SECTION A
[40 marks]

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

1. (*a*) Draw a table for multiplication, $\otimes$, in modulo 7 on the set $Q = \{2, 3, 4, 5, 6\}$.

(*b*) Use the table to find on the set Q, the truth set of $n \otimes (n \otimes 6) = 3$.

2. (*a*) The slant height of a cone is 9.35 cm and the diameter of the base is 12 cm. Calculate, correct to **three** significant figures, the curved surface area of the cone.
[Take $\pi = \frac{22}{7}$]

(*b*) Solve: $\dfrac{\left(\frac{1}{3}\right)^x \times 9^{3\frac{1}{2}}}{3} = 27^{\frac{2}{3}}$.

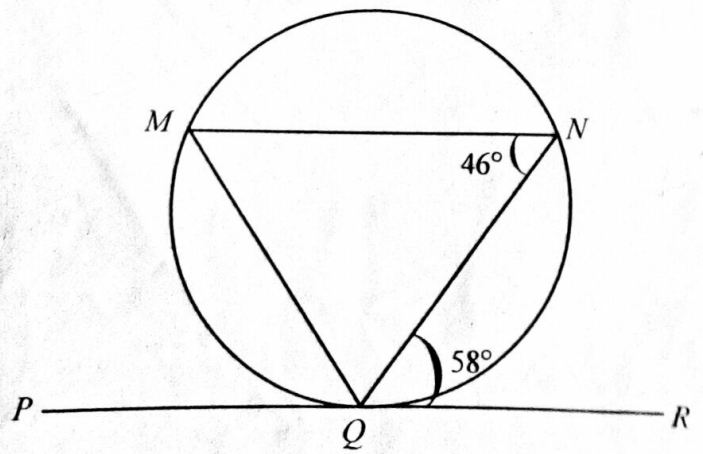
3. (*a*) Simplify: $\dfrac{3m}{2n} - \dfrac{m-1}{5n} + \dfrac{m-2}{10n}$, $n \neq 0$.

(*b*) The probabilities that Kojo and Adwoa will pass an examination are $\frac{3}{4}$ and $\frac{3}{5}$ respectively. Find the probability that:
(i) **both** will fail the examination;
(ii) **only** Adwoa will pass the examination.

4. Given that $\tan y = \sqrt{2}$, where x and y are acute angles, find:
(*a*) $\cos y$;

(*b*) the value of x if $\sin x = 1 - \cos y$.

5. (*a*)



NOT DRAWN TO SCALE

In the diagram PQR is a tangent to the circle at Q, $\angle NQR = 58°$ and $\angle MNQ = 46°$. Find $\angle MQN$.

(*b*) Given that $M(2, 3)$ and $N(4, 7)$ are two points in the Oxy plane, find $|\overline{MN}|$.

SECTION B
[60 marks]

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

6. (*a*) If $3^x \times 9^y = 243$ and $3^x \div 3^{2y} = \frac{1}{27}$, find $(x + y)$.

(*b*) Find the equation of the line which passes through the points $(2, -\frac{1}{2})$ and $(-1, \frac{2}{3})$.

7. The marks obtained by 100 students in an essay competition are given in the table.

Marks Scored	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79	80 - 84	85 - 89	90 - 94	95 - 99
Number of Students	15	5	20	12	28	9	5	3	2	1

(*a*) Calculate, correct to **two** decimal places, the mean mark of students who scored between 50 and 74.

(*b*) Draw a histogram for the distribution.

(*c*) Use the histogram to estimate the modal mark.

8. (*a*) The difference between the eighth and fourth terms of an Arithmetic Progression (A.P.) is 40. If the eighth term is $1\frac{1}{2}$ times the fourth term, find the:

(i) **common** difference;
(ii) **first term** of the Arithmetic Progression.

(*b*) Given that $m + n = 5$ and $m - n = 4$, find the value of $m^2 - n^2$.

9. (*a*) B and C are subsets of a universal set μ where B and C are **not** disjoint and **not** subsets of **each** other.

(i) Draw a *venn diagram* to illustrate μ, B and C.
(ii) Shade the set $B' \cup C$ where B' is the compliment of B.
(iii) Use set notation to describe the unshaded region.

(*b*) The lengths of the diagonals of a rhombus are 6 cm and 9 cm respectively. Find, correct to **three** significant figures, the

(i) perimeter;
(ii) area of the rhombus.

10. (*a*) Make x the subject of the relation $\frac{x-1}{m} + \frac{y}{n} = 2$.

(*b*) Araba purchased x number of apples for GH¢ 48.00. She found out after a day that 40 of the apples were rotten and then sold all the remaining apples. If the selling price of one apple was GH¢ 1.00 more than the cost price, find in terms of x:

(i) the selling price of **one** apple;

(ii) an expression for the total amount that she received from the sale of the apples.

11. (*a*) Copy and complete the table of values for $y = x^2 - 1$, $-4 \leq x \leq 4$.

x	−4	−3	−2	−1	0	1	2	3	4
y		8			−1				

(*b*) Using a scale of 2 cm to 1 unit on the x-axis and 2 cm to 2 units on the y-axis, draw the graph for $y = x^2 - 1$.

(*c*) Using the graph:

(i) solve $x^2 = 8$;

(ii) find the range of values of x for which y decreases as x increases.

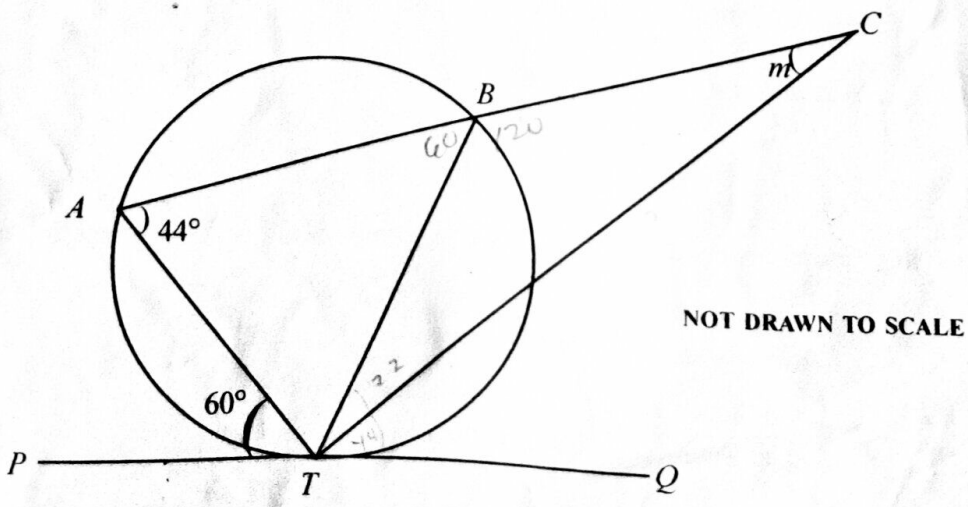
12. (*a*) The points P, Q and R are located such that Q is 15 km south of P, R is 10 km from P on a bearing of 270°. Calculate correct to:

(i) **two** significant figures $|QR|$;

(ii) the **nearest** degree, the bearing of Q from R.

(*b*) If $\cos t = \frac{4}{5}$, $0 \leq t \leq 90°$, find without using mathematical tables or calculators the value of $\frac{1}{1-\sin t} - \frac{1}{1+\sin t}$.

13. (*a*)



NOT DRAWN TO SCALE

In the diagram, $\overline{PQ}$ is a tangent to the circle ABT at T, ABC is a straight line and TC bisects $\angle BTQ$. Find the value of m.

(*b*) A number is selected at random from **each** of the sets {2, 3, 5} and {4, 6, 7}. Find the probability that the sum of the numbers selected is **greater than** 9.

END OF PAPER