

2016 BECE Mathematics (Maths) Past Questions Paper One

Objective Test

1 Hour

1. Which of the following is a finite set?
A. {2, 4, 6, 8, ...} B. {1, 2, 3, 4, ...}
C. {..., 2, 3, 5, 7} D. {3, 6, 9, 12}
2. Given that $M = \{a, b, c\}$, find the number of subsets of M
A. 3
B. 4
C. 6
D. 8
3. If $P = \{2, 3, 4, 6, 8\}$ and $Q = \{1, 2, 3, 4\}$, find $P \cap Q$
A. {2, 3, 4}
B. {7, 9, 10}
C. {2, 3, 4, 6, 8}
D. {1, 2, 3, 4, 6, 8}
4. A boy bought 3 pairs of socks at GHc 17.50 per a pair and paid with two GHc 50.00 notes. How much change was he given?
A. GHc 27.50
B. GHc 37.50 C. GHc 47.50 D. GHc 48.50
5. Find the least Common Multiple (LCM) of the numbers 5, 10 and 12

- A. $2 \times 3 \times 5$
B. $2 \times 3^2 \times 5$
C. $2^2 \times 3 \times 5$
D. $2^2 \times 3^2 \times 5^2$
6. Correct 48,947.2547 to the nearest hundred.
A. 490
B. 48,900
C. 48,950
D. 49,000
7. Simplify: $16 + 5.6 + 0.681$
A. 2.2281 B. 22.281 C. 222.81
D. 2228.1
8. Evaluate: $\frac{4}{5} - \frac{1}{3} + \frac{2}{9}$
A. $\frac{5}{11}$
B. $\frac{11}{45}$
C. $\frac{31}{45}$
D. $\frac{41}{45}$
9. Arrange the following integers from the least to the highest $-4, 9, -10, -7$ and 2 .
A. $-10, -7, -4, 2, 9$
B. $-10, 9, -7, -4, 2$ C. $-4, -7, -10, 2, 9$
D. $2, -4, -7, 9, -10$
10. Simplify: $(46 \times 102) + (102 \times 54)$
A. 1,020
B. 10,200
C. 102,000
D. 1,020,000
11. Correct 5178.3426 to two decimal places
A. 5178.00 B. 5178.30 C. 5178.34 D. 5178.35

12. Find the simple interest on GHc 120,000.00 for 5 months at 12% per annum.
- A. GHc 6,000.00
 B. GHc 7,200.00
 C. GHc 50,000.00
 D. GHc 72,000.00
13. Fifteen boys took 12 hours to weed a plot of land. If nine boys work at the same rate, how long will it take them to weed the plot of land?
- A. 6 hours
 B. $7\frac{1}{5}$ hours
 C. $11\frac{1}{4}$ hours
 D. 20 hours
14. A car cost GHc 12,500.00. A discount of 9% is given for cash payment. Find the cost of the car when payment is made by cash.
- A. GHc 10,250.00 B. GHc 11,250.00 C. GHc 11,375.00
 D. GHc 13,625.00
15. Simplify: $5^2 \times 2^2 \times 5^2 \times 2$
- A. $2^2 \times 5^2$ B. $2^2 \times 5^4$ C. $2^3 \times 5^2$
 D. $2^3 \times 5^4$

The table shows the marks of some students in a test.

Marks	0	1	2	3	4	5	6	7	8	9	10
Number of students	3	4	5	4	5	4	7	3	4	2	2

Use the information to answer questions 16 and 17

16. What is the modal mark?
- A. 2 B. 5
 C. 6
 D. 10
17. How many students failed the test, if the pass mark was 4?

- A. 4
- B. 6
- C. 16 D. 21

18. What is the probability of obtaining 4, when a fair die is tossed once?

- A. $\frac{1}{6}$
- B. $\frac{1}{2}$
- C. $\frac{2}{3}$
- D. $\frac{5}{6}$

19. Make P the subject of the relation, $R = (\text{_____})^{P+Q} 2$

- A. $P = Q - 2R$
- B. $P = 2R - Q$
- C. $P = 2R + Q$
- D. $P = 2Q + R$

20. Given that $t = p^2 + 1$, find p when $t = 10$.

- A. 3.0
- B. 4.5
- C. 11.0
- D. 81.0

21. Simplify: $4(x + 2) - 3(x + 1)$.

- A. $x + 5$
- B. $x + 11$
- C. $7x + 5$
- D. $7x + 11$

22. When a number is doubled and the result is decreased by 9, the answer is 19. Find the number.

- A. 5
- B. 7
- C. 14
- D. 16

23. Solve the inequality $2x + 10 \geq \frac{7}{2}x - 5$

- A. $x \geq 10$ B. $x \leq 10$ C. $x \leq 40$

D. $x \geq 40$

24. Find the image of 5, under the mapping $x \rightarrow 4x - 7$

A. 3

B. 13 C. 20

D. 27

25. An angle which is greater than 180° but less than 360° is A. a right angle

B. an acute angle

C. an obtuse angle

D. a reflex angle

26. How many lines of symmetry has a rectangle?

A. 1 B. 2 C. 3

D. 4

27. The perimeter of an isosceles triangle is 45 cm. Find the length of the third side, if each of the equal sides is 14 cm long.

A. 11 cm B. 14 cm C. 17 cm

D. 31 cm

28. Find the area of a circle whose diameter is 7cm. [Take $\pi = \frac{22}{7}$]

A. 11 cm^2

B. $38 \frac{1}{2} \text{ cm}^2$

C. $44 \frac{1}{2} \text{ cm}^2$

D. 54 cm^2

29. The mean of three numbers is 12. If two of the numbers are 14 and 16, find the third number.

A. 6

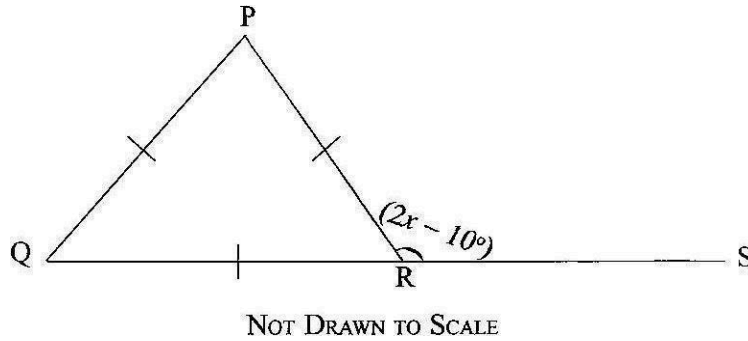
B. 12 C. 30

D. 36

30. The sum of the interior angles of a regular polygon is 540° . Find the number of sides of the polygon.

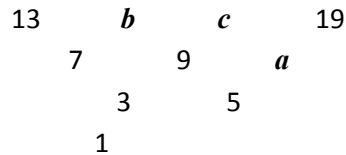
A. 7 B. 6 C. 5 D. 4

31. The figure QPR is an equilateral triangle. If angle PRS = $(2x - 10^\circ)$, find the value of x.



- A. 55° B. 65° C. 85°
D. 95°
32. The diagonal of a rectangle is 10 cm long. If the length of the rectangle is 8 cm, find its breadth.
- A. 2 cm B. 3 cm C. 5 cm
D. 6 cm
33. In an enlargement, $XY \rightarrow X_1Y_1$. If $|XY| = 24$ cm and $|X_1Y_1| = 8$ cm, calculate the scale factor of the enlargement.
- A. $\frac{1}{32}$
B. $\frac{1}{24}$
C. $\frac{1}{8}$
D. $\frac{1}{3}$

Study the triangle of odd numbers and use it to answer Questions 34 and 35.



34. Evaluate: $13 + b + c + 19$.
- A. 62 B. 64 C. 74 D. 76
35. Evaluate: $a + b + c$
- A. 24 B. 29 C. 36
D. 43

36. Simplify: $\left(\frac{-3}{5}\right) + \left(\frac{2}{-7}\right)$

A. $\left(\frac{-1}{2}\right)$

B. $\left(\frac{-5}{12}\right)$

C. $\left(\frac{-1}{-2}\right)$

D. $\left(\frac{-5}{-12}\right)$

37. The bearing of X from Y is 196° . What is the bearing of Y from X?

A. 016° B. 074° C. 106°

D. 244°

38. If $a = -4$ and $b = 3$, evaluate $\frac{3a+2b}{ab}$

A. $\frac{3}{2}$

B. 1

C. $\frac{1}{2}$

D. $-\frac{3}{2}$

39. The point P $(-3, 7)$ is reflected in the x-axis. Find its image.

A. $(-3, -7)$

B. $(-3, 7)$ C. $(-7, 3)$ D. $(3, -7)$

40. The instrument used to measure the angle between two lines that meet at a point is known as a

A. pair of compasses

B. set-square

C. protractor

D. pair of dividers

JUNE 2016

MATHEMATICS 1

Objective Test

SOLUTIONS

1. D. {3, 6, 9, 12}
2. D. 8
3. A. {2, 3, 4}
4. C. GHc 47.50
5. C. $2^2 \times 3 \times 5$
6. B. 48,900
7. B. 22.281
8. C.
9. A. -10, -7, -4, 2, 9
10. B. 10,200
11. C. 5178.34
12. A. GHc 6,000.00
13. D. 20 hours
14. C. GHc 11,375.00
15. D. $2^3 \times 5^4$
16. C. 6
17. C. 16
18. A. $\frac{1}{6}$
19. B. $P = 2R - Q$
20. A. 3.0
21. A. $x + 5$
22. C. 14

23. B. $x \leq 10$
24. B. 13
25. D. a reflex angle

26. B. 2
27. C. 17 cm
28. B. $38\frac{1}{2} \text{ cm}^2$
29. A. 6
30. C. 5
31. B. 65°
32. D. 6 cm
33. D. $\frac{1}{3}$
34. B. 64
35. D. 43
36. C. $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$
37. A. $0\overline{)6^\circ}$
38. C. $\frac{1}{2}$
39. A. $(-3, -7)$
40. C. protractor

2016 BECE Mathematics (Maths) Past Questions Paper Two

*Answer **four** questions **only**.*

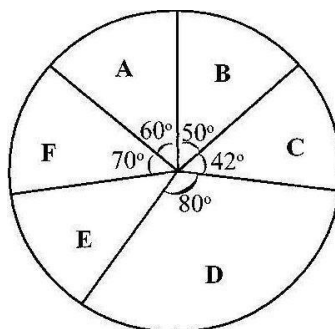
*All questions carry **equal** marks.*

*All working **must** be clearly shown.*

*Marks will **not** be awarded for correct answers without corresponding working*

1. (a) In an examination, 50 candidates sat for either Mathematics or English Language. 60% passed in Mathematics and 48% passed in English Language. If each candidate passed in at least one of the subjects, how many candidates passed in :
- (i) Mathematics?
 - (ii) English Language?
- (b) Illustrate the information given in (a) on a Venn diagram.
- (c) Using the Venn diagram, find the number of candidates who passed in
- (i) both subjects;
 - (ii) Mathematics only.
- (d) If $\mathbf{a} = \begin{pmatrix} 4 \\ -5 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 2x \\ 3 + y \end{pmatrix}$ are equal vectors, find the values of x and y
2. (a) The cost (P), in Ghana cedis, of producing n items is given by the formula,
 $P = \frac{3}{4}n + 1800$. Find the:
- (i) cost of producing 2,000 items;
 - (ii) number of items that will be produced with GHC 2,400.00;
 - (iii) cost when no items are produced.
- (b) A passenger travelling by air is allowed a maximum of 20 kg luggage. A man has four bags weighing 3.5 kg, 15 kg, 2 kg and 1.5 kg.
- (i) Find the excess weight of his luggage
 - (ii) Express the excess weight as a percentage of the maximum weight allowed.

3. (a) A doctor treated 2,000 patients over a period of time. If he worked for 5 hours a day and spent 15 minutes on each patient, how many days did the doctor spend to treat all the patients?
- (b) The pie chart shows the distribution of textbooks to six classes A, B, C, D, E and F in a school.



NOT DRAWN TO SCALE

- (i) If Class D was given 720 textbooks, how many textbooks were distributed to each of the remaining classes?
- (ii) What is the average number of textbooks distributed to the classes?
- (iii) How many classes had less than the average number of textbooks distributed?
4. (a) Using a scale of 2 cm to 1 unit on both axes, draw on a graph sheet, two perpendicular axes OX and OY for $-5 \leq x \leq 5$ and $-5 \leq y \leq 5$.
- (i) Plot, indicating the coordinates of all points P(1, 1), Q(1, 2), R(2, 2) and S(2, 1) on a graph sheet. Join the points to form square PQRS.
- (ii) Draw and indicate clearly all coordinates, the image $P_1Q_1R_1S_1$ of square PQRS under an enlargement from the origin with a scale factor of 2, where $P \rightarrow P_1$, $Q \rightarrow Q_1$, $R \rightarrow R_1$ and $S \rightarrow S_1$.
- (iii) Draw and indicate clearly all coordinates, the image $P_2Q_2R_2S_2$ of square $P_1Q_1R_1S_1$ under a reflection in the x-axis where $P_1 \rightarrow P_2$, $Q_1 \rightarrow Q_2$, $R_1 \rightarrow R_2$ and $S_1 \rightarrow S_2$.
- (b) Using the graph in 4(a), find the gradient of line R_2S .
5. (a) Given that $u = 4$, $t = 5$, $a = 10$ and $s = ut + \frac{1}{2}at^2$, find the value of s .
- (b) The selling price of a gas cooker is GHC450.00. If a customer is allowed a discount of 20%, calculate the
- :
- (i) discount;
- (ii) amount paid by the customer.

- (c) A crate of minerals containing ten bottles of Coca Cola and fourteen bottles of Fanta was given to some children for a birthday party. If a child chose a drink at random from the crate, find the probability that it was Fanta.

6. (a) Using a ruler and a pair of compasses only, construct:
(i) triangle XYZ with $|XY| = 9$ cm, $|YZ| = 12$ cm and $|XZ| = 8$ cm; (ii) the perpendicular bisector of line XY; (iii) the perpendicular bisector of line XZ.
- (b) (i) Label the point of intersection of the two bisectors as T; (ii) With point T as centre, draw a circle of radius 6 cm.
- (c) Measure:
(i) $|TX|$
(ii) angle XYZ

MATHEMATICS 2

ESSAY

SOLUTIONS

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

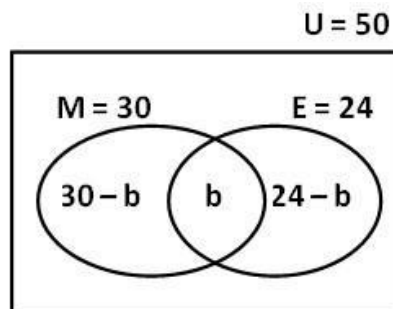
$$\begin{aligned} &= 60\% \text{ of } 50 \text{ candidates} \\ &= \frac{60}{100} \times 50 \\ &= 6 \times 5 \\ &= 30 \end{aligned}$$

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

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

(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,
 $30 - b + b + 24 - b = 50$

$$\Rightarrow 54 - b = 50$$

$$\Rightarrow b = 4$$

Hence, 4 candidates passed in both subjects

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

$$= 26$$

(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,

Cost of producing 2,000 items

$$= \frac{3}{4} \times 2000 + 1800$$

[Substituting $n = 2000$]

$$= 3 \times 500 + 1800$$

[Simplifying]

$$= 1500 + 1800$$

$$= 3300$$

Cost of producing 2,000 items = GHC 3,300.00

(ii) **Method 1 (Substitution and solving)**

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

$$2400 = \frac{3}{4}n + 1800$$

[Substituting $P = 2400$]

4]

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

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

sides]

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

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

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

$$800 = n$$

$$n = 800$$

Hence, the number of items = 800

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

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

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

$$\Rightarrow 4P = 3n + 7200 \quad [\text{Simplifying}]$$

sides]

$$\Rightarrow 4P - 7200 = 3n \quad [\text{Subtracting 7200 from both}]$$

$$\Rightarrow \frac{4P - 7200}{3} = \frac{3n}{3} \quad [\text{Dividing through by 3}]$$

$$\Rightarrow n = \frac{4P - 7200}{3} \quad [\text{Simplifying}]$$

$$\Rightarrow n = \frac{4 \times 2400 - 7200}{3} \quad [\text{Now, substituting } P = 2400]$$

$$\Rightarrow n = \frac{9600 - 7200}{3} = \frac{2400}{3} \quad [\text{Simplifying}]$$

$$n = 800$$

Hence, the number of items = 800

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

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

$$= (\frac{3}{4} \times 0) + 1800 \quad [\text{Substituting } n = 0]$$

$$= 0 + 1800$$

[Simplifying]

$$P = 1800$$

$$\text{Cost when no items are produced} = \underline{\text{GHC } 1,800.00}$$

(b) (i) Total weight of four bags = $3.5 + 15 + 2 + 1.5$
 $= 22 \text{ kg}$
Hence, **excess weight** = $22 - 20$
 $= 2 \text{ kg}$

3.5
15.0
2.0
<u>1.5</u>
22.0

(ii) **Excess weight as a percentage of maximum weight allowed**

$$= \frac{2}{20} \times 100\%$$

$$= 2 \times 5\%$$

$$= \underline{10\%}$$

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

$$\begin{aligned} \text{Number of patients treated a day} &= \frac{5 \text{ hours}}{15 \text{ minutes}} \\ &= \frac{5 \times 60 \text{ minutes}}{15 \text{ minutes}} \\ &= \frac{5 \times 60}{15} = 5 \times 4 \\ &= 20 \end{aligned}$$

Hence, he treats 20 patients each day

$$\begin{aligned} \text{Number of days used} &= \frac{2000 \text{ patients}}{20 \text{ patients}} \\ &= \frac{2000}{20} \\ &= 100 \end{aligned}$$

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°) $\rightarrow$ 720 textbooks

Then Class A (60°) $\rightarrow$? (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 ,

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

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

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

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

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

$$= 58^\circ$$

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

(ii) Average number of textbooks = Total _____ number
of textbooks

Total number of classes

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

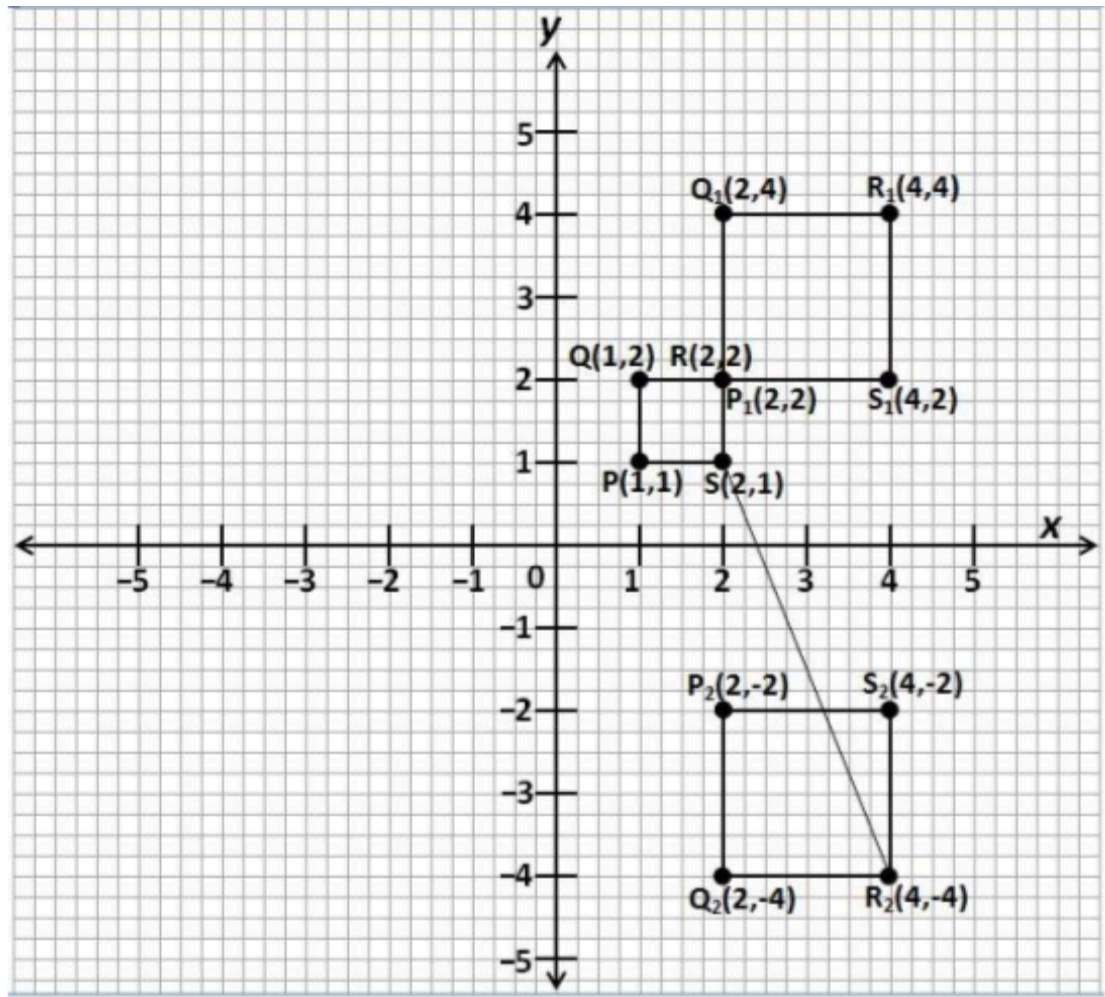
$$= \frac{3240}{6}$$

$$= 540$$

(iii) Number of classes which had less than average

= 3 (Classes B, C and E had less than 540 textbooks)

4. (a)



$$\begin{aligned}
 \text{(b) Gradient of line } R_2S &= \frac{\text{Vertical interval}}{\text{Horizontal interval}} \\
 &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{1 - (-4)}{2 - 4} = \frac{1 + 4}{2 - 4} = \frac{5}{-2} \\
 &= -2.5 \text{ or } -2\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad \text{(a)} \quad \text{From } s &= ut + \frac{1}{2}at^2 \\
 &= (4)(5) + \frac{1}{2}(10)(5)^2 \\
 &= 20 + \left(\frac{1}{2} \times 10 \times 25\right)
 \end{aligned}$$

$$\begin{aligned} &= 20 + 125 \\ \text{Hence } s &= \underline{145} \end{aligned}$$

$$\begin{aligned} \text{(b) (i) Discount} &= \text{20\% of GHC 450.00} \\ &= \frac{20}{100} \times 450 \\ &= 2 \times 45 \\ \text{Discount} &= \underline{\text{GHC 90}} \end{aligned}$$

(ii) Method 1

$$\begin{aligned} \text{Amount paid} &= \text{Original Selling Price} - \text{Discount} \\ &= 450 - 90 \\ &= \underline{360} \end{aligned}$$

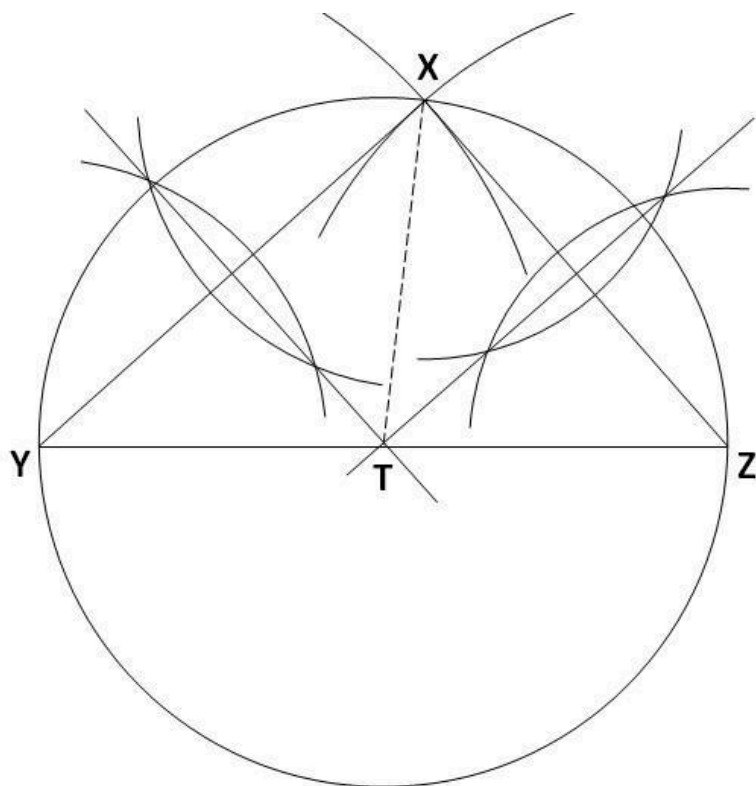
Method 2

$$\begin{aligned} \text{Amount paid} &= 80\% \text{ of GHC 450.00} \quad [100\% - 20\% = 80\%] \\ &= \frac{80}{100} \times 450 \\ &= 8 \times 45 \\ &= 360 \end{aligned}$$

$$\text{The amount paid by the customer} = \underline{\text{GHC 360.00}}$$

$$\begin{aligned} \text{(c) Probability of randomly choosing Fanta} &= \frac{\text{Number of Fanta drinks}}{\text{Total number of drinks}} \\ &= \frac{14}{10+14} = \frac{14}{24} \\ &= \frac{7}{12} \end{aligned}$$

6. (a), (b)



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