FAS-PASS Maths

NCSE MATHEMATICS PAPER 2
YEAR 2007
Section I

1. (a) **Required to calculate:** $\frac{3}{7}+\frac{2}{3}$

giving the result as an improper fraction

Calculation:

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

$$\frac{3(3)+7(2)}{21}=\frac{9+14}{21}$$

$$=\frac{23}{21} \text{ (as an improper fraction)}$$

(b) (i) **Required to calculate:** 562×53

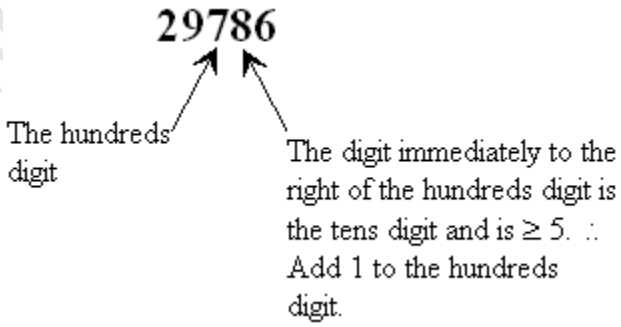
Calculation:

$$\begin{array}{r} 5\,6\,2\times \\ \underline{\quad\quad 5\,3} \\ 2\,8\,1\,0 \\ \underline{1\,6\,8\,6\quad} \\ 29\,7\,8\,6 \end{array}$$

$\therefore$ Answer = 29 786 (exact)

(ii) **Required to express:** The answer to b(i) to the nearest hundred.

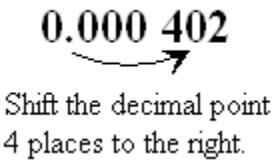
Solution:



All the digits after the hundreds digit are now written as zeros.

$\therefore$ Answer = 29 800 (to the nearest hundred)

(c) **Required to express:** 0.000 402 in standard form.
Solution:



This is equivalent to dividing by 10^4.

$$\therefore 0.000\,402 = \frac{4.02}{10^4}$$
$$= 4.02 \times 10^{-4} \text{ (in standard form)}$$

2. (a) **Required to simplify:** $\frac{15p^2q}{3p}$

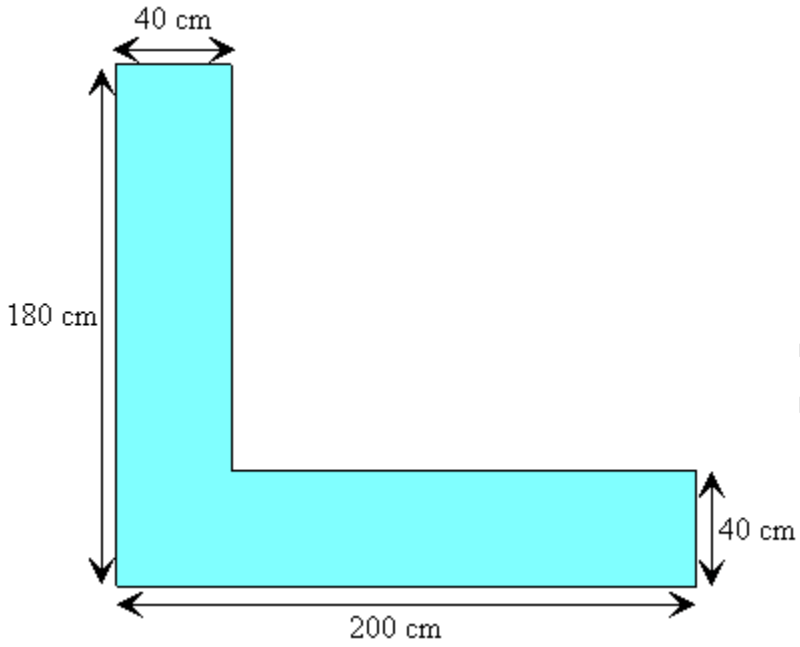
Solution:

$$\frac{15p^2q}{3p} = \frac{\cancel{15}^{5} \times \cancel{p} \times p \times q}{\cancel{3} \times \cancel{p}}$$
$$= 5pq \text{ (in the lowest terms)}$$

(b) **Data:** $3x - 5 = x + 7$
Required to find: x
Solution:

$$3x - 5 = x + 7$$
$$3x - x = 7 + 5$$
$$2x = 12$$
$$\div 2$$
$$x = 6$$

3. **Data:**

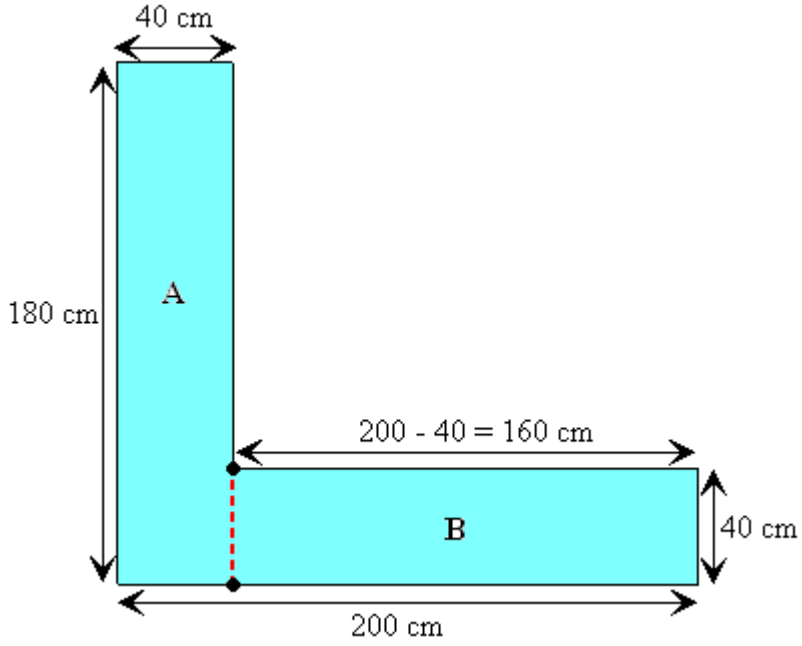


This diagram shows a counter top.

(a) **Required to calculate:** The area of the counter top.

Calculation:

The figure is a compound shape and is now divided into two definite or simple shapes. These shapes A and B are as shown on the diagram and are both rectangles.



Area of rectangle A $= (180 \times 40)$

$= 7200 \text{ cm}^2$

Area of rectangle B $= (160 \times 40)$

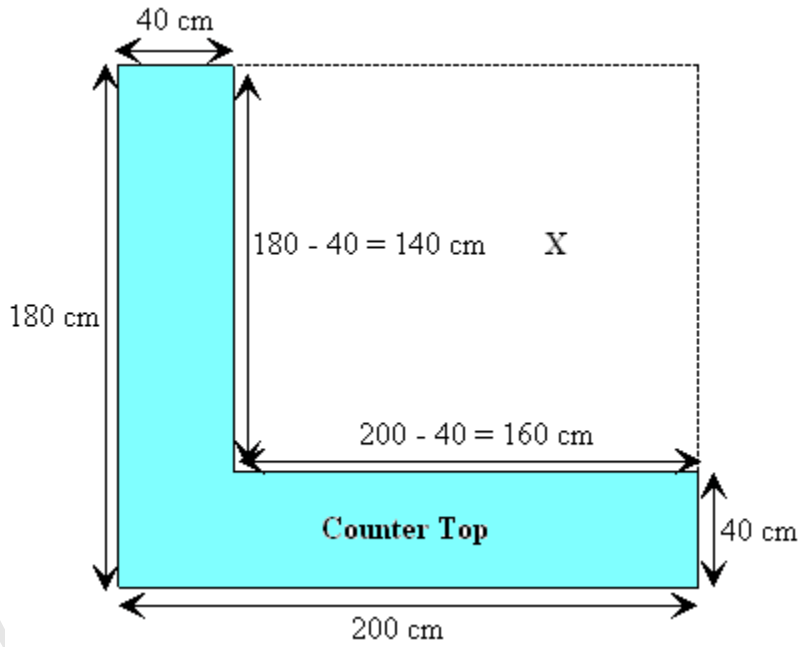
$= 6400 \text{ cm}^2$

$\therefore$ Area of the entire counter top = Area of A + Area of B

$= (7200 + 6400) \text{ cm}^2$

$= 13600 \text{ cm}^2$

ALTERNATIVELY



We may complete the rectangle using the dotted lines, as shown.
Marking off the region, X

Area of X = $(140 \times 160) \text{ cm}^2$

$= 22400 \text{ cm}^2$

Area of counter top + Area of X $= 200 \times 180$

$= 36000 \text{ cm}^2$

$\therefore$ Area of counter top $= (36000 - 22400) \text{ cm}^2$

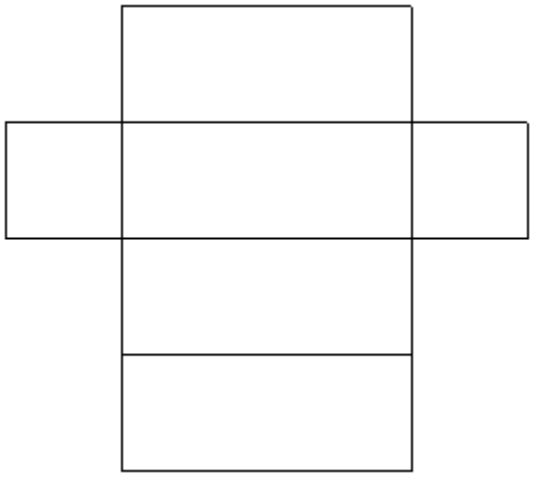
$= 13600 \text{ cm}^2$

(b) **Data:** The counter top is to be tiled with 5 cm square tiles.
Required to calculate: The number of tiles to be used
Calculation:

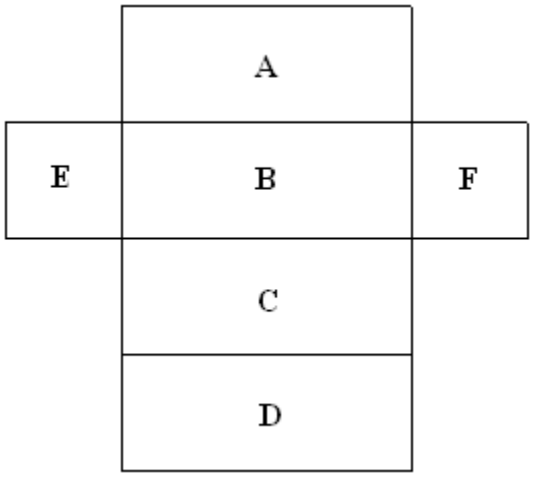
$$\text{Number of tiles needed} = \frac{\text{Area of counter top}}{\text{Area of 1 tile}}$$
$$= \frac{13\,600}{5 \times 5}$$
$$= 544$$

$\therefore$ 544 tiles will be needed to cover the counter top.

4. (a) **Data:** The diagram shows the net of a solid.

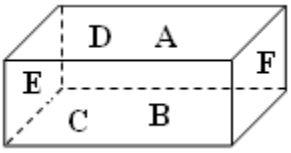


(i) **Required to name:** The solid from the net shown.
Solution:
We name the faces A, B, C, D, E and F as shown.



A, E, F and C are folded vertically and then D folded vertically above C

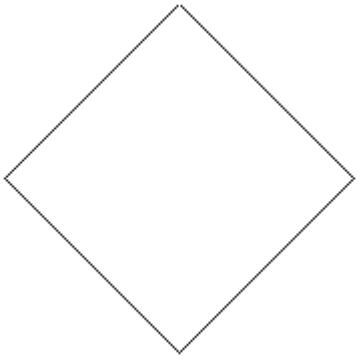
When the faces are folded as described, we shall see that the solid is a cuboid as shown.



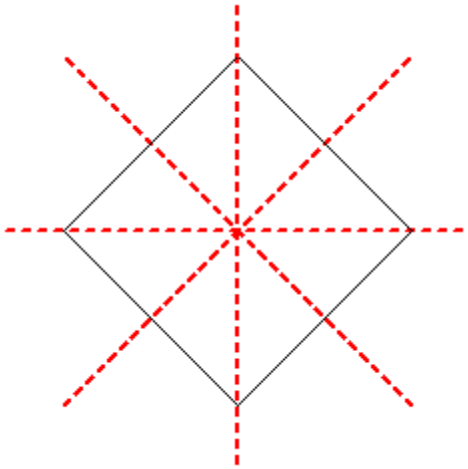
(ii) **Required to complete:** The table given, for the solid.
Solution: By checking we obtain

Number of Edges	Number of Faces	Number of Vertices
12	6	8

(b) **Required to draw:** All the lines of symmetry on the shape shown.

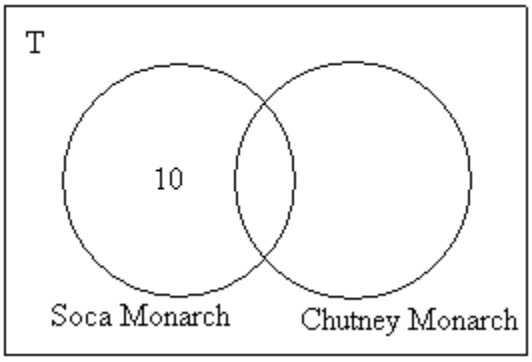


Solution:
Assuming the shape is a square,

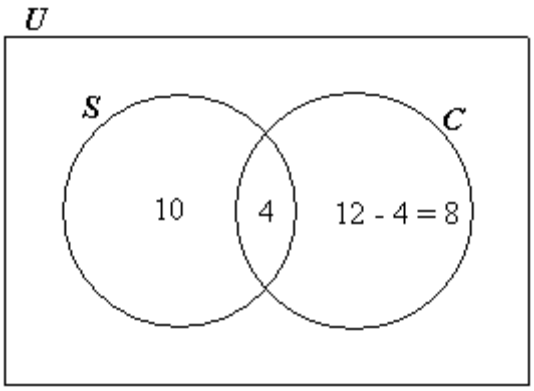


There are 4 lines of symmetry of more precisely reflective symmetry, as shown.

5. **Data:** In a class of 25, students bought tickets for two competitions, the Soca Monarch and the Chutney Monarch. Given that:
   - 10 students bought tickets for the Soca Monarch only
   - 4 bought tickets for both events and
   - 12 bought tickets for the Chutney Monarch.



(a) **Required to complete:** The Venn diagram to show this information.
Solution:
Let U represent the set of all 25 students in the class.
Let
$S = \{\text{Students who bought tickets for the Soca Monarch}\}$
$C = \{\text{Students who bought tickets for the Chutney Monarch}\}$



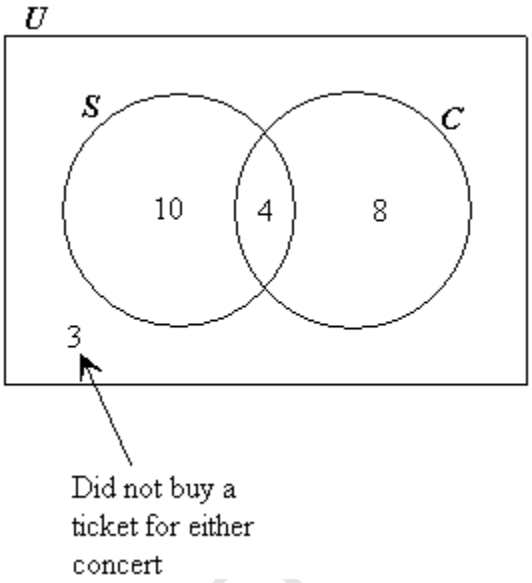
(b) **Required to calculate:** The number of students in the class who bought tickets.
Calculation:
The total number of tickets bought by the students of the class
$= 10 + 4 + (12 - 4)$
$= 10 + 4 + 8$
$= 22$

(c) **Required to calculate:** The number of students who did not buy tickets for either concert.

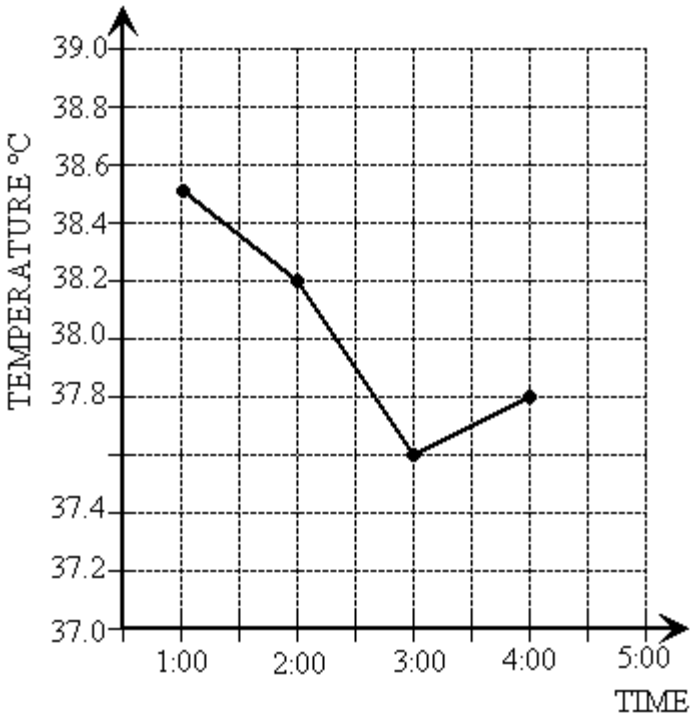
Calculation:

The number of students who did not buy a ticket $= 25 - (22)$

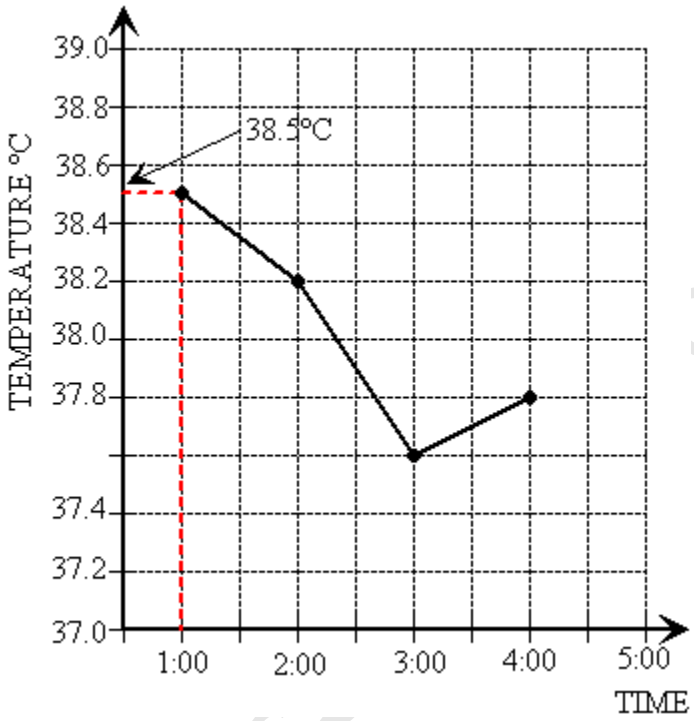
$= 3$



6. **Data:** Angelina had a fever and her temperature was recorded every hour from 1:00 PM to 4:00 PM.



(a) **Required to find:** Angelina's temperature at 1:00 PM.
Solution:
Using the figure given:

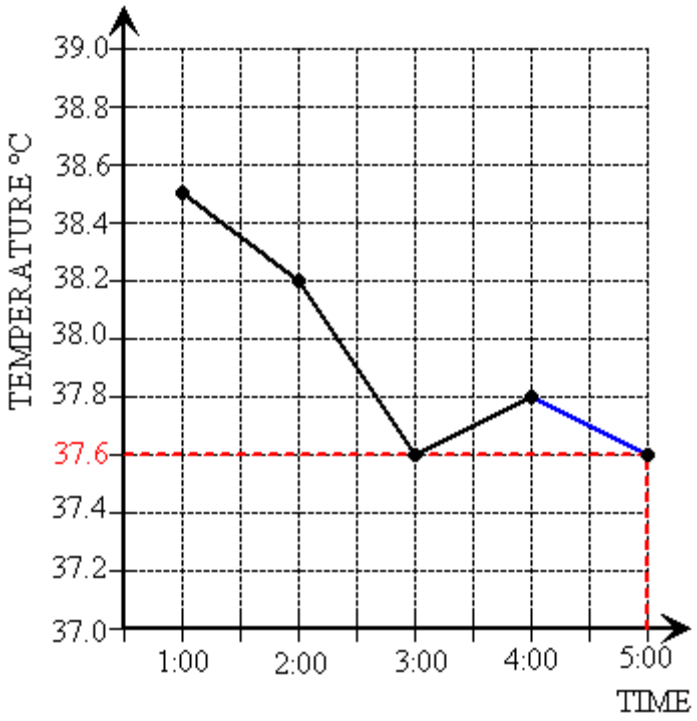


Draw a vertical line from 1:00 PM to meet the graph. At that point, draw a horizontal to meet the temperature axis.

We can read off the temperature at 1:00 PM as 38.5°C.

(b) **Data:** Temperature at 5:00 PM was 0.2°C lower than the temperature at 4:00 PM.
Required to complete: The graph to show this information
Solution:
The temperature at 4:00 PM = 37.8°C
$\therefore$ Temperature at 5:00 PM $= 37.8°C - 0.2°C$ (data)
$= 37.6°C$

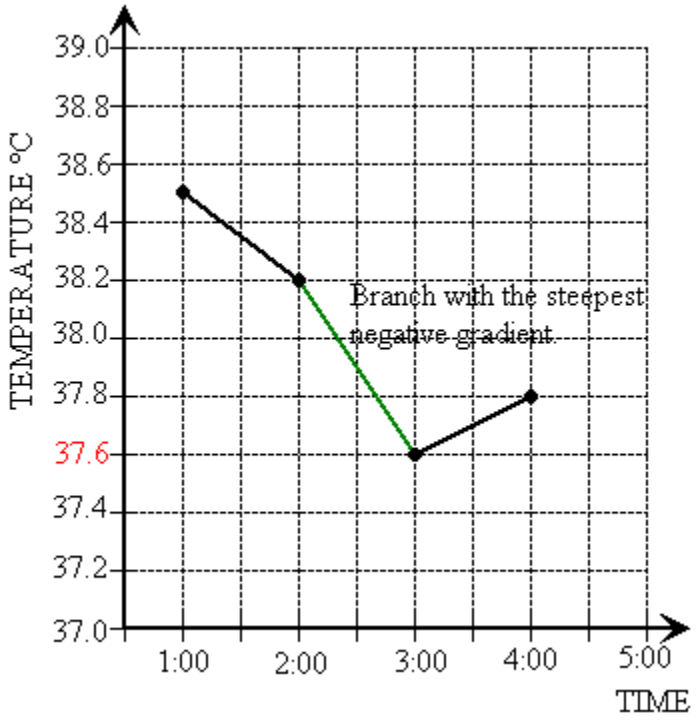
The line to show this information is completed as shown on the graph below.



(c) **Required to estimate:** The temperature at 6:00 PM.
Solution:
The temperature between 5:00 PM and 6:00 PM drops at the same rate between 4:00 PM and 5:00 PM.(data)

$$\therefore \text{Estimated temperature at 6:00 PM} = 37.6°\text{C} - 0.2°\text{C}$$
$$= 37.4°\text{C}$$

(d) **Required to determine:** The 1 hour period with the greatest drop in temperature.
Solution:



Drop from 1:00 PM to 2:00 PM $= 38.5°C - 38.2°C$
$= 0.3°C$

Drop from 2:00 PM to 3:00 PM $= 38.2°C - 37.6°C$ (from graph)
$= 0.6°C$

From 3:00 PM to 4:00 PM – there was actually a rise in temperature (from graph)

Drop from 4:00 PM to 5:00 PM – there was a drop by 0.2°C (data)

Drop from 5:00 PM to 6:00 PM – there was a drop by 0.2°C (data)

$\therefore$ The greatest drop in temperature occurred between 2:00 PM and 3:00 PM. Also, this can be seen as the 'branch' with the steepest negative gradient, shown as the green line segment.

Section II

7. (a) (i) **Data:** Maria and Harry visited a fast food restaurant to buy a meal.

MAIN MENU	
ITEM	**COST**
1 piece chicken	\$6.25
1 portion fries	\$2.75
Salad	\$3.75
Soft drink	\$1.25

Required to calculate: The cost of Maria's meal, if she ordered the following items from the main menu – 1 piece chicken, 1 portion fries, 1 soft drink.

Calculation:

Cost of 1 piece of chicken = \$ 6.25
Cost of 1 portion of fries = \$ 2.75 +
Cost of 1 soft drink = \$ 1.25
Total Cost = \$10.25

(ii) **Data:** After buying her meal, Maria noticed that the fast food restaurant offered the following special.

COMBO MEAL \$9.25
1 piece chicken
1 portion fries
1 soft drink

Required to calculate: The amount of money she would save if she had bought the Combo Meal instead

Calculation:

Maria would save, by buying the Combo Meal:
Total paid by buying the items individually – Cost of the Combo Meal
$= \$10.25 - \$9.25 = \$1.00$

(iii) **Data:** Harry buys two pieces of chicken and other items for a total of exactly \$20.00.

Required to find: The other items

Solution:

Cost of 2 pieces of chicken at \$6.25 each $= \$6.25 \times 2$
$= \$12.50$

$\therefore$ Cost of the remaining items that Harry bought $= \$20.00 - \$12.50$
$= \$7.50$

Possible choices are:
2 salads at \$3.75 each would cost $= \$3.75 \times 2$
$= \$7.50$

OR

1 piece of chicken and 1 soft drink would cost $= \$6.25 + \$1.25$
$= \$7.50$

OR

1 salad and 3 soft drinks would cost $= \$3.75 + 3(\$1.25)$
$= \$3.75 + \$3.75$
$= \$7.50$

OR

6 soft drinks at \$ 1.25 each, costing ($1.25 × 6) = \$ 7 .50

(b) (i) **Data:** A company bought 100 CDs for \$2000.00 and sold them at\$28.00 each.
Required to calculate: The total profit
Calculation:
Total sales on CDs at \$28.00 each $= 100 \times \$28.00$
$= \$2800$

$\therefore$ Profit = Total received for sales – Total cost price
$= \$2800 - \$2000$
$= \$800$

(ii) **Required to calculate:** Percentage profit.
Calculation:

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{Cost Price}} \times 100$$
$$= \frac{\$800}{\$2000} \times 100$$
$$= 40\%$$

(iii) **Data:** Profit in first week = \$632
Required to calculate: Number of CDs sold
Calculation:
Profit on 1 CD = Selling price - Cost price

$$\text{Cost price of 1 CD} = \frac{\text{Total cost price of 100 CDs}}{\text{Number of CDs}}$$
$$= \frac{\$2000}{100}$$
$$= \$20$$

$$\therefore \text{Profit on 1 CD} = \$28 - \$20$$
$$= \$8$$

$$\therefore \text{Number of CDs sold} = \frac{\text{Profit}}{\text{Profit on 1 CD}}$$
$$= \frac{\$632}{\$8}$$
$$= 79 \text{ CDs}$$

8. (a) **Data:** Ken's cellular phone rates and the balance on his account are shown below.

TELESMART CELL PHONE RATES	
Text Messages	20¢ per text
Calls	40¢ per min.

Account Balance	\$100.00

Ken used his cell phone and made calls lasting 3 hours.

(i) **Required to calculate:** Total cost of Ken's call.
Calculation:
Total cost of Ken's calls
$= \text{Cost per minute} \times \text{Duration of the calls in minutes}$
$= \$0.40 \times (60 \times 3)$
$= \$72.00$

(ii) **Data:** Cost of calls is deducted from the account.
Required to calculate: Balance after the deduction.
Calculation:

$$\text{Balance after deduction} = \text{Previous Account Balance} - \text{Cost of calls}$$
$$= \$100 - \$72$$
$$= \$28$$

(iii) **Required to calculate:** The number of text messages that can be sent with the balance.
Calculation:
Balance = \$28.00
Cost of 1 text message = \$0.20

$$\therefore \text{Number of text messages that may be sent} = \frac{\text{Balance}}{\text{Cost per text}}$$
$$= \frac{\$28.00}{\$0.20}$$
$$= 140 \text{ text messages}$$

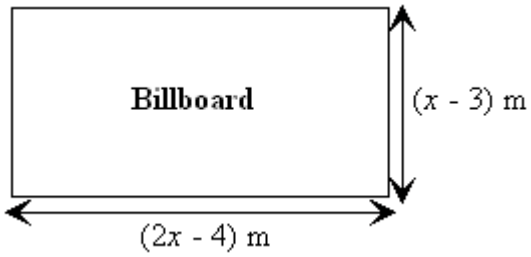
(b) **Data:** \$6000.00 earns 6% simple interest per annum for 5 years.
Required to calculate: Total amount acquired after 5 years
Calculation:

$$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$
$$= \frac{\$6000 \times 6 \times 5}{100}$$
$$= \$1800$$

$\therefore$ Total amount received after 5 years = Principal + Interest Earned
$$= \$6000 + \$1800$$
$$= \$7800$$

(c) **Data:** Computer costs \$350 US, and US \$1.00 ≡ TT \$6.30
Required to calculate: Cost in TT dollars.
Calculation:
Cost in TT dollars for the computer
$$= \text{Cost in US dollars} \times \text{Exchange rate per \$1.00}$$
$$= 350 \times \$6.30$$
$$= \text{TT}\$2205$$

9. **Data:**



(a) **Required to calculate:** The perimeter of the billboard.
Calculation:
Assuming the billboard is rectangular,

$$\text{Perimeter} = 2(\text{Length} + \text{Width})$$
$$= 2\big((2x-4)+(x-3)\big)$$

(b) **Required to write:** A simplified expression in x for perimeter.
Solution:
Simplifying the expression from (a)

$$\text{Perimeter} = 2(2x-4+x-3)$$
$$= 2(3x-7)$$
$$= (6x-14)\text{ m}$$

(c) **Data:** Perimeter of the billboard = 70 m.
Required to calculate: x
Calculation:
Perimeter of billboard $= 6x-14 = 70$ (data)

$$\therefore 6x = 70+14$$
$$x = \frac{84}{6}$$
$$= 14$$

(d) **Required to calculate:**
(i) Length of billboard
(ii) Width of billboard
Calculation:
(i) Length of billboard $= (2x-4)\text{ m}$

Substituting $x = 14$

$$\text{Length} = 2(14)-4$$
$$= 28-4$$
$$= 24\text{ m}$$

(ii) Width of billboard $=(x-3)$ m

Substitute $x=14$
Width $=14-3$
$=11$ m

10. **Data:** The equation $y=2x+1$ gives the relationship between two variables x and y.

x	1	2	3	4	5	6
y	3		7		11	

(a) **Required to complete:** The table given.
Solution:
When $x=2$, $y=2(2)+1=5$
When $x=4$, $y=2(4)+1=9$
When $x=6$, $y=2(6)+1=13$

$\therefore$ The completed table is:

x	1	2	3	4	5	6
y	3	5	7	9	11	13

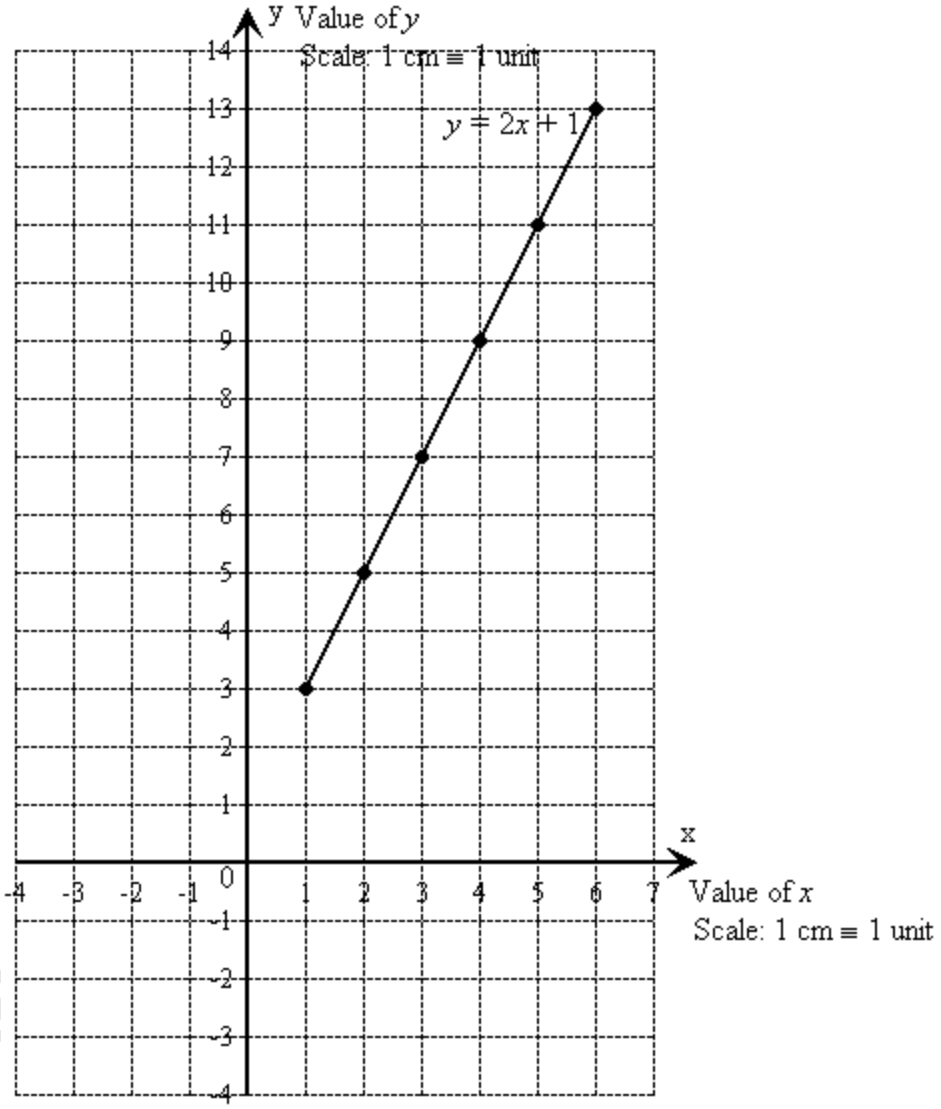
(b) **Required to:**

(i) Draw the x and y axes, using a scale of 1 cm to represent 1 unit on each axis.

(ii) Use the values in the table to plot the points.

(iii) Draw the graph of $y = 2x + 1$.

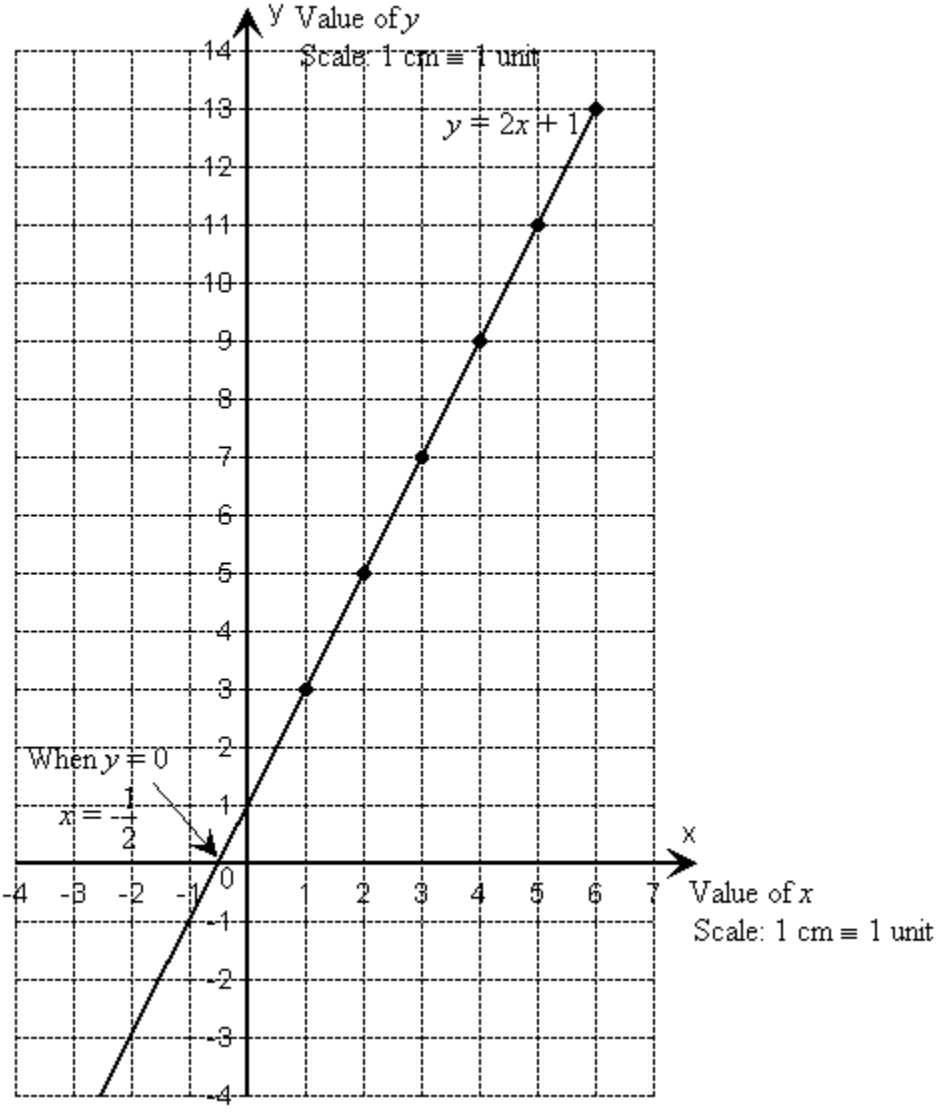
Solution:



(c) (i) **Required to find:** The value of x when $y = 0$.

Solution:

The line is extended backwards, as shown by the dotted lines.



When $y = 0,\ x = -\frac{1}{2}$, (as read off from the graph and shown).

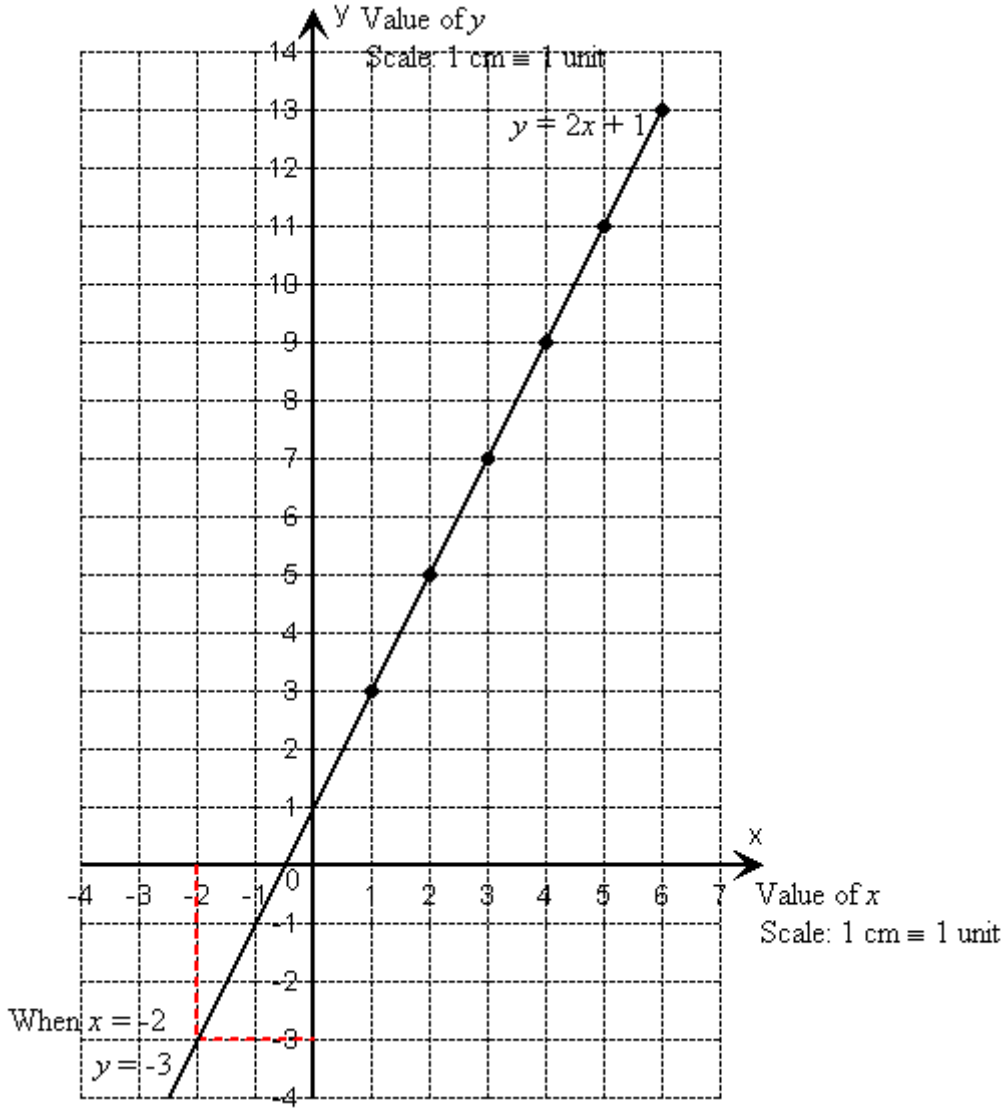
(ii) **Required to find:** The value of y when $x = -2$.

Solution:

The vertical at $x = -2$ meets the line $y = 2x + 1$

At that point a horizontal is drawn to meet the $x-$axis.

The value of $y = -3$ is read off and illustrated in red



Hence, when $x = -2,\ y = -3$.

11. (a) **Required to:** Use a ruler, pencil and a pair of compasses to

(i) Draw a line segment AB such that AB = 5.2 cm.

(ii) Construct the perpendicular bisector of AB. Let the bisector cut AB at M.

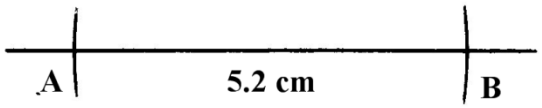
(iii) Locate points P and Q on the bisector such that PM = MQ = 4 cm.

(iv) Draw the quadrilateral APBQ.

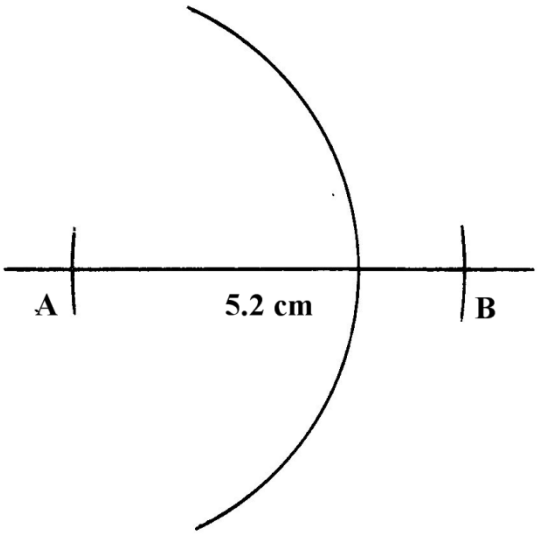
(v) Name the quadrilateral APBQ.

Solution:

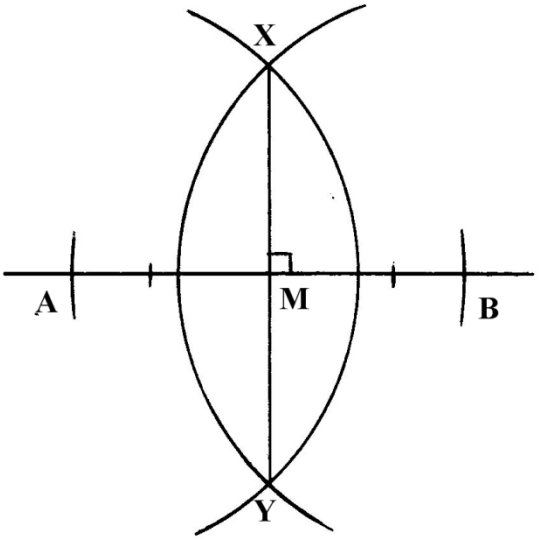
(i) A line longer than 5.2 cm is drawn. The pair of compasses opened at a radius of 5.2 cm is used to cut off AB = 5.2 cm. The cut-off arcs to identify, A and B are shown.



(ii) With center A and radius more than half the length of AB, an almost semi-circular arc is drawn.

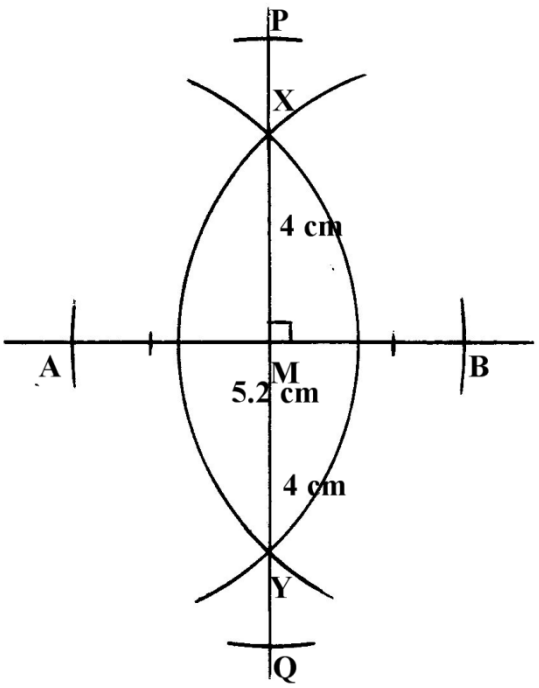


With center B and the same radius, another arc is drawn so as to cut the first arc at X and Y as shown

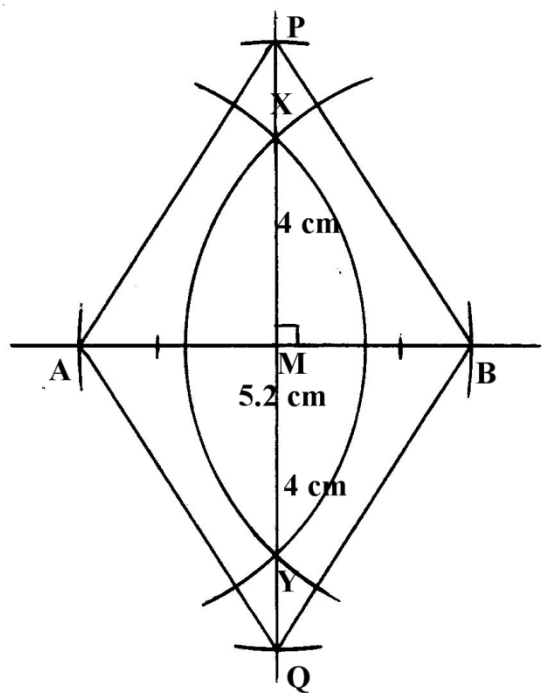


Join X to Y so that XY meets AB at M. XY is the perpendicular bisector of AB, meeting AB at M, AM = MB and $A\hat{M}X = B\hat{M}X = 90°$.

(iii) The line XY is extended, if necessary, so that MP = MQ = 4cm. We use the compass to cut off the points P and Q as shown



(iv) APBQ is now drawn by connecting the points A, P, B and Q.

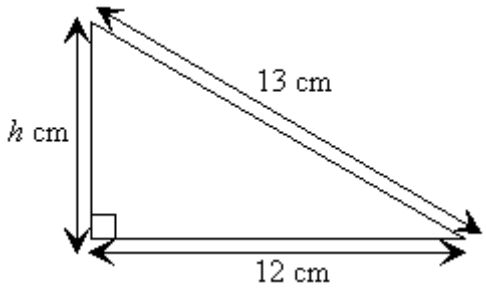


(v) The diagonals of the quadrilateral APBQ bisect each other (MA = MB and MP = MQ) and also cut at right angles
$(P\hat{M}A = P\hat{M}B = Q\hat{M}A = Q\hat{M}B = 90°)$

Only the diagonals of a rhombus both
(i) bisect each other and
(ii) cut at right angles.

$\therefore$ The quadrilateral APBQ is therefore a rhombus.

(b) **Data:**

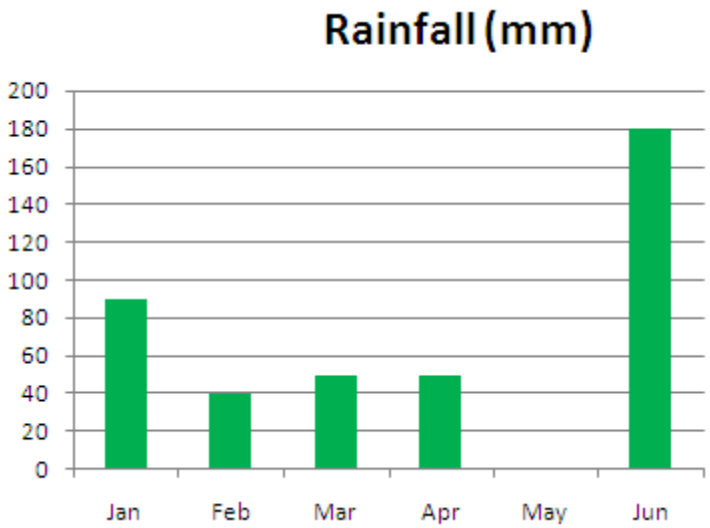


Required to calculate: The value of h
Calculation:

$(h)^2 + (12)^2 = (13)^2$ (Pythagoras' Theorem)

$$\therefore h^2 = (13)^2 - (12)^2$$
$$= 169 - 144$$
$$= 25$$
$$h = \sqrt{25}$$
$$= 5$$

12. **Data:** The Bar Chart below shows the average monthly rainfall in Trinidad for the first half of a certain year. The Bar representing the amount of rainfall for the month of May is missing.



Month	Amount of rainfall (mm)
Jan	90
Feb	
Mar	
Apr	
May	
June	

(a) **Required to complete:** The incomplete table given by using the diagram.
Solution:
Reading the amount of rainfall for the months from the bar chart, the table is now completed.

Month	Amount of rainfall (mm)
Jan	90
Feb	40
Mar	50
Apr	50
May	130
June	180

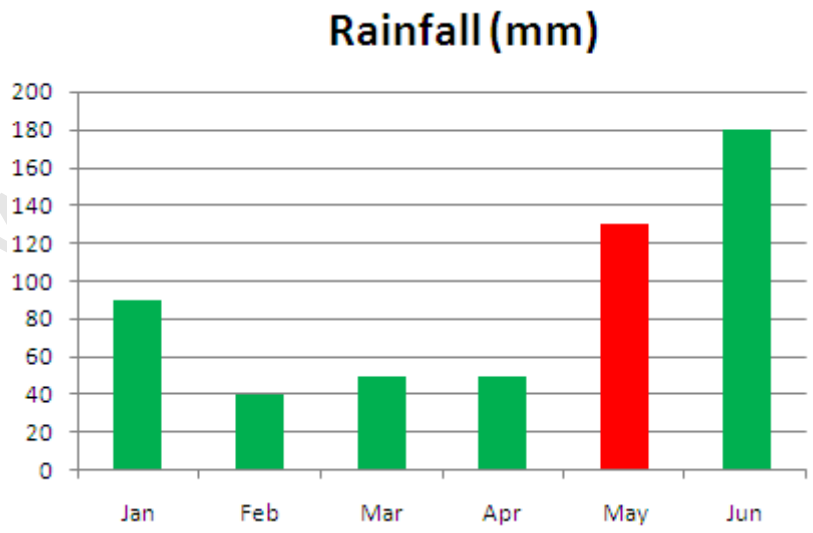
(b) **Data:** Total rainfall for the first half of the year = 540 mm.
Required to calculate: The amount of rainfall in May
Calculation:

$$90+40+50+50+\text{Amount of rainfall in May (mm)}+180=540$$

$$\therefore \text{Amount of rainfall in May} = 540-(90+40+50+50+180)$$

$$=130 \text{ mm}$$

(c) **Required to draw:** The bar to represent the rainfall in May.
Solution:
This is done on the diagram by drawing a bar (shown red) for May to be 130 mm in height.



(d) **Required to find:** The month with the least rainfall.
Solution:
The month of February has the lowest or shortest bar and so February is the month that has the least rainfall from January to June.

(e) **Required to calculate:** The mean monthly rainfall from January to June.
Calculation:

$$\text{The mean monthly rainfall} = \frac{\text{Total amount of rainfall from Jan to Jun}}{\text{Number of months from Jan to Jun}}$$
$$= (90 + 40 + 50 + 50 + 130 + 180) \div 6$$
$$= 540 \div 6$$
$$= 90 \text{ mm}$$

(f) **Required to calculate:** The percentage of the total rainfall that fell in June.
Calculation:
The percentage of the total rainfall that occurred in the month of June

$$= \frac{\text{Rainfall in June}}{\text{Total rainfall}} \times 100$$
$$= \frac{180}{540} \times 100\%$$
$$= 33\frac{1}{3}\%$$