

2
SECTION A
[40 marks]

Answer all the questions in this section. All questions carry equal marks.

1. (a) Without using mathematical tables or calculators, evaluate $\frac{0.015 \times 0.567}{0.05 \times 0.189}$, leaving the answer in standard form.
- (b) If $\frac{5y-x}{8y+3x} = \frac{1}{5}$, find, correct to **two** decimal places, the value of $\frac{x}{y}$.
2. (a) Z varies directly as x and inversely as **twice** the cube root of y. If $Z = 8$, when $x = 4$ and $y = \frac{1}{8}$, find the relation for y in terms of x and Z.
- (b) Factorize completely: $4b^2 - ab + (a + 9b)^2 - a^2$.
3. (a) Solve $\frac{5x-7}{6} + \frac{2x-3}{4} = -\frac{2}{3}$.
- (b) Evaluate: $\frac{\sqrt{28} + \sqrt{343}}{2\sqrt{63}} + \frac{5}{3}$.
4. A car dealer made a profit of 22.5 % by selling a car for GH¢ 58,000.00. Find, correct to **two** decimal places, the percentage profit if the car had been sold for GH¢ 61,200.00.
5. (a) A number is chosen at random from $Q = \{1, 2, 3, \dots, 10\}$. Find the probability that the chosen number is either a prime factor of 42 or a multiple of 3.
- (b) If $110_x = 1020_{\text{four}}$, find the value of x.

SECTION B
{60 marks}

Answer five questions only from this section. All questions carry equal marks.

6. (a) If $\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ and $\mathbf{r} = \mathbf{a} + \frac{1}{2}(\mathbf{a} - \mathbf{b})$, find:
- \mathbf{r} ;
 - $|\mathbf{r}|$.
- (b) Given that $a = bc$ and $n = \frac{mk}{ec}$,
- express k in terms of a, b, e, m and n ;
 - find, correct to **three** significant figures, the value of k , when $a = \frac{1}{2}$, $b = -4$, $e = 3$, $m = 7$ and $n = -5$.

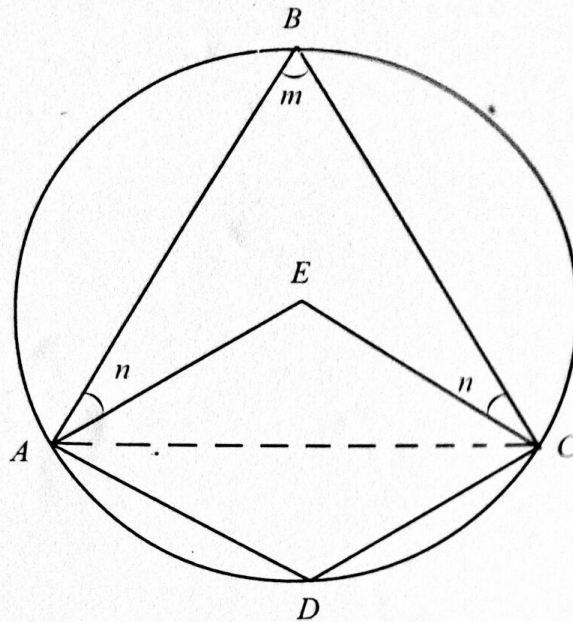
7. (a) Copy and complete the table of values for $y = 5\sin x + 9\cos x$ for $0^\circ \leq x \leq 150^\circ$.

x	0°	30°	60°	90°	120°	150°
y		10.3			-0.2	

- (b) Using a scale of 2 cm to 30° on the x -axis and 2 cm to 2 units on the y -axis, draw the graph of $y = 5\sin x + 9\cos x$ for $0^\circ \leq x \leq 150^\circ$.
- (c) Use the graph to solve the equations:
- $5\sin x + 9\cos x = 0$;
 - $5\sin x + 9\cos x = 2$.
- (d) Using the graph, find, the value of y when $x = 45^\circ$.
8. (a) Using ruler and a pair of compasses only, construct:
- the quadrilateral $ABCD$ such that $|AB| = 6.5$ cm, $|BC| = 9$ cm, $|AD| = 4$ cm, $\angle ABC = 60^\circ$ and $\angle BAD = 120^\circ$;
 - the perpendicular bisectors of \overline{BC} and \overline{CD} .
- (b) Locate the point of intersection, T , of the two bisectors in 8(a)(ii).
- (c) With the point T in 8(b) as centre, draw a circle to pass through the vertices B, C and D .
- (d) Measure:
- $|BT|$;
 - $|CD|$.

9. (a) Using a scale of 2 cm to 1 unit on both axes, draw on a sheet of graph paper, two perpendicular axes Ox and Oy for $-5 \leq x \leq 5$ and $-5 \leq y \leq 5$.
- (b) Draw on the same graph sheet, indicating clearly all vertices and their coordinates:
- ΔABC with vertices $A(2, 1)$, $B(1, 4)$ and $C(-1, 2)$;
 - the image $\Delta A_1B_1C_1$ of ΔABC under a reflection in the line $y = 0$, where $A \rightarrow A_1$, $B \rightarrow B_1$ and $C \rightarrow C_1$;
 - the image $\Delta A_2B_2C_2$ of ΔABC under a translation by the vector $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$, where $A \rightarrow A_2$, $B \rightarrow B_2$ and $C \rightarrow C_2$;
 - the image $\Delta A_3B_3C_3$ of ΔABC under an anticlockwise rotation of 90° about the origin, where $A \rightarrow A_3$, $B \rightarrow B_3$ and $C \rightarrow C_3$.
- (c) What single transformation maps $\Delta A_1B_1C_1$ onto $\Delta A_3B_3C_3$, where $A_1 \rightarrow A_3$, $B_1 \rightarrow B_3$ and $C_1 \rightarrow C_3$.
10. (a) In a class of 50 students, 24 like football, 21 basketball and 18 cricket. Six like football and basketball only, 3 like basketball only, 5 like all the three games and 14 did **not** like any of the three games.
- Illustrate this information on a *Venn diagram*.
 - Find the number of students who like:
 - football and cricket **only**;
 - exactly **one** of the games.
- (b) If $(3 - a)$, 6 , $(7 - 5a)$ are consecutive terms of a Geometric Progression (G.P) with common ratio $r > 0$. find the values of a .
11. (a) Two passenger trains, A and B , 450 km apart, start to move towards each other at the same time and meet after 2 hours. If train B , travels $\frac{8}{7}$ as fast as train A . Find the speed of **each** train.
- (b) A solid cube of side 8 cm was melted to form a solid circular cone. The base radius of the cone is 4 cm. Calculate, correct to **one** decimal place, the height of the cone.
[Take $\pi = \frac{22}{7}$].

$$\begin{pmatrix} 2 \\ -1 \end{pmatrix} \rightarrow \begin{pmatrix} -1 \\ 2 \end{pmatrix}$$



NOT DRAWN TO SCALE

- (a) The diagram shows a circle $ABCD$ with centre E . Quadrilateral $EADC$ is a rhombus, $\angle BAE = \angle ECB = n$ and $\angle ABC = m$.

Find:

- (i) m ;
 (ii) n .

- (b) Find the quadratic equation whose roots are $\frac{3}{4}$ and -4 .

13. (a) The fourth term of an Arithmetic Progression (A.P) is **one less than twice** the second term. If the sixth term is 7, find the first term.

- (b) A clerk spends $\frac{1}{5}$, $\frac{1}{3}$ and $\frac{1}{8}$ of his annual salary on rent, transport, and entertainment respectively. If after all these expenses he had GH¢ 4,100.00 left, find how much he earns per annum.

- (c) Given that $f: x \rightarrow 2x^2 - 8x + 5$,
 $g: x \rightarrow x - 2$;

Find:

- (i) $f(-3)$;
 (ii) the values of x such that $f(x) = g(x)$.

END OF PAPER