

NCSE 2017 PAPER II

SECTION I

1. (a) **Required to calculate:** $3\frac{1}{8} - 2\frac{1}{2}$

Calculation:

$$\begin{aligned} 3\frac{1}{8} - 2\frac{1}{2} &= \frac{25}{8} - \frac{5}{2} \\ &= \frac{1(25) - 4(5)}{8} \\ &= \frac{25 - 20}{8} \\ &= \frac{5}{8} \text{ (as a fraction)} \end{aligned}$$

- (b) **Required to calculate:** $(2.38 + 0.22) + (0.33)^2$

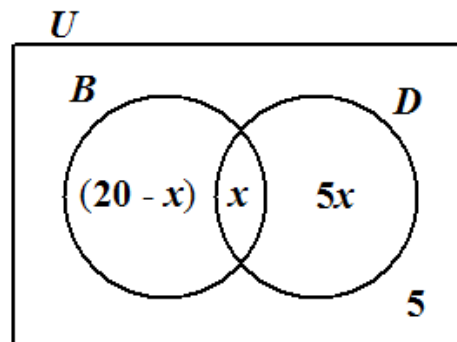
Calculation:

$$\begin{aligned} (2.38 + 0.22) + (0.33)^2 &= 2.6 + 0.1089 \text{ (By the calculator)} \\ &= 2.7089 \\ &= 2.71 \text{ (correct to 2 decimal places)} \end{aligned}$$

2. **Data:** Results of a survey conducted on 40 students to find out whether they used Digicel (D) or Bmobile (B) phones to make calls. 20 students used Bmobile phones. $5x$ students used Digicel phones only. x students used both Bmobile and Digicel phones. 5 students did not use either Bmobile or Digicel phones.

- (a) **Required to complete:** A Venn diagram for the information given.

Solution:



- (b) **Required to write:** An expression, in terms of x , to represent the total number of students in the survey.

Solution:

The total number of students in the survey is the sum of the numbers in all the subsets of the Universal set.

$$\begin{aligned}\text{Total number of students in the survey} &= 20 - x + x + 5x + 5 \\ &= 25 + 5x\end{aligned}$$

(c) **Required to find:** The value of x .

Solution:

$$n(U) = 40$$

$$\text{Hence, } 25 + 5x = 40$$

$$5x = 40 - 25$$

$$5x = 15$$

$$x = \frac{15}{5}$$

$$x = 3$$

3. (a) (i) **Required to simplify:** $6m - 2n + m + 4n$

Solution:

$$6m - 2n + m + 4n = 6m + m - 2n + 4n$$

$$= 7m + 2n$$

(ii) **Required to solve:** $4x + 3 = 15$

Solution:

$$4x + 3 = 15$$

$$4x = 15 - 3$$

$$4x = 12$$

$$x = \frac{12}{4}$$

$$x = 3$$

(b) (i) **Required to factorise:** $4p + 20$

Solution:

$$4p + 20 = \underline{4} \times p + \underline{4} \times 5$$

$$= 4(p + 5)$$

(ii) **Required to factorise:** $x^2 - 25y^2$

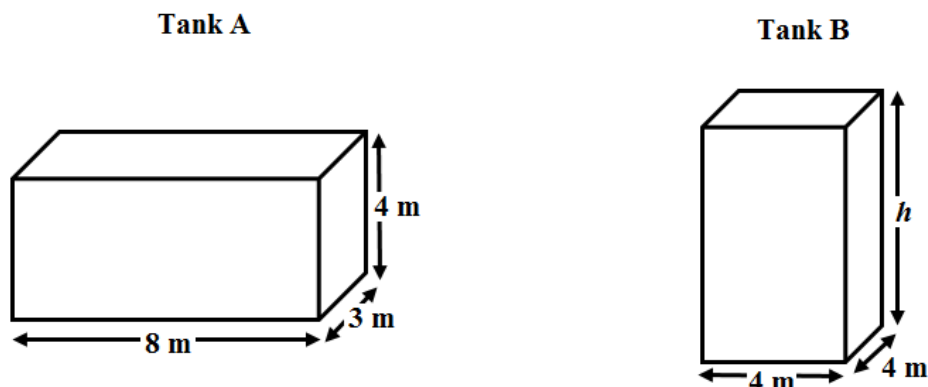
Solution:

$$x^2 - 25y^2 = (x)^2 - (5y)^2$$

This is in the form of a difference of two squares:

$$\text{So } x^2 - 25y^2 = (x - 5y)(x + 5y)$$

4. **Data:** Diagrams showing two fish tanks A and B with dimensions at Valley Line Zoo. Tank A is kept filled to maximum capacity.



- (a) **Required to find:** The volume of water in Tank A.

Solution:

$$\begin{aligned} \text{Volume of water in Tank A} &= 8 \times 3 \times 4 \text{ m}^3 \\ &= 96 \text{ m}^3 \end{aligned}$$

- (b) **Data:** $1 \text{ m}^3 = 1000$ litres

Required to state: The volume of water in Tank A in litres

Solution:

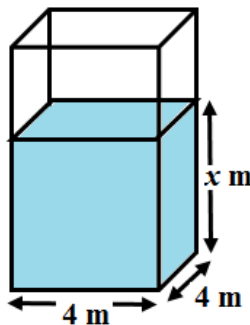
$$\begin{aligned} \text{Volume of water in Tank A} &= 96 \text{ m}^3 \\ &= 96 \times 1000 \text{ litres} \\ &= 96\,000 \text{ litres} \end{aligned}$$

- (c) **Data:** All the water from Tank A is emptied into Tank B.

Required to find: The height of the water in Tank B

Solution:

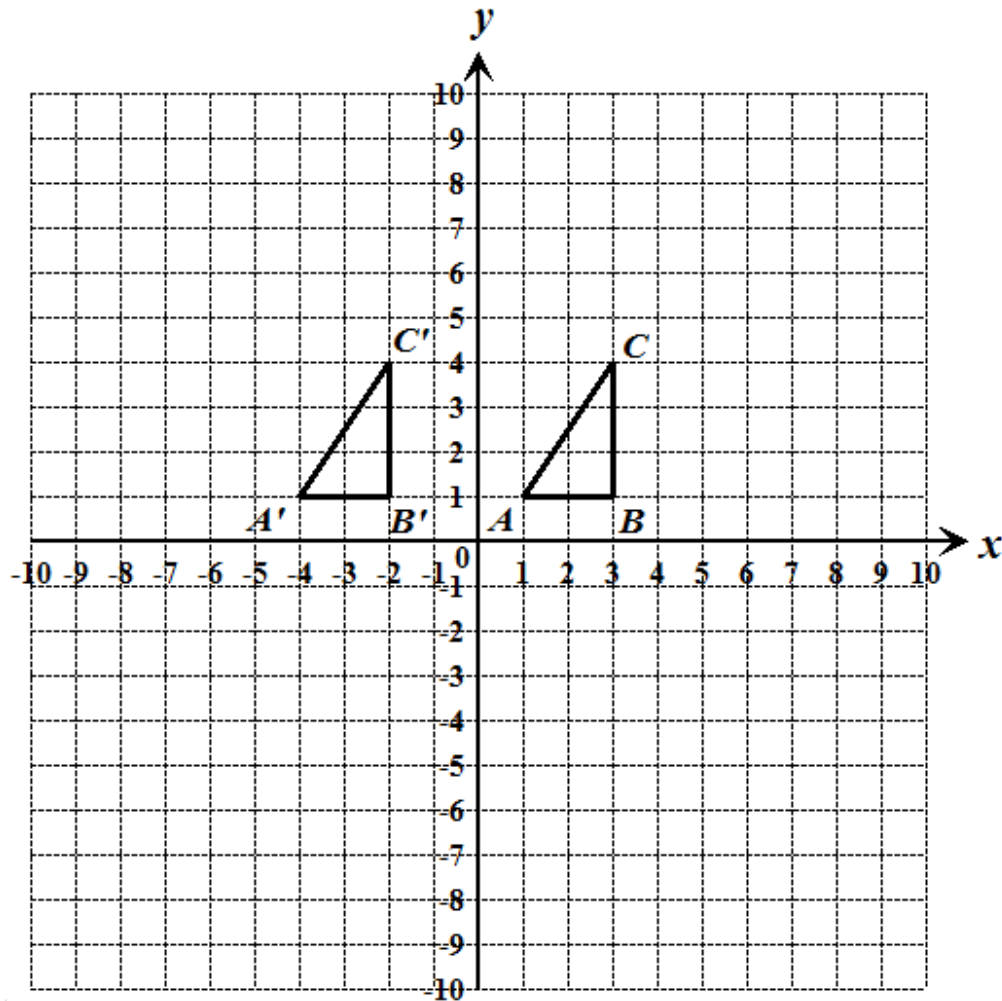
Let the height of the water in Tank B be x m.



$$\begin{aligned} \text{The volume of water in Tank B} &= 4 \times 4 \times x \\ &= 16x \end{aligned}$$

$$\begin{aligned} \text{Hence, } 16x &= 96 \\ x &= \frac{96}{16} \\ x &= 6 \text{ m} \end{aligned}$$

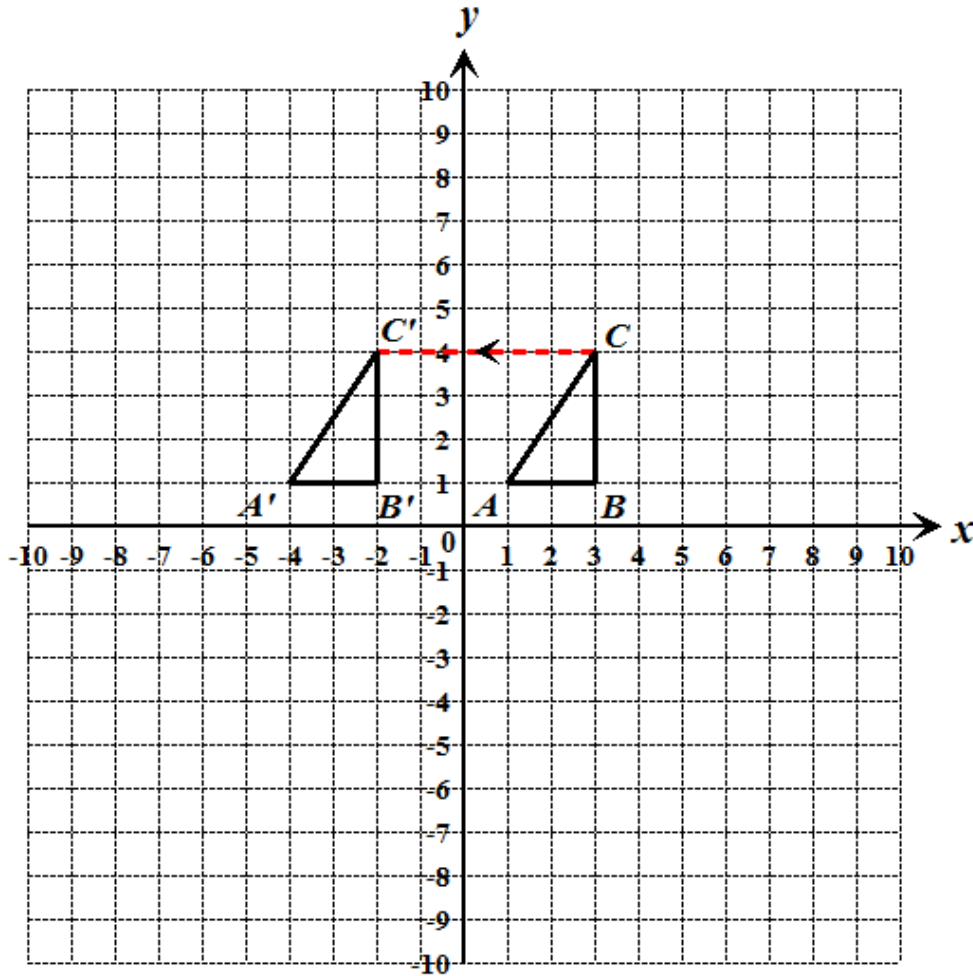
5. **Data:** Diagram showing triangle ABC translated to give image triangle $A'B'C'$.



- (a) **Required to write:** The translation vector that maps triangle ABC onto triangle $A'B'C'$.

Solution:

Choose any point, say C . $C \xrightarrow{T} C'$.



This is a shift of 5 units horizontally to the left and which is expressed as -5.
There is no vertical shift and this is expressed as 0.

$$\therefore T = \begin{pmatrix} -5 \\ 0 \end{pmatrix}$$

- (b) **Data:** Triangle ABC is mapped onto triangle XYZ by the translation vector $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$.

Required to draw: Triangle XYZ

Solution:

$$\triangle ABC \xrightarrow{T = \begin{pmatrix} 1 \\ -4 \end{pmatrix}} \triangle XYZ$$

$$A = (1, 1)$$

$$\begin{pmatrix} 1 \\ 1 \end{pmatrix} \xrightarrow{T = \begin{pmatrix} 1 \\ -4 \end{pmatrix}} \begin{pmatrix} 1+1 \\ 1+(-4) \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$$

$$\text{So } X = (2, -3)$$

$$B = (3, 1)$$

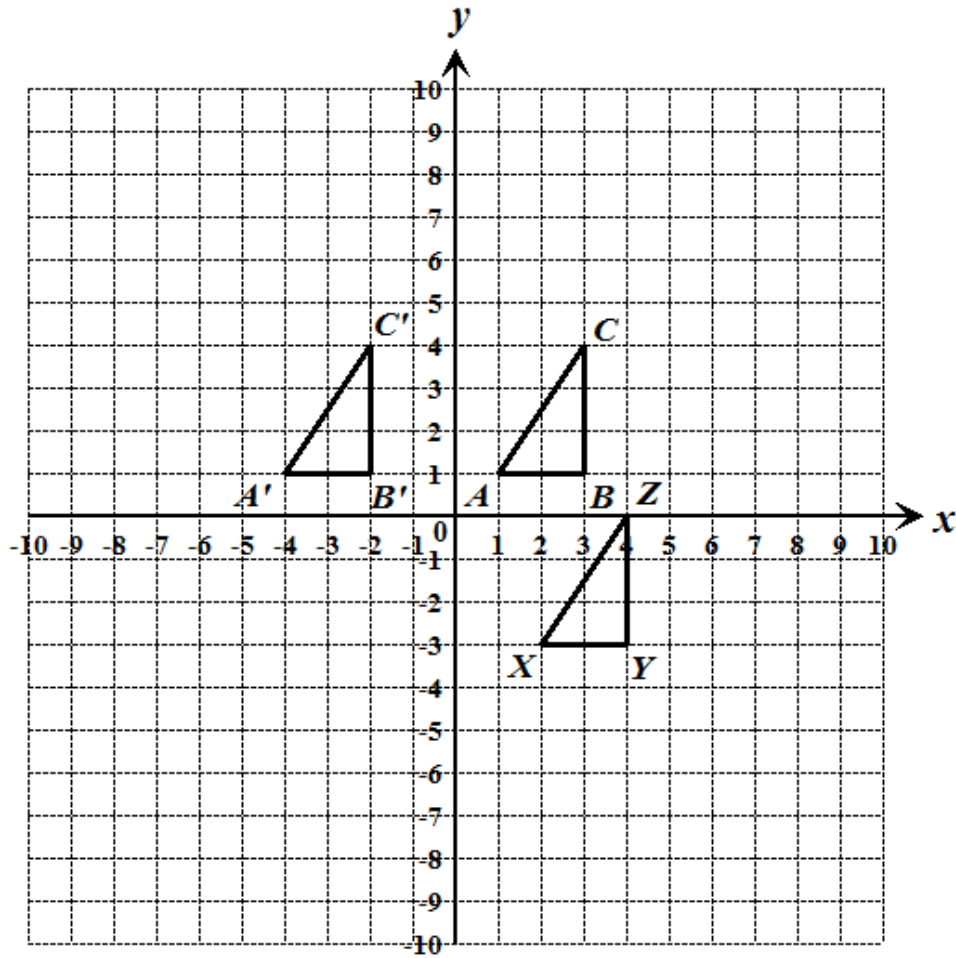
$$\begin{pmatrix} 3 \\ 1 \end{pmatrix} \xrightarrow{T = \begin{pmatrix} 1 \\ -4 \end{pmatrix}} \begin{pmatrix} 3+1 \\ 1+(-4) \end{pmatrix} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$$

$$\text{So } Y = (4, -3)$$

$$C = (3, 4)$$

$$\begin{pmatrix} 3 \\ 4 \end{pmatrix} \xrightarrow{T = \begin{pmatrix} 1 \\ -4 \end{pmatrix}} \begin{pmatrix} 3+1 \\ 4+(-4) \end{pmatrix} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$$

$$\text{So } Z = (4, 0)$$



- (c) **Required to write:** The coordinates of
- (i) X
 - (ii) Y
 - (iii) Z

Solution:

The coordinates of these points were found from before.

$$X = (2, -3)$$

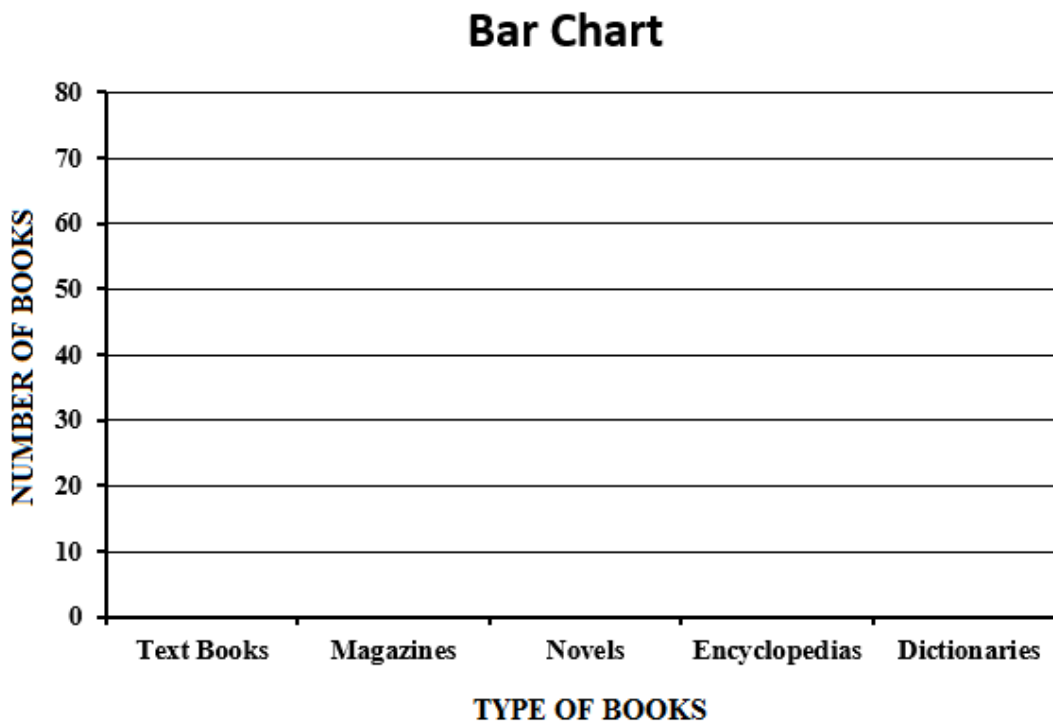
$$Y = (4, -3)$$

$$Z = (4, 0)$$

6. **Data:** Table showing the type of books sold by a bookstore in Trinidad and Tobago.

| TYPE OF BOOKS | NUMBER OF BOOKS |
|---------------|-----------------|
| Text Books | 30 |
| Magazines | 35 |
| Novels | 50 |
| Encyclopedias | 55 |
| Dictionaries | 30 |
| TOTAL | 200 |

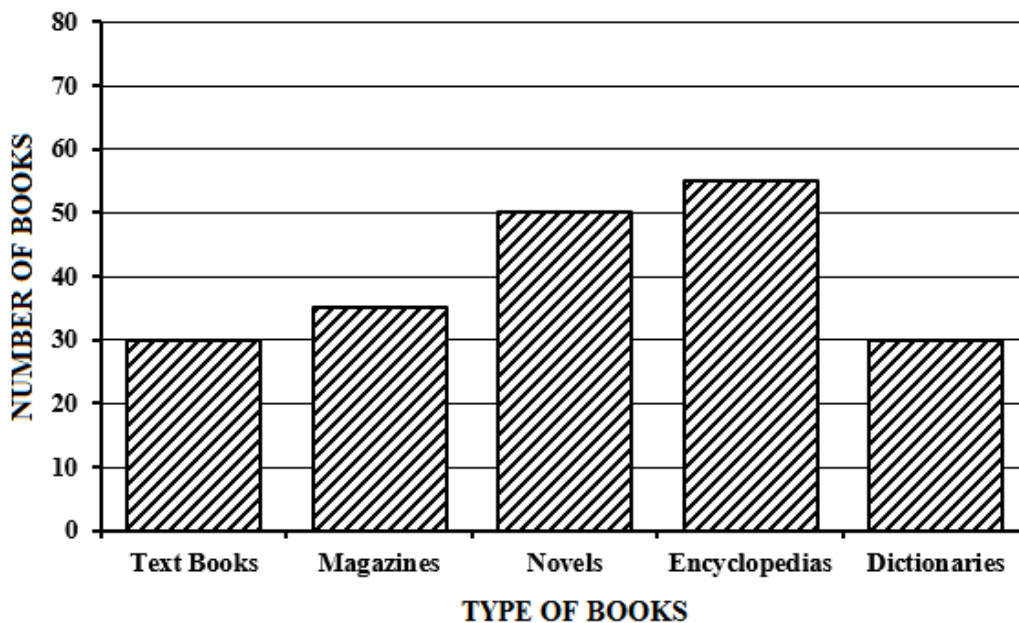
(a) **Data:** Incomplete bar chart to illustrate the types of books sold by a bookstore in Trinidad and Tobago.



Required to draw: A bar chart to illustrate the data given

Solution:

Bar Chart



- (b) (i) **Required to find:** The modal type of books.

Solution:

The modal type of books is encyclopedias as shown by the longest bar.

- (ii) **Required to find:** The probability that a customer buying a book would buy a dictionary.

Solution:

$$\begin{aligned}
 P(\text{Book bought is a dictionary}) &= \frac{\text{No. of dictionaries sold}}{\text{Total no. of books sold}} \\
 &= \frac{30}{200} \\
 &= \frac{3}{20} \text{ or } 0.15 \text{ or } 15\%
 \end{aligned}$$

SECTION II

7. (a) **Data:** Table showing the menu at a restaurant. Marlon orders 1 small portion of fried rice, 2 pieces of BBQ chicken and a medium drink. V.A.T. is charged at $12\frac{1}{2}\%$.

| ITEM | COST (\$) |
|---------------------------------|-----------|
| 1 small portion of fried rice | \$10.00 |
| 1 small portion of macaroni pie | \$12.00 |
| 1 piece of BBQ chicken | \$15.00 |
| 1 piece of BBQ fish | \$20.00 |
| 1 small drink | \$ 6.00 |
| 1 medium drink | \$ 8.00 |

- (i) **Required to calculate:** The bill before V.A.T.
Calculation:
 1 small portion of fried rice = \$10.00
 2 pieces of BBQ chicken = $2 \times \$15.00 = \30.00
 1 medium drink = \$ 8.00
 TOTAL = \$48.00
- (ii) **Required to calculate:** The total bill with V.A.T. included.
Calculation:

$$\begin{aligned} \text{V.A.T.} &= 12\frac{1}{2}\% \text{ of } \$48.00 \\ &= \frac{12.5}{100} \times \$48.00 \\ &= \$6.00 \end{aligned}$$
 The bill after V.A.T. = $\$48.00 + \6.00
 = \$54.00

- (b) **Data:** Keisha went to the bank at which the exchange rate is $\text{US}\$1 = \text{TT}\6.75 to change $\text{TT}\$216.00$ to $\text{US}\$$.
Required to convert: $\text{TT}\$216.00$ to $\text{US}\$$.
Solution:

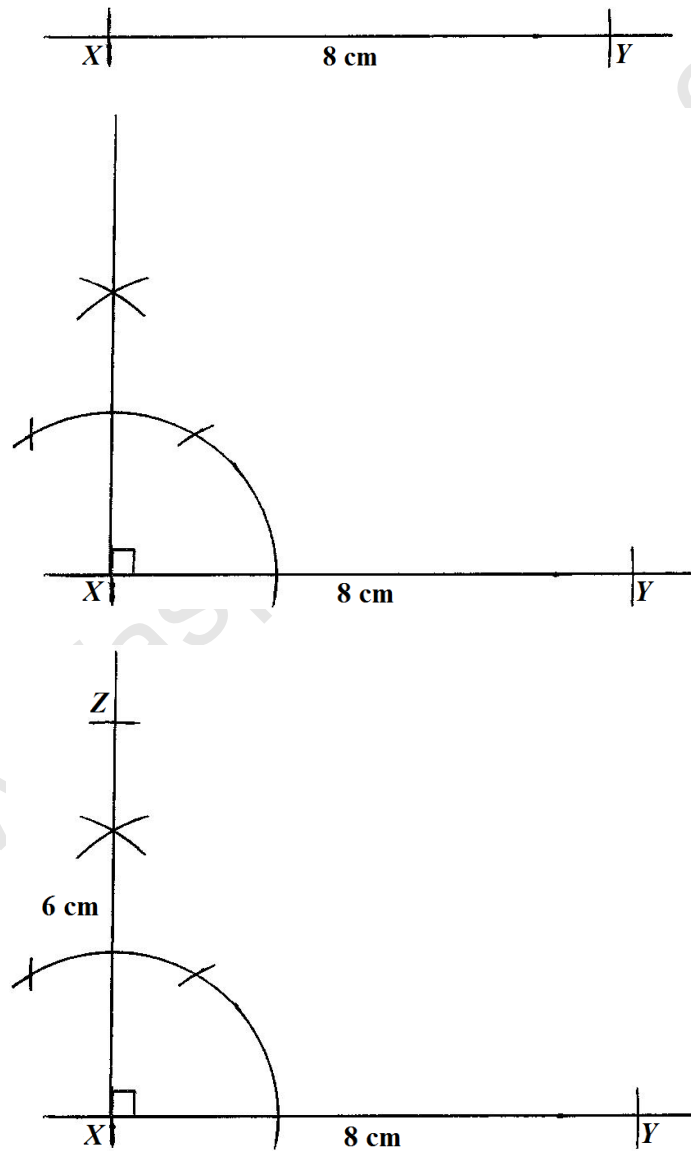
$$\text{TT\$}6.75 \equiv \text{US\$}1.00$$

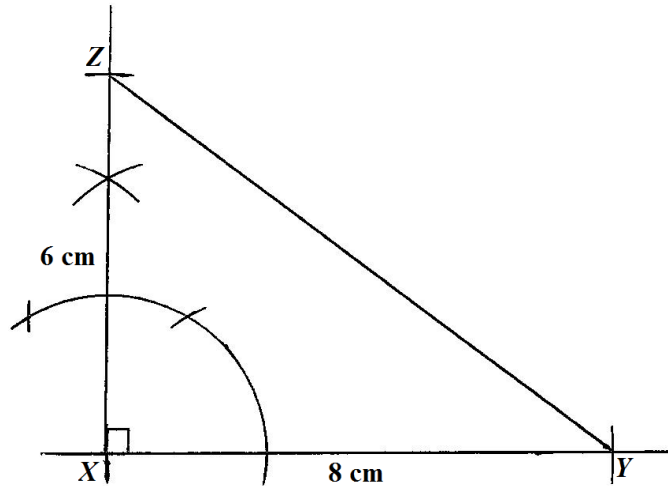
$$\therefore \text{TT\$}1.00 = \text{US\$} \frac{1.00}{6.75}$$

$$\begin{aligned} \text{TT\$}216.00 &= \text{US\$} \frac{1.00}{6.75} \times 216 \\ &= \text{US\$}32 \end{aligned}$$

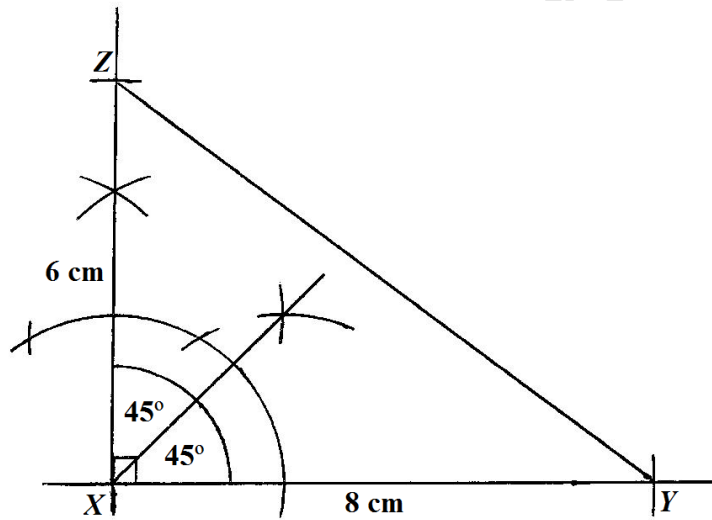
- (c) (i) **Required to construct:** Triangle XYZ with $XY = 8 \text{ cm}$, $XZ = 6 \text{ cm}$ and angle $YXZ = 90^\circ$.

Solution:

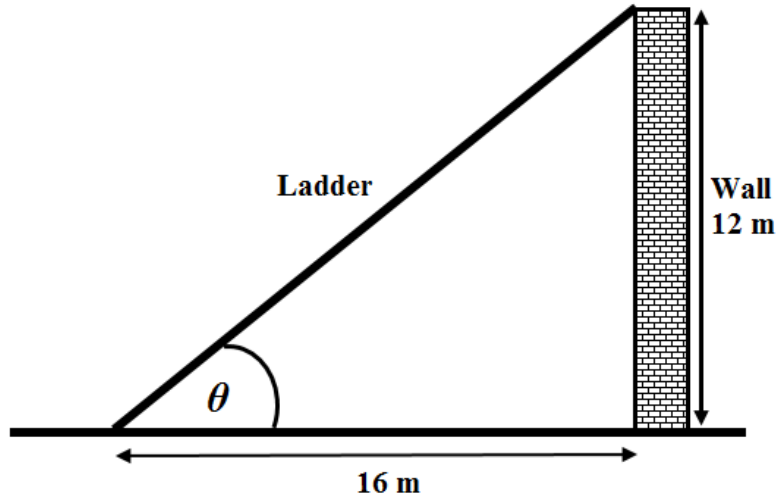




- (ii) **Required to bisect:** Angle YXZ .
Solution:



8. (a) **Data:** Diagram showing a ladder leaning against a 12 m high vertical wall. The foot of the ladder rests on ground and is 16 m away from the base of the wall.



- (i) **Required to calculate:** The length of the ladder.

Calculation:

$$(\text{Length of ladder})^2 = (16)^2 + (12)^2 \quad (\text{Pythagoras' Theorem})$$

$$\begin{aligned} \text{Length of ladder} &= \sqrt{(16)^2 + (12)^2} \\ &= \sqrt{256 + 144} \\ &= \sqrt{400} \\ &= 20 \text{ m} \end{aligned}$$

- (ii) **Required to calculate:** The value of θ .

Calculation:

Since we know all three sides of the right triangle, we could have said

$$\tan \theta = \frac{12}{16}$$

$$\theta = \tan^{-1}\left(\frac{12}{16}\right)$$

$$= 36.86^\circ$$

$$= 36.9^\circ \text{ (to the nearest } 0.1^\circ)$$

OR

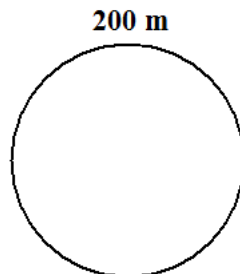
$$\begin{aligned}\cos \theta &= \frac{16}{20} \\ \theta &= \cos^{-1}\left(\frac{16}{20}\right) \\ &= 36.86^\circ \\ &= 36.9^\circ \text{ (to the nearest } 0.1^\circ\text{)}\end{aligned}$$

OR

$$\begin{aligned}\sin \theta &= \frac{12}{20} \\ \theta &= \sin^{-1}\left(\frac{12}{20}\right) \\ &= 36.86^\circ \\ &= 36.9^\circ \text{ (to the nearest } 0.1^\circ\text{)}\end{aligned}$$

- (b) **Data:** Diagram showing a circular track of circumference 200 m. Ryan takes 3 minutes to ride around the track.

Circular Track



- (i) **Required to convert:** 3 minutes to hours

Solution:

$$60 \text{ minutes} = 1 \text{ hour}$$

$$\therefore 1 \text{ minute} = \frac{1}{60} \text{ hour}$$

$$3 \text{ minutes} = \frac{1}{60} \times 3$$

$$= \frac{1}{20} \text{ hour}$$

- (ii) **Required to calculate:** Ryan's speed in km/hr.

Calculation:

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

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

$$\begin{aligned} \therefore 200 \text{ m} &= \frac{1}{1000} \times 200 \\ &= \frac{1}{5} \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Speed} &= \frac{\text{Distance}}{\text{Time}} \\ &= \frac{\frac{1}{5} \text{ km}}{\frac{1}{20} \text{ hour}} \\ &= 4 \text{ kmh}^{-1} \end{aligned}$$

- (iii) **Data:** Ryan cycled around the track 15 times.
Required to find: The distance covered in km
Solution:

$$\text{Distance around track} = \frac{1}{5} \text{ km}$$

$$\begin{aligned} \therefore \text{Distance covered after cycling 15 times} &= 15 \times \frac{1}{5} \text{ km} \\ &= 3 \text{ km} \end{aligned}$$

9. (a) **Data:** Cost of 1 story book and 4 magazines is \$50.00 and the cost of 2 story books and 3 magazines is \$65.00. b represents the cost of 1 story book and m represents the cost of 1 magazine.

- (i) **Required to write:** Two equations in b and m to represent the information given.

Solution:

Cost of 1 story book at b and 4 magazines at $m = 50$

$$\begin{array}{rccccccc} b & & + & & 4m & & = 50 \\ & & & & & & b + 4m = 50 \quad \dots \textcircled{1} \end{array}$$

Cost of 2 story books at b and 3 magazines at $m = 65$

$$\begin{array}{rccccccc} 2b & & + & & 3m & & = 65 \\ & & & & & & 2b + 3m = 65 \quad \dots \textcircled{2} \end{array}$$

(ii) **Required to solve:** The pair of simultaneous equation to find b and m .

Solution:

$$b + 4m = 50 \quad \dots \textcircled{1}$$

$$2b + 3m = 65 \quad \dots \textcircled{2}$$

From equation $\textcircled{1}$:

$$b = 50 - 4m \quad \dots \textcircled{3}$$

Substitute equation $\textcircled{3}$ into equation $\textcircled{2}$:

$$2(50 - 4m) + 3m = 65$$

$$100 - 8m + 3m = 65$$

$$-5m = 65 - 100$$

$$-5m = -35$$

$$m = \frac{-35}{-5}$$

$$m = 7$$

When $m = 7$

$$b = 50 - 4(7)$$

$$= 50 - 28$$

$$= 22$$

The cost of 1 story books is \$22 and the cost of 1 magazine is \$7.

(b) **Data:** Equation of the straight line is $y = 3x - 2$.

(i) **Data:** Table of values for the straight line $y = 3x - 2$.

| | | | | |
|-----|----|---|---|---|
| x | 0 | 1 | 2 | 3 |
| y | -2 | | 4 | |

Required to complete: The table of values.

Solution:

When $x = 1$

$$y = 3(1) - 2$$

$$= 3 - 2$$

$$= 1$$

When $x = 3$

$$\begin{aligned} y &= 3(3) - 2 \\ &= 9 - 2 \\ &= 7 \end{aligned}$$

The completed table looks like:

| | | | | |
|-----|----|---|---|---|
| x | 0 | 1 | 2 | 3 |
| y | -2 | 1 | 4 | 7 |

(ii) **Required to draw:** The graph of $y = 3x - 2$.

Solution:

www.faspasmaths.com

