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

DEPARTMENT OF MATHEMATICS

S.4 MATHEMATICS−2020

PAPER 1 TEST 2

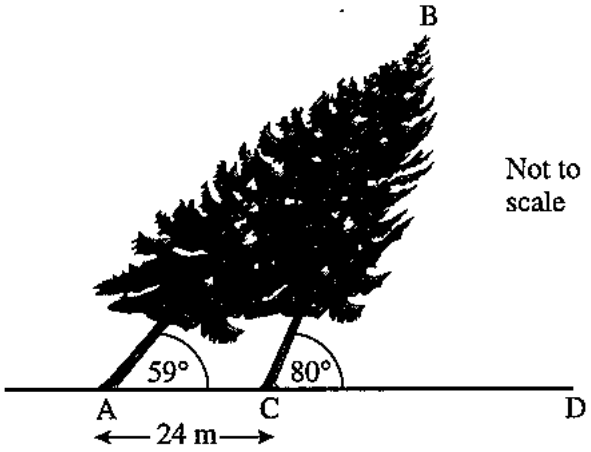
2 HOURS : 30 MINUTES

- *Answer **all** the **ten** questions in section **A** and any **five** from section **B**.*
- *Any additional question(s) answered will **not** be marked.*

SECTION A: (40 MARKS)

1. One solution of the equation $2x^2 - 7x + k = 0$ is $x = -\frac{1}{2}$. Find the value of k.
(*04 marks*)

2. During a storm, a tree, AB, is blown over and rests on another tree CB. $\angle BAC = 59^0$, $\angle BCD = 80^0$, $AC = 24$ and ACD is horizontal.



Calculate the length AB. (*04 marks*)

3. The height of a small box is 2 cm and its volume is 10 cm^3. If the height of a similar box is 6 cm, what is its volume? (*04 marks*)

4. A bag contains blue, green and red pens of the same type in the ratio 8:2:5 respectively. A pen is picked at random without replacement and its colour noted. Determine the probability that the first pen picked is

   (a) blue.

   (b) either green or red. *(04 marks)*

5. Make t the subject of the formula $p = \sqrt[3]{\dfrac{t+q^2}{2t}}$. *(04 marks)*

6. A point $A(0,3)$ is reflected in the line $y + x = 0$. Find the coordinate of its image A'. *(04 marks)*

7. Find M if $\begin{pmatrix} 1 & 1 \\ -2 & 1 \end{pmatrix} M = 2\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$. *(04 marks)*

8. The total marks scored in a test by 6 pupils was 420. If the mean mark for the first 5 pupils was 68 find the marks scored by the sixth pupil. *(04 marks)*

9. Simplify $\dfrac{t^2 - 5t}{t^2 - 25}$. *(04 marks)*

10. A triangle PQR has a height of x cm and a base of $(x + 3)$ cm. if its area is 5 cm^2, calculate the height of its base. *(04 marks)*

SECTION B: (60 MARKS)

11. A triangle with vertices $A(2,4)$, $B(6,4)$ and $C(1,6)$, undergoes two successive transformations $\mathbf{P}_1$ followed by $\mathbf{P}_2$. The transformation $\mathbf{P}_1$ is represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ and $\mathbf{P}_2$ by the matrix $\begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix}$.

   (a) Find the coordinates of the vertices of triangle:

      (i) $A'B'C'$ the image of ABC under $\mathbf{P}_1$.

      (ii) $A''B''C''$ the image of $A'B'C'$ under $\mathbf{P}_2$.

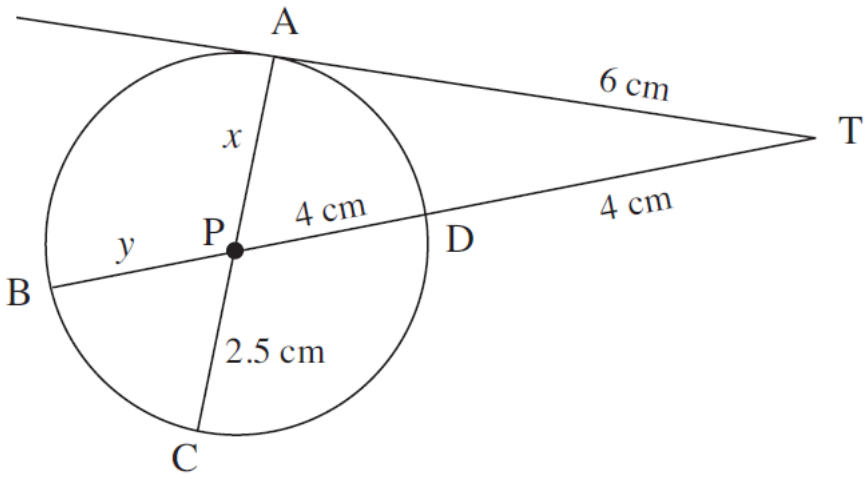
   (b) Show on the same axes the three triangles ABC, $A'B'C'$ and $A''B''C''$.

(c) Use your graph in (b), to describe fully the transformations represented by

(i) $\mathbf{P}_1$,

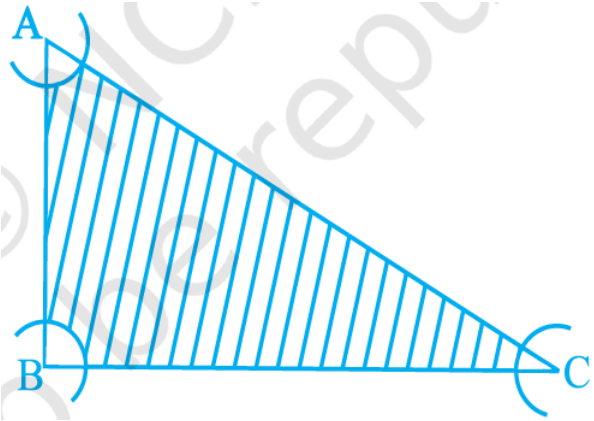
(ii) $\mathbf{P}_2$. *(12 marks)*

12. (a) Determine x and y.



(06 marks)

(b) With the vertices A, B and C of a triangle ABC as centres, arcs are drawn with radii 5 cm each as shown below. If $AB = 14$ cm, $BC = 48$ cm and $CA = 50$ cm, then find the area of the shaded region. (Use $\pi = 3.14$).



(06 marks)

13. (a) If $A = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 1 \\ 4 & -1 \end{pmatrix}$, show that $(A+B)^2 = A^2 + B^2$.

(b) Given that $D = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ and I is a 2×2 identity matrix, obtain the value of p and q such that $D^2 = pD + qI$. *(12 marks)*

14. The length of certain plants in cm, were recorded as follows

Length(cm)	$11-20$	$21-30$	$31-40$	$41-50$	$51-60$
Frequency(f)					
Cummulative frequency	4	12	28	48	58

(a) Complete the table.

(b) Calculate the mean and madian.

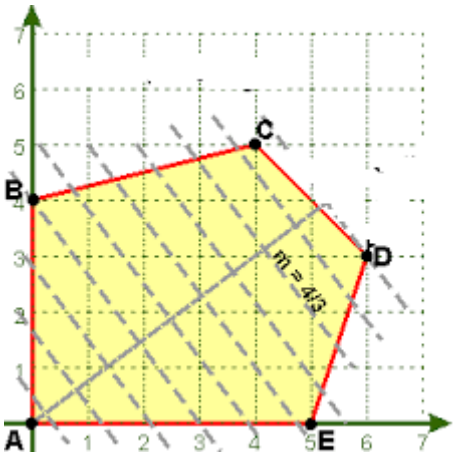
(c) Plot a histogram and use it to estimate the modal length. *(12 marks)*

15. (a) James' present age is $\frac{1}{3}$ of his father's age. In ten years' time, he will be $\frac{1}{2}$ of his father's age then. How old is his father?

(b) Make x the subject of the formula $t^2 = \frac{ax}{a+x}$ and hence calculate x if $t = 2$ and $a = 6$. *(12 marks)*

16. (a) List the integer values of x which satisfy the inequality $2x - 1 < 20 < 3x - 5$

(b) Write down five inequalities defined by the shaded region below.



(12 marks)

17. (a) Solve the simultaneous equations:
$4y - x = 6$
$5x - 2y^2 = 12.$

(b) The equal angles of an isosceles triangle are $(2x + y)^0$ and $(3y - x)^0$. The third angle is $(2y - x)^0$. Find x and y. *(12 marks)*

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