Indraprastha INTERNATIONAL SCHOOL

Sector 10, Dwarka, New Delhi – 110075

Set A

Session: 2020-2021

Periodical Assessment - III

Mathematics (041)

Class: X **Maximum Marks: 80**

Date: 3.12.2020 **Time Allowed: 3 Hours**

General Instructions

- **The question paper consists of 36 questions and 7 printed pages.**
- This question paper contains two parts A and B.
- Both Part A and Part B have internal choices.

Part – A:

1. It consists of two sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B:

1. Question No 21 to 26 are Very short answer Type questions of 2 mark each,
2. Question No 27 to 33 are Short Answer Type questions of 3 marks each
3. Question No 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

PART – A

SECTION - I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

1 a. Write a rational number between $\sqrt{2}$ and $\sqrt{3}$. **1**

OR

b. The product of two numbers is 1600 and their HCF is 5. What is the LCM of the numbers?

2 How many maximum numbers of zeroes that a polynomial of degree 2 can have? **1**

3 How many solutions does the pair of equations $y = 0$ and $y = -7$ has? **1**

4 What is the condition for a pair of lines to be parallel? **1**

5 a. Find the 31st term of an AP whose first two terms are -3 and 4. **1**

OR

b. Find the sum of the first 20 terms of the progression:
$5 + 13 + 21 + ...$

6 Find the value(s) of k if the equation $9x^2 + 6kx + 4 = 0$ has equal roots. **1**

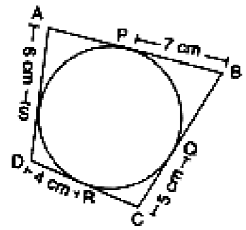
7 a. If $x = 3$ is a solution of the equation $3x^2 + (k - 1)x + 9 = 0$ then what is the value of k? **1**

OR

b. If α and β are the roots of the equation $3x^2 + 8x + 2 = 0$ then find $\alpha^{-1} + \beta^{-1}$.

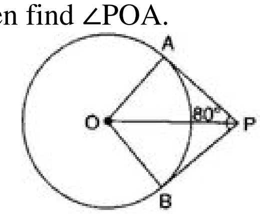
8 What is the length of the tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm? **1**

9 a. In the given figure, what is the perimeter of ABCD? **1**



OR

b. If tangents PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 80^0, then find $\angle POA$.



10 If $\Delta ABC \sim \Delta PQR$ such that AB = 1.2 cm, PQ = 1.4 cm, then find ar(ΔABC) : ar(ΔPQR). **1**

11 If one pair of opposite angles of a cyclic quadrilateral are equal then find their measure. **1**

12 If $9\sec^2 A - 9\tan^2 A = x$, then find the value of x. **1**

13 If $\cos\alpha = \sin\alpha$, then find the value of α. **1**

14 If the area of a circle is equal to the sum of the areas of two circles of diameters 10 cm and 24 cm, then what is the diameter of the larger circle? **1**

15 Find the ratio of the volumes of two cones with equal heights if the ratio of their radii is 2 : 5. **1**

16 a. Find the probability of getting a black ace when a card is drawn at random from a well-shuffled pack of 52 cards. **1**

OR

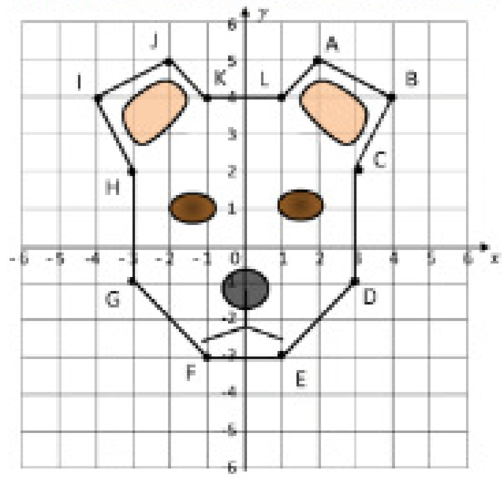
b. What is the probability of 53 Sundays in a leap year?

SECTION - II

Case study based questions are compulsory. Attempt any four sub parts of each question. Each sub part carries 1 mark.

17 **Case Study based-1**

Venky drew a sketch on a graph sheet and corner points are indicated with letters:



a. What are the coordinated of point B? **1**

i. (3,3) ii. (3,4) iii. (4,4) iv. (4,3)

b. Which point is symmetrical to point B? **1**

i. J ii. D iii. I iv. G

c. What is the length of GD? **1**

i. 0 units ii. 3 units iii. $\sqrt{3}$ units iv. 6 units

d. What are the coordinates of mid point of IK? **1**

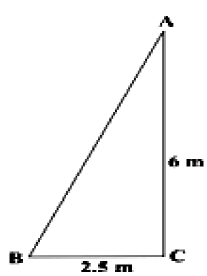
i. (-2, 4) ii. (-2.5, 4) iii. (-1, 4) iv. (0, 0)

e. What is the distance of point E from y-axis? **1**

i. 1 units ii. 2 units iii. -1 units iv. -2 units

18 **Case Study based-2**

There is some fire incident in the house. The fireman is trying to enter the house from the window as the main door is locked. The window is 6 m above the ground. He places a ladder against the wall such that its foot is at a distance of 2.5 m from the wall and its top reaches the window.



a. Here, ________ be the ladder and ________ be the wall with the window respectively. **1**

i. CA, AB ii. AB, AC iii. AC, BC iv. AB, BC

b. We will apply Pythagoras Theorem to find length of the ladder. Which is it? **1**

i. $AB^2 = BC^2 - CA2$ ii. $CA2= BC^2 + AB^2$

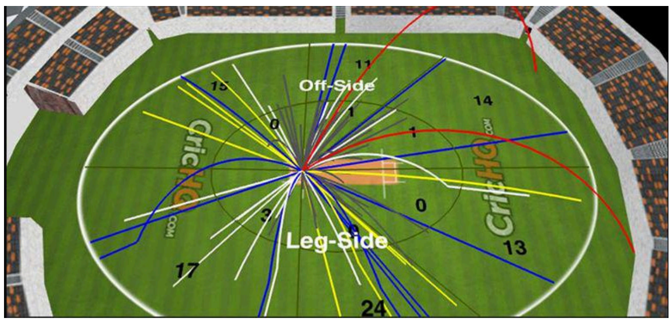
iii. $BC^2 = AB^2+ CA^2$ iv. $AB^2 = BC^2 + CA^2$

c. What is the length of the ladder? **1**
   i. 4.5 m   ii. 2.5 m   iii. 6.5 m   iv. 5.5 m

d. What would be the length of the ladder if it is placed 6 m away from the wall and the window is 8 m above the ground? **1**
   i. 12 m   ii. 10 m   iii. 14 m   iv. 8 m

e. How far should the ladder be placed if the fireman gets a 9 m long ladder? **1**
   i. 6.7 m (approx.)   ii. 7.7 m (approx.)
   i. 5.7 m (approx.)   iv. 4.7 m (approx.)

19 **Case Study based-3**



If a projectile, such as a baseball or cricket ball, travels in a parabolic path, with negligible air resistance, and if a player is positioned so as to catch it as it descends, he sees its angle of elevation increasing continuously throughout its flight. The tangent of the angle of elevation is proportional to the time since the ball was sent into the air, usually by being struck with a bat. Even when the ball is really descending, near the end of its flight, its angle of elevation seen by the player continues to increase. The player therefore sees it as if it were ascending vertically at constant speed. Finding the place from which the ball appears to rise steadily helps the player to position himself correctly to make the catch. If he is too close to the batsman who has hit the ball, it will appear to rise at an accelerating rate. If he is too far from the batsman, it will appear to slow rapidly, and then to descend.

a. If parabolic path followed by one of the sixer ball is represented by $x^2 - 5x - 6$, then what will be its zeroes? **1**
   i. 3, 2   ii. -3 , -2   iii. 6, -1   iv. -6, 1

b. If zeroes of the parabolic path followed by a four runs ball are 0 and 5 then what can be the expression? **1**
   i. $x^2 - 5x$ ii. $x^2 + 5x$ iii. x^2 iv. None of these

c. What do we call the curve made by a quadratic polynomial? **1**
   i. Line   ii. Parabola
   iii. Circle   iv. No special name exist.

d. What is the tangent of the angle of elevation proportional to? **1**
   i. Speed   ii. Distance
   iii. Time   iv. Not proportional.

e. How many real zeroes are there for polynomial $x^2 + 3$? **1**

i. Exactly one ii. Exactly two

iii. At most two iv. None

20 **Case Study based-4**

Education with vocational training is helpful in making a student self-reliant and to help and serve the society. Keeping this in view, a teacher made the following table giving the frequency distribution of a student undergoing vocational training from the training institute:

Age (in years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-above
F	62	132	96	37	13	8	6	4	4	3

a. What is the Median class (in years) of above data? **1**

i. 20 – 24 ii. 20.5 - 24.5 iii. 19.5 - 24.5 iv. 24.5 - 29.5

b. Calculate the median of above data. **1**

i. 24.06 years ii. 30.07 years iii. 24.77 years iv. 42.07 years

c. What is the empirical relationship between mean, median, mode? **1**

i. Mode = 3 Median + 2 Mean ii. Mode = 3 Median - 2 Mean

iii. Mode = 3 Mean + 2 Median iv. 3 Mode = Median - 2 Mean

d. If mode = 80 and mean = 110, then find the median. **1**

i. 200 years ii. 500 years iii. 190 years iv. 100 years

e. What is the mode? **1**

i. The middlemost frequent value. ii. The least frequent value.

iii. The maximum frequent value. iv. None of these.

PART – B

All the questions are compulsory. In case of internal choices, attempt any one.

21 The decimal expansion of $\frac{51}{2^3 X 5^2}$ will terminate after how many decimal places? **2**

22 a. Find the values of x for which the distance between the points A(x, 2) and B(9, 8) is 10 units. **2**

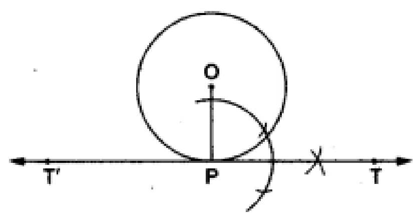
OR

b. In what ratio does the point P(- 4, 6) divides the line segment joining the points A(- 6, 10) and B(3, - 8)?

23 Write a quadratic polynomial, sum of whose zeros is $-2\sqrt{3}$ and their product is 2. **2**

24 Form a question for the following construction: **2**

a. Draw a circle of radius 2.5 cm taking a point O as its centre.
b. Mark a point P on this circle.
c. Join OP.



d. Construct angle OPT = 90°
e. Produce TP to T'.

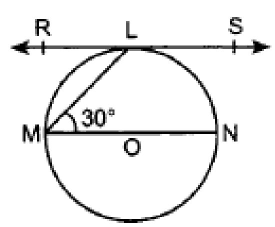
Then T'PT is the required tangent.

25 a. Evaluate $\operatorname{cosec}^2 30^0 \sin^2 45^0 - \sec^2 60^0$. **2**

OR

b. If $x = a\cos^3\theta$, $y = b\sin^3\theta$, prove that $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = 1$.

26 In the given figure, RS is the tangent to the circle at L and MN is a diameter. If ∠NML = 30°, determine ∠RLM. **2**



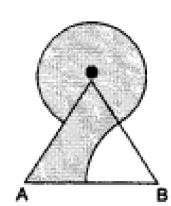
27 Find the LCM and HCF of 336 and 54 and verify that LCM × HCF = product of two numbers. **3**

28 a. Find roots of given quadratic equation: $p^2x^2+(p^2-q^2)x-q^2=0$, $p\neq0$. **3**

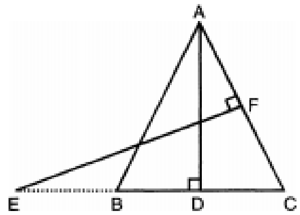
OR

b. Solve: $3^{(x+2)} + 3^{-x} = 10$.

29 Find the area of the shaded region in the given figure, where a circular arc of radius 6 cm has been drawn with vertex of an equilateral triangle of side 12 cm as centre and a sector of circle of radius 6 cm with centre B is made. [Use $\sqrt{3}$ = 1.73 and π= 3.14.] **3**



30 a. In the given figure, AB = AC. E is a point on CB produced. If AD is perpendicular to BC and EF perpendicular to AC. Prove that AB×EF=AD×EC. **3**



OR

b. In △ABC, D and E are the midpoints of AB and AC respectively. Find the ratio of areas of △ADE and △ABC.

31 Find the median marks for the following distribution: **3**

Classes	**Number of students**
0 - 10	2
10 - 20	12
20 - 30	22
30 - 40	8
40 - 50	6

32 If a tower 30m high, casts a shadow $10\sqrt{3}$m long on the ground, then what is the angle of elevation of the sun? **3**

33 Find the missing frequencies in the following distribution, if the sum of the frequencies is 120 and the mean is 50. **3**

Class	0-20	20-40	40-60	60-80	80-100
Frequency	17	f_1	32	f_2	19

34 a. Two men are on opposite sides of a tower. They measure the angles of elevation of the top of the tower as 30^0 and 45^0 respectively. If the height of the tower is 50 metres, find the distance between the two men. [Take $\sqrt{3}$ = 1.732.] **5**

OR

b. From the top of a building AB, 60m high, the angles of depression of the top and bottom of a vertical lamp-post CD are observed to be 30° and 60°respectively. Find the height of the lamp-post.

35 A tent is in the form of a right circular cylinder surmounted by a cone. The diameter of the base of the cylinder and of the cone is 24 m. The height of the cylinder is 11 m. If the vertex of the cone is 16 m above the ground, find the area of the canvas required for making the tent. (Use π = 22/7) **5**

36 Sum of the areas of two squares is 468 m^2. If the difference of their perimeters is 24 m, find the sides of the two squares. **5**