_{new}^2} = \frac{k}{\left(\frac{d}{2}\right)^2} = \frac{k}{\frac{d^2}{4}} = \frac{4k}{d^2}$

....F multiplied by 4.... [1]

19 $f(x) = 7x - 8$ $\quad g(x) = \frac{4}{x} + 5$ $\quad h(x) = 2^x + 1$

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

f : $\times 7 \rightarrow -8$

: $7 \leftarrow +8$: f^{-1}

$f^{-1}(x) =$ $\frac{x+8}{7}$ [2]

(b) Find the value of x when $h(x) = g\left(\frac{1}{3}\right)$.

$2^x + 1 = \frac{4}{\frac{1}{3}} + 5 = 17$

$2^x = 16$

$x = 4$

$x =$ 4 [2]

20 Factorise completely.

(a) $2m + 3p - 8km - 12kp$

$(2m + 3p) - 4k(2m + 3p)$

$(2m + 3p)(1 - 4k)$

$(2m + 3p)(1 - 4k)$ [2]

(b) $5x^2 - 20y^2$

$5(x^2 - 4y^2)$

$5[x^2 - (2y)^2]$

$5(x - 2y)(x + 2y)$

$5(x - 2y)(x + 2y)$ [3]

21 The nth term of a sequence is $an^2 + bn - 4$.

The first term is -3 and the second term is 2.

Find the value of a and the value of b.

First term $= -3 \Rightarrow a \times 1^2 + b \times 1 - 4 = -3$

$\Rightarrow a + b = 1$ (1)

Second term $= 2 \Rightarrow a \times 2^2 + b \times 2 - 4 = 2$

$\Rightarrow 4a + 2b = 6$ (2)

(1) $\Rightarrow 2a + 2b = 2$ (3)

(2) − (3) : $4a - 2a = 6 - 2$

$2a = 4$

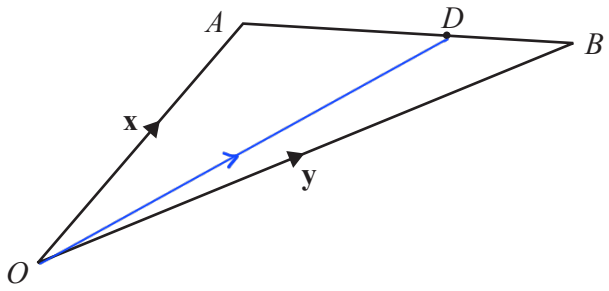
$a = 2$

$\Rightarrow b = 1 - 2 = -1$

$a =$ ..... 2 .....

$b =$ ..... −1 ..... [5]

22



NOT TO SCALE

$\overrightarrow{OA} = \mathbf{x}$, $\overrightarrow{OB} = \mathbf{y}$ and $\overrightarrow{OD} = \frac{3}{7}\mathbf{x} + \frac{4}{7}\mathbf{y}$.

Calculate the ratio $AD : DB$.

$\overrightarrow{AD} = \overrightarrow{AO} + \overrightarrow{OD} = -x + \frac{3}{7}x + \frac{4}{7}y = \frac{-4}{7}x + \frac{4}{7}y$

$\overrightarrow{DB} = \overrightarrow{DO} + \overrightarrow{OB} = -\frac{3}{7}x - \frac{4}{7}y + y = \frac{-3}{7}x + \frac{3}{7}y$

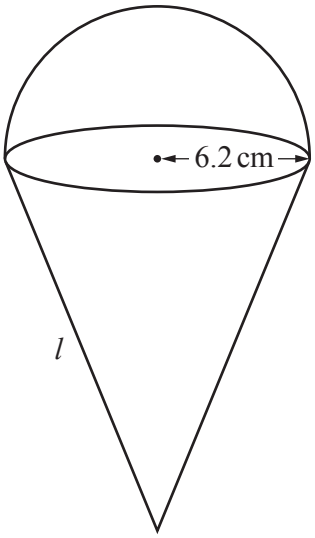
$\Rightarrow \overrightarrow{AD} = \frac{4}{3}\overrightarrow{DB}$

$\Rightarrow AD = \frac{4}{3}DB$

$\Rightarrow AD : DB = \frac{4}{3} = 4 : 3$

..... 4 ..... : ..... 3 ..... [2]

23



NOT TO SCALE

The diagram shows a solid metal shape made from a cone and a hemisphere, both with radius 6.2 cm. The total surface area of the solid shape is 600 cm^2.

Calculate the slant height, l, of the cone.

$$\frac{4\pi \times 6.2^2}{2} + \pi \times 6.2\, l = 600$$

$$6.2\pi\, l = 600 - 76.88\pi$$

$$l = \frac{600 - 76.88\pi}{6.2\pi}$$

$$l = 18.4$$

l = ... 18.4 ..... cm [4]