FAS-PASS Maths

NCSE 2018 PAPER II

SECTION I

1. (a) **Required to calculate:** $3\frac{3}{4}\div\frac{5}{8}$

Calculation:

$$3\frac{3}{4}\div\frac{5}{8}=\frac{(4\times3)+3}{4}\div\frac{5}{8}$$

$$=\frac{15}{4}\div\frac{5}{8}$$

$$=\frac{\cancel{15}^{3}}{\cancel{4}_{1}}\times\frac{\cancel{8}^{2}}{\cancel{5}_{1}}$$

$$=\frac{6}{1}$$

$$=6 \text{ (in exact form)}$$

(b) **Required to convert:** $\frac{5}{8}$ to a percent

Solution:

$$\frac{5}{8} \text{ as a percent } =\frac{5}{8}\times100$$

$$=\frac{500}{8}$$

$$=\frac{125}{2}$$

$$=62.5\%$$

(c) **Required to express:** 6489 in standard form

Solution:

$6\,4\,8\,9.$

We shift the decimal point 3 places to the left

Hence, $6489.=6.489\times10^{3}$

This may be approximated to 6.49×10^{3} or even to 6.5×10^{3}.

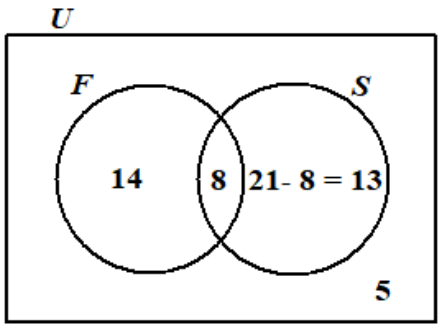
2. Data: Of the 40 students in a class, 14 study French only, 8 study both Spanish and French, 21 study Spanish and 5 students study neither of the two subjects.

(a) **Required to complete:** The Venn diagram given to show the information.

Solution:

We assume $F=\{\text{Students who study French}\}$ and

$S=\{\text{Students who study Spanish}\}$.



(b) **Required to find:** The number of students who study one language
Solution:
The number of students who study Spanish $= 21$
8 of these students study French as well.
$\therefore$ The number of students who study Spanish only $= 21 - 8$
$= 13$

So, the number who study French only and Spanish only $= 14 + 13$
$= 27$

(c) **Required to find:** The probability that a student chosen at random studies both French and Spanish.
Solution:
P(Student studies both French and Spanish)

$$= \frac{\text{No. of students who study both French and Spanish}}{\text{Total no. of students}}$$

$$= \frac{8}{40}$$

$$= \frac{1}{5}$$

(This may be written as $\frac{1}{5}$ or 0.2 or 20%.)

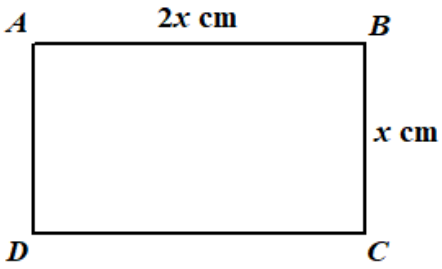
3. (a) **Required to simplify:** $3(x-2)$
Solution:
$3(x-2) = 3x - 6$

(b) **Required to solve:** $6x - 8 = 16 + 2x$
Solution:

$6x - 8 = 16 + 2x$

$$6x - 2x = 16 + 8$$
$$4x = 24$$
$$x = \frac{24}{4}$$
$$x = 6$$

(c) **Data:** Diagram showing rectangle *ABCD*, with length twice its width and a perimeter of 18 cm.

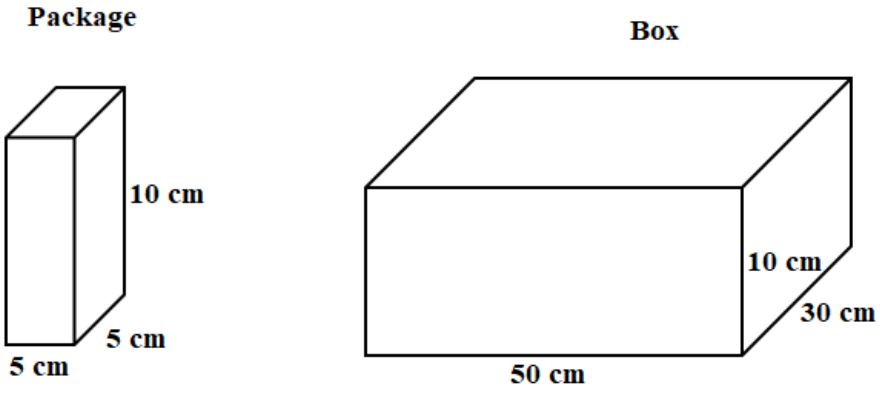


Required to calculate: x
Calculation:

The perimeter $= 18$ cm

Hence, $2x + x + 2x + x = 18$
$$6x = 18$$
$$x = \frac{18}{6}$$
$$x = 3 \text{ cm}$$

4. **Data:** Diagrams showing the dimensions of packages in which cookies are placed and the boxes they were packed in for shipping.



(a) **Required to calculate:** The volume of the package
Calculation:

Volume of the package $= 5 \times 5 \times 10 \text{ cm}^3$

$= 250 \text{ cm}^3$

(b) **Required to find:** The number of packages required to completely fill the box.
Solution:
The number of packages that will completely fill the box

$$= \frac{\text{Volume of the box}}{\text{Volume of 1 package}}$$

$$= \frac{50 \times 30 \times 10 \text{ cm}^3}{5 \times 5 \times 10 \text{ cm}^3}$$

$= 60$ packages

(c) **Required to convert:** The volume of a box from cubic centimetres to cubic metres.
Solution:

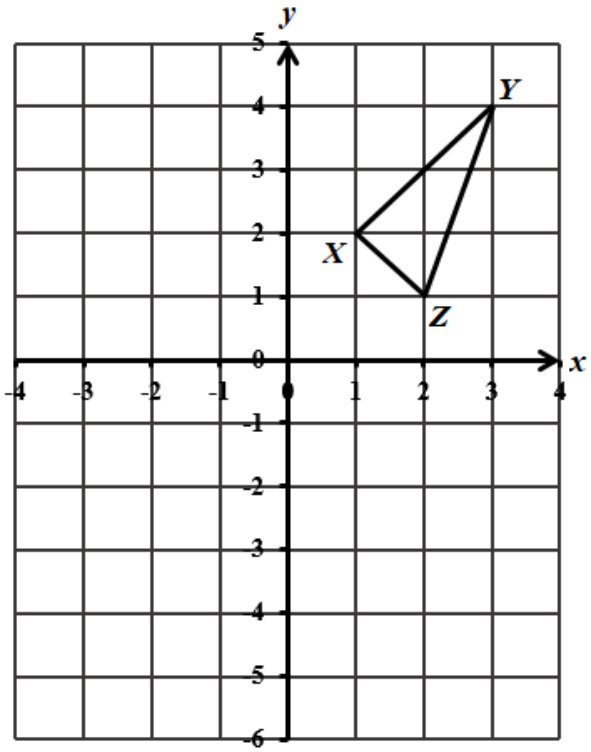
$$\text{Volume of the box} = 50 \times 30 \times 10 \text{ cm}^3$$

$$= \frac{50}{100} \times \frac{30}{100} \times \frac{10}{100} \text{ m}^3$$

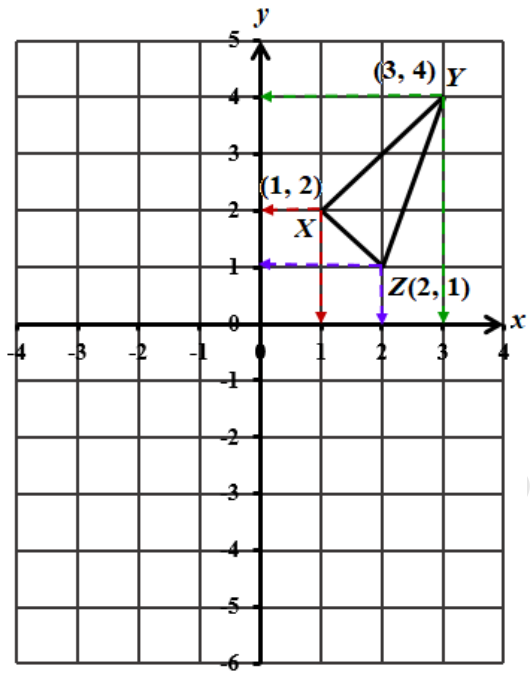
$$= 0.5 \times 0.3 \times 0.1 \text{ m}^3$$

$$= 0.015 \text{ m}^3 \text{ or } 1.5 \times 10^{-2} \text{ m}^3$$

5. **Data:** Graph showing triangle *XYZ*.

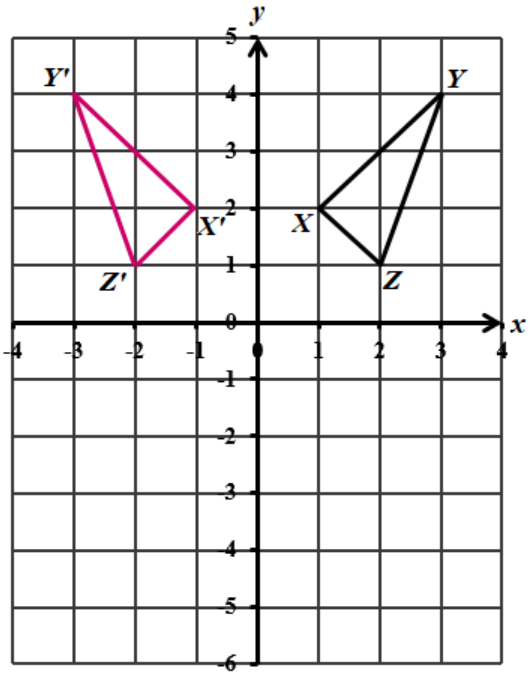


(a) **Required to state:** The coordinates of X, Y and Z
Solution:

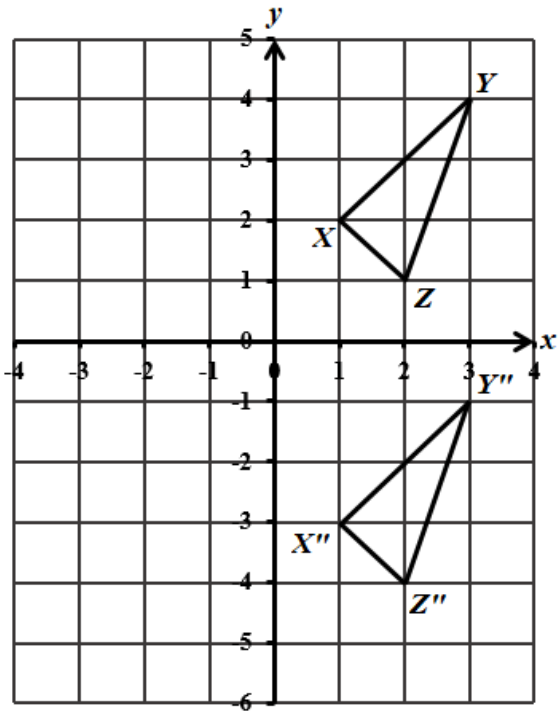


$X\,(1,\,2)$ $Y\,(3,\,4)$ $Z\,(2,\,1)$

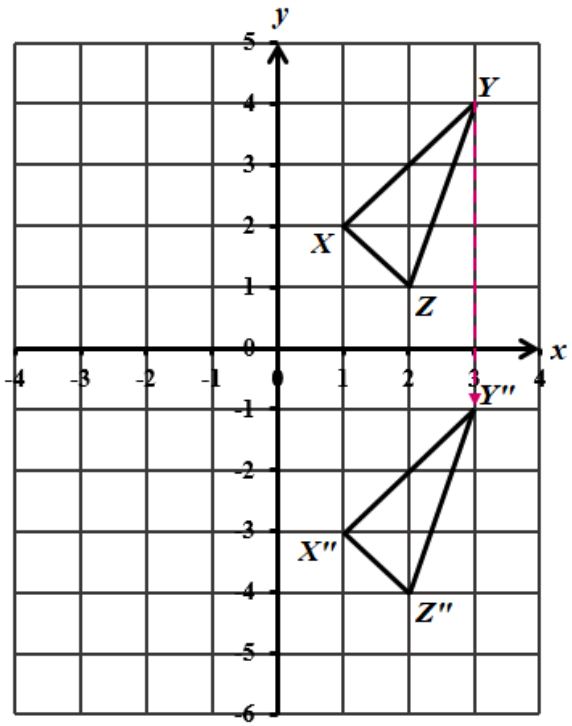
(b) **Required to draw:** Triangle $X'Y'Z'$ the reflection of triangle XYZ in the y – axis.
Solution:



(c) **Data:** Graph showing triangles XYZ and $X''Y''Z''$.



Required to describe: The transformation which maps ΔXYZ unto $\Delta X''Y''Z''$.'
Solution:



Each point on ΔXYZ is shifted 5 units vertically downwards. There is no horizontal shift. Hence, the translation, $T = \begin{pmatrix} -5 \\ 0 \end{pmatrix}$.

So, $\Delta XYZ \xrightarrow{T=\begin{pmatrix} -5 \\ 0 \end{pmatrix}} \Delta X''Y''Z''$.

6. (a) Data: Table showing the preferred ice cream flavours of 30 students in a class.

Preferred Flavour	**No. of Students**
Chocolate	4
Vanilla	8
Cherry	
Kiwi	2
Pistachio	6

Required to complete: The table given.
Solution:

$$4+8+\text{No. who chose cherry}+2+6=30$$
$$\therefore \text{No. who chose cherry} = 30-(4+8+2+6)$$
$$= 30-20$$
$$= 10$$

The completed table looks like:

Preferred Flavour	**No. of Students**
Chocolate	4
Vanilla	8
Cherry	10
Kiwi	2
Pistachio	6

(b) **Required to find:** The flavor preferred by $\frac{1}{5}$ of the students in the class.

Solution:
Total number of students in the class $= 30$

$$\frac{1}{5} \text{ of } 30 = \frac{1}{5} \times 30$$
$$= 6$$

Pistachio was preferred by 6 students. So, pistachio was preferred by $\frac{1}{5}$ of the students in the class.

(c) **(i)** **Required to state:** The least liked flavor.
Solution:
The lowest number in the column for number of students is 2 which corresponds to the flavour of kiwi.
Hence, kiwi is the least liked flavour.

(ii) **Required to state:** The modal flavour
Solution:
The highest number in the column for number of students is 10 which corresponds to cherry.
Hence, the modal flavour is cherry.

SECTION II

7. (a) **Data:** A list of items and their prices that Mary purchased.

Item	**Cost**
Dress	\$90.00
Shoes	\$120.00
Pants	\$100.00

V.A.T. is charged at a rate of 12.5%.

(i) **Required to calculate:** Mary's bill without V.A.T.
Calculation:

$$\begin{aligned}\text{Mary's bill exclusive of V.A.T.} &= \$\ 90.00\\ &\quad \$120.00\ +\\ &\quad \underline{\$100.00}\\ &\quad \underline{\$310.00}\end{aligned}$$

(ii) **Required to calculate:** Mary's bill with V.A.T.
Calculation:

$$\begin{aligned}\text{V.A.T.} &= 12.5\%\ \text{of}\ \$310.00\\ &= \frac{12.5}{100}\times\$310.00\\ &= \$38.75\end{aligned}$$

$$\begin{aligned}\text{Hence, Mary's bill inclusive of V.A.T.} &= \$310.00+\$38.75\\ &= \$348.75\end{aligned}$$

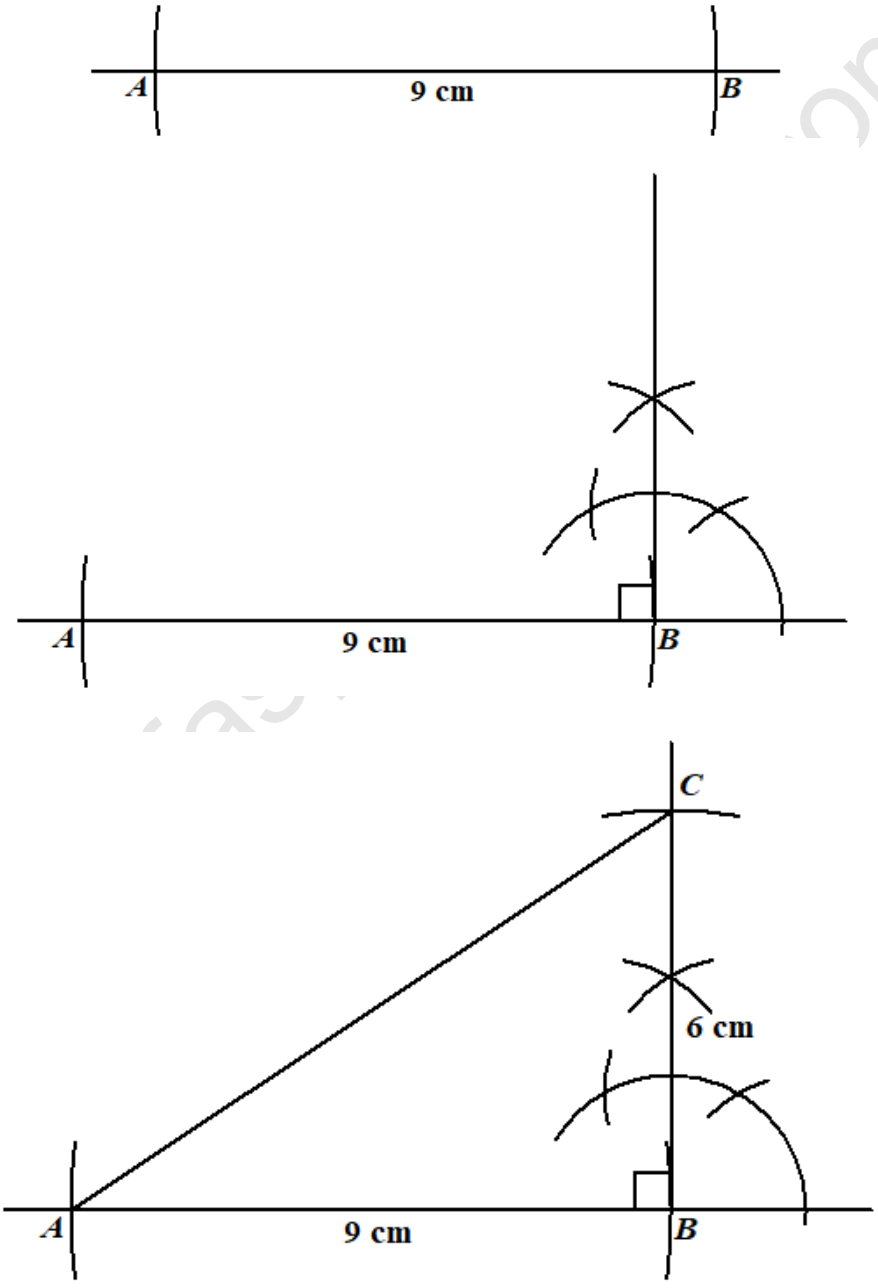
(iii) **Data:** US \$1.00 = TT \$6.80
Required to find: The amount of US\$ Sita receives if she converts TT\$3400
Solution:

$$\text{TT}\$6.80 = \text{US}\$1.00$$

Hence, $\text{TT}\$1.00 \equiv \text{US}\$\dfrac{1.00}{6.80}$

For $\text{TT}\$3\,400$, the equivalent in US \$ is $\$\dfrac{1.00}{6.80} \times 3\,400 = \text{US}\$500$

(b) **(i)** **Required to construct:** Triangle ABC with $AB = 9\,\text{cm}$, angle $ABC = 90°$ and $BC = 6\,\text{cm}$.
Construction: The construction is shown in steps to assist the reader**.**

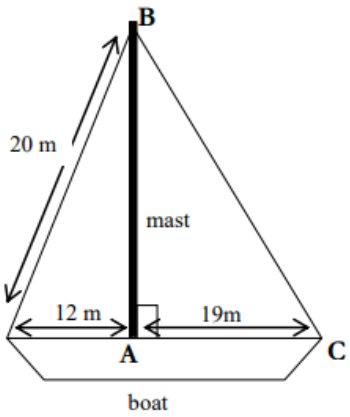


(ii) **Required to state:** The size of angle BAC by measurement.

Solution:

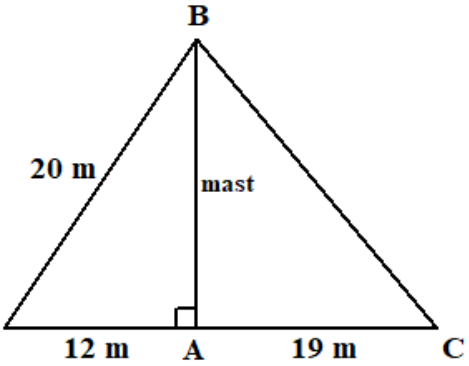
$B\hat{A}C = 34°$ (by measurement)

8. (a) **Data:** Diagram showing dimensions of a boat.



(i) **Required to find:** The height of the mast AB.

Solution:



$$AB^2 + (12)^2 = (20)^2 \qquad \text{(Pythagoras' Theorem)}$$

$$\therefore AB^2 = (20)^2 - (12)^2$$

$$= 400 - 144$$

$$= 256$$

$$AB = \sqrt{256}$$

$$= 16 \text{ m}$$

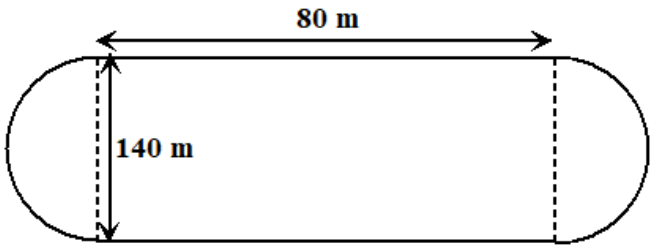
(ii) **Required to find:** The length of BC, correct to the nearest metre.

Solution:

$BC^2 = AB^2 + AC^2$ (Pythagoras' Theorem)

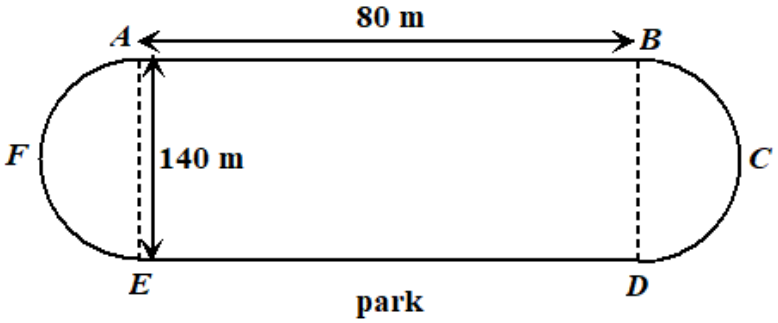
$$\therefore \text{BC}^2 = (16)^2 + (19)^2$$
$$= 256 + 361$$
$$= 617$$
$$\text{BC} = \sqrt{617}$$
$$= 24.\underline{8}\ \text{m}$$
$$\approx 25\ \text{m to the nearest metre}$$

(b) **Data:** Diagram showing a park in the shape of a rectangle with semi-circular ends.



park

(i) **Required to calculate:** The perimeter of the park.
Calculation:



park

Perimeter of the park
$= 80\ \text{m} + l\text{ength of semi-circle } BCD + 80\ \text{m} +$
$l\text{ength of semi-circle } EFA$

$$= 80 + \frac{1}{2}\left(2\pi \times \frac{140}{2}\right) + 80 + \frac{1}{2}\left(2\pi \times \frac{140}{2}\right) m$$
$$= 80 + (\pi \times 70) + 80 + (\pi \times 70)$$
$$= 80 + \left(\frac{22}{7} \times 70\right) + 80 + \left(\frac{22}{7} \times 70\right)$$
$$= 80 + 220 + 80 + 220$$
$$= 600\ \text{m}$$

(ii) **Required to express:** The perimeter of the park in kilometres.
Solution:

$$1000 \text{ m} = 1 \text{ km}$$

$$1 \text{ m} = \frac{1}{1000} \text{ km}$$

$$\therefore 600 \text{ m} = \frac{1}{1000} \times 600 \text{ km}$$

$$= 0.6 \text{ km}$$

(iii) **Data:** Joshua takes 10 minutes to ride around the track.
Required to calculate: Joshua's speed in kmh^{-1}.
Calculation:

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

$$= \frac{0.6 \text{ km}}{\frac{10}{60} \text{ hours}}$$

$$= 0.6 \times 6 \text{ kmh}^{-1}$$

$$= 3.6 \text{ kmh}^{-1}$$

9. (a) **Data:** Joanne bought 2 pieces of chicken and 3 portions of fries for \$69.00 and Malika purchased 1 piece of chicken and 4 portions of fries for \$72.00. \$$x$ represents the cost of 1 piece of chicken and \$$y$ represents the cost of 1 portion of fries.

(i) **Required to write:** Two equations, in terms of x and y, to represent the information given.
Solution:
Joanne
2 pieces of chicken at \$$x$ each and 3 portions of fries at \$$y$ each cost \$69.

$$\therefore (2 \times x) + (3 \times y) = 69$$

$$2x + 3y = 69 \quad \ldots ❶$$

Malika
1 piece of chicken at \$$x$ each and 4 portions of fries at \$$y$ each cost \$72.

$$\therefore (x \times 1) + (y \times 4) = 72$$

$$x + 4y = 72 \quad \ldots ❷$$

(ii) **Required to find:** The cost of one piece of chicken and one portion of fries.
Solution:

$$2x + 3y = 69 \quad \ldots ❶$$

$x+4y=72 \qquad \ldots ❷$

Equation ❷ $\times -2$:

$-2x-8y=-144 \qquad \ldots ❸$

Equation ❶ + Equation ❸:

$$\begin{array}{r} 2x+3y= \quad 69 \\ -2x-8y=-144 \\ \hline -5y=- \quad 75 \end{array}$$

$$y=\frac{-75}{-5}$$

$$y=15$$

Substitute $y=15$ into equation ❷:

$$x+4(15)=72$$

$$x=72-60$$

$$=12$$

Hence, the cost of 1 piece of chicken $=\$12$ and the cost of 1 portion of fries $=\$15$.

(b) (i) **Required to complete:** Mapping diagram given for the relation $f:x\to 2x-1$

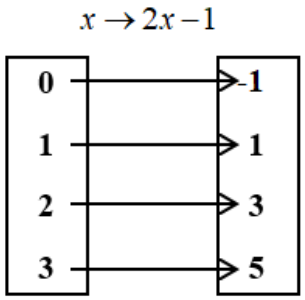
Solution:

$f:x\to 2x-1$

$f:2\to 2(2)-1=4-1=3$

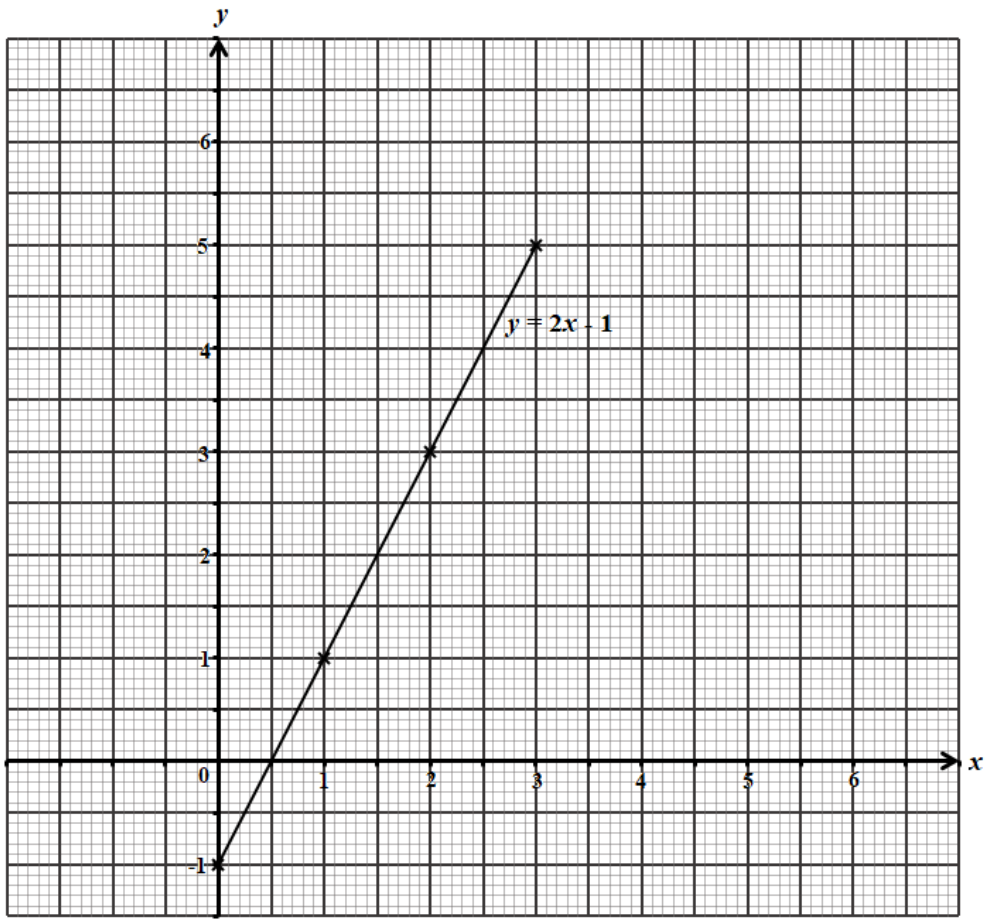
$f:3\to 2(3)-1=6-1=5$

The completed mapping diagram looks like:



(ii) **Required to plot:** The graph of $y=2x-1$ using the mapping of $x\to 2x-1$.

Solution:



(ii) **Required to draw:** The line parallel to $y = 2x - 1$ which passes through the origin on the same axes.

Solution:

$y = 2x - 1$ is of the form $y = mx + c$, where $m = 2$ is the gradient and $c = -1$ is the intercept on the $y-$ axis.

Hence, if the line passes through O and is parallel to $y = 2x - 1$, its equation is $y = 2x + 0$.

The gradient $= 2$ since parallel lines have the same gradient.

$y = 2x$

When $x = 0$: $y = 2(0) = 0$

When $x = 2$: $y = 2(2) = 4$

x	y
0	0
2	4

We plot $(0, 0)$ and $(2, 4)$, extending it to any desired length.