

2016 BECE MATHEMATICS 2 SOLUTION
MATHEMATICS 2

1. (a) (i) **Number of candidates who passed in Mathematics**

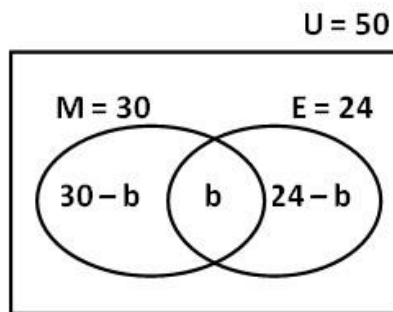
$$\begin{aligned} &= 60\% \text{ of } 50 \text{ candidates} \\ &= \frac{60}{100} \times 50 \\ &= 6 \times 5 \\ &= \mathbf{30} \end{aligned}$$

(ii) **Number of candidates who passed in English Language**

$$\begin{aligned} &= 48\% \text{ of } 50 \text{ candidates} \\ &= \frac{48}{100} \times 50 \\ &= \frac{48}{2} \\ &= \mathbf{24} \end{aligned}$$

(b) **Venn diagram**

Let U = Total number of Candidates,
 M = Number of candidates who passed in Mathematics and E =
Number of candidates who passed in English
 b = Number of candidates who passed in both Mathematics and English



(c) (i) From the Venn diagram above,

$$\begin{aligned} 30 - b + b + 24 - b &= 50 \\ \Rightarrow 54 - b &= 50 \\ \Rightarrow \mathbf{b} &= \mathbf{4} \end{aligned}$$

Hence, 4 candidates passed in both subjects

(ii) **Mathematics only** = $30 - b = 30 - 4$

$$= \mathbf{26}$$

(d) If $a = b$, then
 taking the horizontal component, $4 = 2x$
 $\Rightarrow x = 4 \div 2$
 $\Rightarrow x = 2$

Now, taking the vertical component, $-5 = 3 + y$
 $\Rightarrow y = -5 - 3$
 $\Rightarrow y = -8$

2. (a) (i) Since Cost, $P = \frac{3}{4}n + 1800$, where n = the number of items,
 4

Cost of producing 2,000 items

$$= \frac{3}{4} \times 2000 + 1800 \quad \text{[Substituting } n = 2000\text{]}$$

$$= 3 \times 500 + 1800 \quad \text{[Simplifying]}$$

$$= 1500 + 1800$$

$$= 3300$$

$$\text{Cost of producing 2,000 items} = \underline{\underline{\text{GHC } 3,300.00}}$$

(ii) Method 1 (Substitution and solving)

$$\text{From } P = \frac{3}{4}n + 1800$$

$$2400 = \frac{3}{4}n + 1800 \quad \text{[Substituting } P = 2400\text{]}$$

$$\Rightarrow 4 \times 2400 = (4 \times \frac{3}{4}n) + (4 \times 1800) \quad \text{[multiplying through by 4]}$$

$$\Rightarrow 9600 = 3n + 7200 \quad \text{[Simplifying]}$$

$$\Rightarrow 9600 - 7200 = 3n \quad \text{[Subtracting 7200 from both sides]}$$

$$\Rightarrow 2400 = 3n \quad \text{[Simplifying]} \Rightarrow = \frac{2400}{3} \quad \text{[Dividing through by 3]}$$

$$\frac{2400}{3} = 800$$

$$\Rightarrow 800 = n \quad \text{[Simplifying]}$$

$$n = 800$$

Hence, the number of items = 800

(ii) Method 2 (Making n the subject, substituting and simplifying)

$$\begin{aligned} &\text{From } P = \frac{3}{4}n + 1800 \\ \Rightarrow &4P = (4 \times \frac{3}{4}n) + (4 \times 1800) && \text{[Multiplying through by 4]} \\ \Rightarrow &4P = 3n + 7200 && \text{[Simplifying]} \\ \Rightarrow &4P - 7200 = 3n && \text{[Subtracting 7200 from both sides]} \\ \Rightarrow &\frac{4P-7200}{3} = \frac{3n}{3} && \text{[Dividing through by 3]} \\ \Rightarrow &n = \frac{4P-7200}{3} && \text{[Simplifying]} \\ \Rightarrow &n = \frac{4 \times 2400 - 7200}{3} && \text{[Now, substituting } P = 2400\text{]} \\ \Rightarrow &n = \frac{9600 - 7200}{3} = \frac{2400}{3} && \text{[Simplifying]} \\ &n = 800 \end{aligned}$$

Hence, the number of items = 800

(iii) When no items are produced, $n = 0$

$$\begin{aligned} &\text{From } P = \frac{3}{4}n + 1800 \\ &= (\frac{3}{4} \times 0) + 1800 && \text{[Substituting } n = 0\text{]} \\ &= 0 + 1800 && \text{[Simplifying]} \\ &P = 1800 \\ \text{Cost when no items are produced} &= \underline{\underline{\text{GHC } 1,800.00}} \end{aligned}$$

(b) (i)	Total weight of four bags	=	3.5 + 15 + 2 + 1.5	3.5
		=	22 kg	
	Hence, excess weight	=	22 - 20	
		=	2 kg	2.0
(ii)	Excess weight as a percentage of maximum weight allowed			<u>1.5</u>
		=	$\frac{2}{20} \times 100\%$	<u>22.0</u>
		=	$2 \times 5\%$	
		=	<u>10%</u>	

3. (a) If doctor works 5 hours a day and spends 15 minutes on each patient, then

$$\begin{aligned} &5 \text{ hours} \\ \text{Number of patients treated a day} &= \frac{5 \text{ hours}}{15 \text{ minutes}} \\ &= \frac{5 \times 60 \text{ minutes}}{15 \text{ minutes}} \end{aligned}$$

$$= \frac{5 \times 60}{15} = 5 \times 4$$

$$= 20$$

Hence, he treats **20 patients each day**

$$\text{Number of days used} = \frac{2000 \text{ patients}}{20 \text{ patients}}$$

$$= \frac{2000}{20}$$

$$= 100$$

Hence, he treats 2000 patients in 100 days

NOTE: Alternatively the idea of ratio or simple proportion can be applied to solve the question.

(b) (i) If Class D (80°) → 720 textbooks Then Class A (60°)
→ ? (less)

If less, then more (80°) divides

$$\Rightarrow \frac{60^\circ}{80^\circ} \times 720$$

$$= 60 \times 9 = 540 \text{ textbooks}$$

Now, if number of textbooks of Class A (60°) = 60 × 9,

$$\text{then, Class B (50°)} = 50 \times 9 = \underline{450 \text{ textbooks}}$$

$$\text{Class C (42°)} = 42 \times 9 = \underline{378 \text{ textbooks}}$$

$$\text{Class F (70°)} = 70 \times 9 = \underline{630 \text{ textbooks}}$$

$$\text{Now, angle for Class E} = 360^\circ - (70^\circ + 60^\circ + 50^\circ + 42^\circ + 80^\circ)$$

$$= 360^\circ - 302^\circ$$

$$= 58^\circ$$

$$\text{Hence, Class E (58°)} = 58 \times 9 = \underline{522 \text{ textbooks}}$$

(ii) Average number of textbooks = $\frac{\text{Total number of textbooks}}{\text{Total number of classes}}$

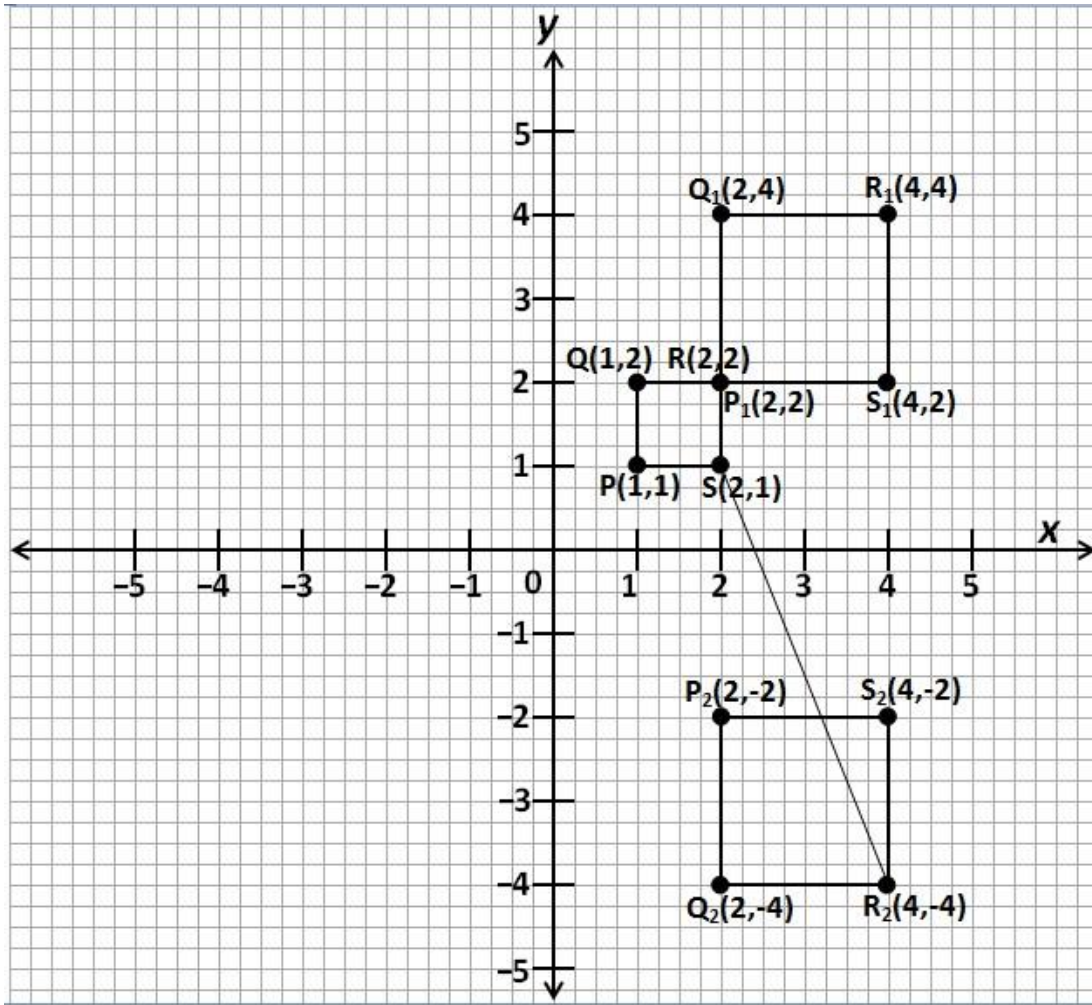
$$= \frac{720 + 540 + 450 + 378 + 630 + 522}{6}$$

$$= \frac{3240}{6}$$

$$= 540$$

- (iii) Number of classes which had less than average
 = 3 (Classes B, C and E had less than 540 textbooks)

4. (a)



(b) Gradient of line $R_2S = \frac{\text{Vertical interval}}{\text{Horizontal interval}}$

$$= \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{1 - (-4)}{2 - 4} = \frac{1 + 4}{2 - 4} = \frac{5}{-2}$$

$$= -2.5 \text{ or } -2\frac{1}{2}$$

5. (a) From $s = ut + \frac{1}{2}at^2$

$$= (4)(5) + \frac{1}{2}(10)(5)^2$$

$$= 20 + \left(\frac{1}{2} \times 10 \times 25\right)$$

$$= 20 + 125$$

Hence $s = \underline{145}$

(b) (i) **Discount** = **20% of GHC 450.00**

$$= \frac{20}{100} \times 450$$

$$= 2 \times 45$$

Discount = GHC 90

(ii) **Method 1**

Amount paid = Original Selling Price – Discount

$$= 450 - 90$$

$$= \underline{360}$$

Method 2

Amount paid = 80% of GHC 450.00 [100% - 20% = 80%]

$$= \frac{80}{100} \times 450$$

$$= 8 \times 45$$

$$= 360$$

The amount paid by the customer = GHC 360.00

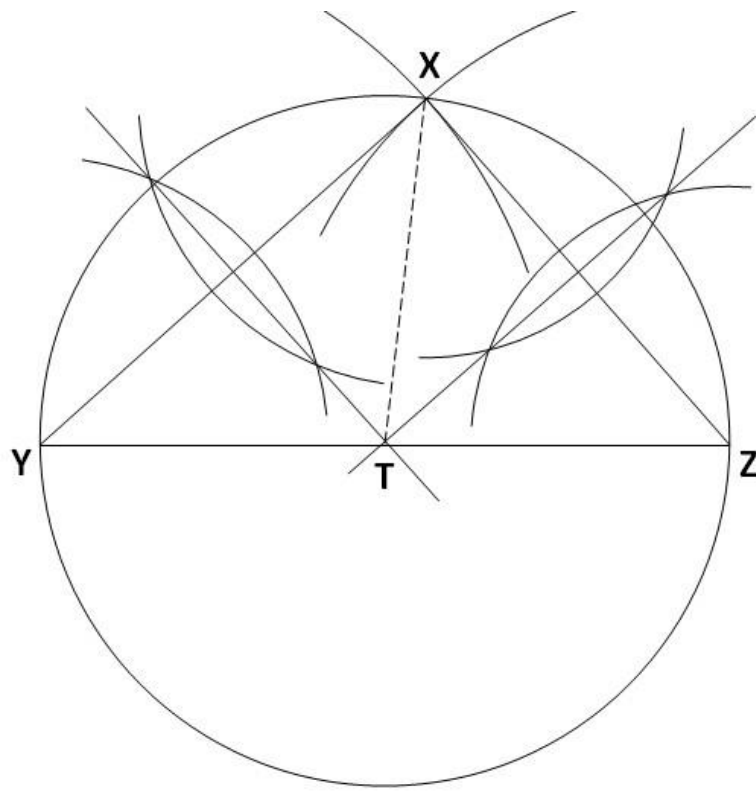
(c) **Probability of randomly choosing Fanta** = *Number of Fanta drinks*

$$= \frac{\text{Total number of Fanta drinks}}{\text{Total number of drinks}}$$

$$= \frac{14}{10+14} = \frac{14}{24}$$

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

6. (a), (b)



- (c) (i) $|TX| = \underline{6 \text{ cm}} (\pm 0.1 \text{ cm})$
(ii) $\text{angle } XYZ = \underline{40^\circ} (\pm 1^\circ)$