

Name.....Stream.....House.....



DEPARTMENT OF MATHEMATICS

S.4 MATHEMATICS—2020

PAPER 1 TEST 5

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **all** questions in Section **A** and any **five** questions from Section **B**.

Any additional question(s) answered will **not** be marked.

3

All necessary calculations **must** be done on the same answer booklet provided. Therefore, no paper should be given for rough work.

Graph paper is provided.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

State the **degree of accuracy** at the end of each question attempted using calculator or mathematical table and indicate **Cal** for calculator or **Tab** for mathematical tables.

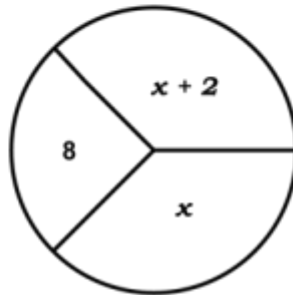
SECTION A : (40 MARKS)

Answer **all** the questions in this section.

1. Make M the subject of the formula, $Q = \sqrt{\frac{3B}{N-M}}$. (04 marks)

2. Matrix $P = \begin{pmatrix} 3 & -1 \\ 2 & 1 \end{pmatrix}$ and $Q = \begin{pmatrix} 2 & 3 \\ -1 & 1 \end{pmatrix}$. Find the matrix R such that $P^2 = PQ - R$. (04 marks)

3. In the diagram below, the angle representing $x + 2$ is 120° . Find the value of x . (04 marks)



4. The length of a rectangular carpet is 4 metres more than its width. If its area is $12m^2$, find the width of the carpet. (04 marks)

5. Find the equation of a straight line which passes through the point A $(-1, 2)$ and it is parallel to the line $x - 2y - 6 = 0$. (04 marks)

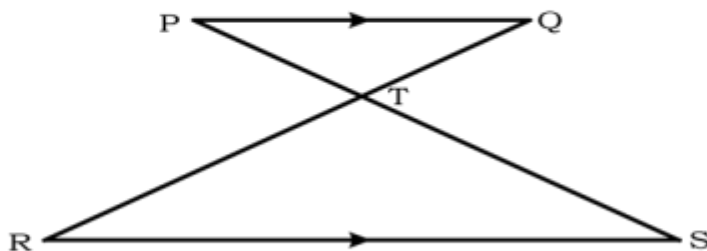
6. Given that $13\sin\theta + 5 = 0$ for $100^\circ \leq \theta \leq 270^\circ$, find the value of $\cos\theta + \tan\theta$. (04 marks)

7. Use matrix method to solve the equations;
 $\frac{1}{2}x + y = \frac{5}{2}$ and $x + \frac{2}{3}y = \frac{7}{3}$ (04 marks)

8. The mean of n , $8n+1$, 17 and 20 is 14.
Find the;

- (i) Value of n
- (ii) Mode of the data. (04 marks)

9. In the figure below, PQ is parallel to RS and the lines PS and RQ meet at T
 Given that $PT:TS = 2:3$ and that $RQ = 10cm$, find the length of RT. (04 marks)



10. Given that $a * b = ab - b^2$. Find $(4 * -1) * (2 * 1)$. (04 marks)

SECTION B: (60 MARKS)Attempt any **five** questions from this section

11. The data below shows the weights in kg of fish trapped in River Kagera.

Weights (kg)	4.8 – 5.2	5.3 – 5.7	5.8 – 6.2	6.3 – 6.7	6.8 – 7.2
Number of fish	3	8	12	10	7

- (a) State the;
- (i) Class width
 - (ii) Median class
- (b) Calculate the mean weight.
- (c) Draw a histogram and hence use it to estimate the modal weight.

(12 marks)

12. Given the transformations represented by matrices:

$$T_1 = \begin{pmatrix} 2 & 1 \\ -1 & -2 \end{pmatrix} \text{ and } T_2 = \begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix}$$

 T_1 followed by T_2 can be represented by a single matrix T .

- (a) Find the matrix T and its inverse.
- (b) The points $A''(7, -11)$, $B''(-7, -13)$ and $C''(-8, 16)$ are images of A , B and C under T . Find the coordinates of A , B and C .
- (c) Find the coordinates of $A'B'$ and C' the image of A , B and C under the transformation T_1 .

(12 marks)

13. Using a ruler and a pair of compasses only,

- (a) Construct a parallelogram $ABCD$ such that $AB = 6\text{cm}$, $BC = 4.8\text{cm}$ and angle $ABC = 150^\circ$.
- (b) Construct a perpendicular from D to meet AB at M . measure the length DM .
- (c) Draw a circle through the points M , A and D . Measure the radius of the circle.

(12 marks)

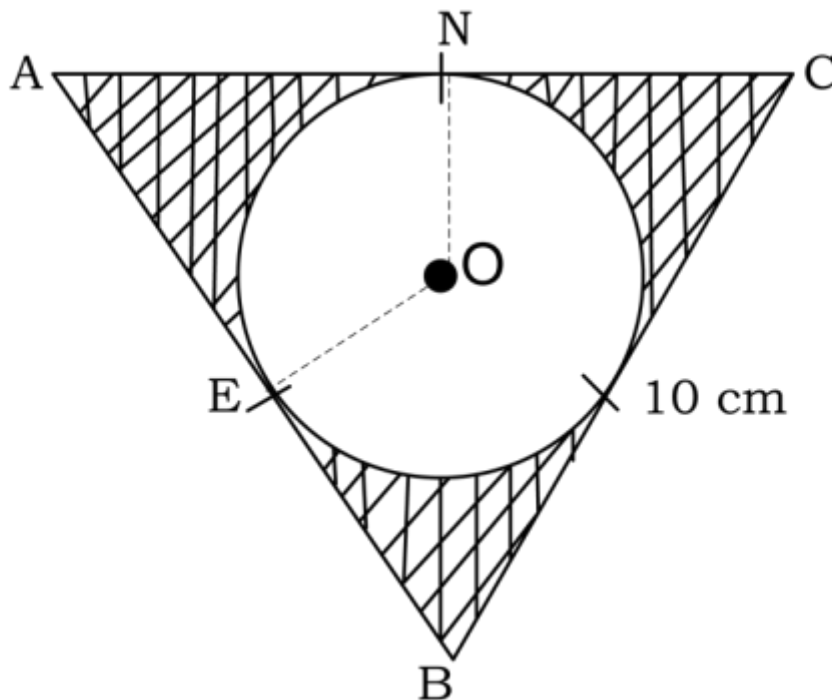
14. (a) Draw a graph of
- $y = 2x^2 - x - 3$
- for
- $-3 \leq x \leq 3$
- .

Use scales of 2cm to represent 1 unit on the x -axis and 1cm to represent 1 unit on the y -axis.

- (b) On the same axes, draw the line $y = x + 1$.
- (c) (i) Use the two graphs to solve the equation $x^2 - x - 2 = 0$
- (ii) Find the minimum value of the function $y = 2x^2 - x - 3$

(12 marks)

15. A garden measures 10m by 8m. A uniform path is made all round the garden. The total area of the path is $88m^2$.
- Find the width of the path.
 - The path in (a) above is to be covered by a square concrete slab. Each corner of the path is covered by small slabs whose side is equal to the width of the path and rest of the path is covered by small slab of side 50cm each. Find the number of slabs required.
 - The cost of making each corner slab is shs. 6,000 and each smaller slab is shs. 5,000. Calculate the cost of covering the path. **(12 marks)**
16. The diagram below shows an inscribe circle within a triangle ABC.



Given that triangle ABC is equilateral measuring 10cm and O is the centre of the circle, find:

- the radius of the circle.
 - the area of the sector EON
 - Area of the shaded region. **(12 marks)**
17. (a) Solve and list all the integral values of x which satisfy the inequalities $x + 6 \leq 15 - 2x < 2x + 21$ **(04 marks)**