FLORETS INTERNATIONAL SCHOOL, PANKI
PRE-BOARD EXAMINATION (2020-21)
CLASS – X

Time – 3 hours   MATHEMATICS (041/SET-01)   M. Marks – 80

General Instructions:
1. This question paper contains two parts A and B. Both Part A and Part B have internal choices.
3. In Part A, Internal choice is provided in 5 questions.
3. Part A has 4 questions on case study. Each case study has 5 case-based sub-parts. Attempt any 4 out of 5 sub-parts.
4. In Part B, Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

PART – A

Question numbers 1 to 16 carry 1 mark each.

1. After how many decimal places will the decimal expansion of the rational number $\frac{359}{2^6 \times 5^3}$ terminate?

OR

Given that HCF (135, 225) = 45, find the LCM (135, 225).

2. If 1 is a zero of the polynomial $ax^2 - 3(a-1)x - 1$, then find the value of a.

3. For what value of k, the pair of linear equations $3x + y = 3$ and $6x + ky = 8$ does not have a solution.

4. For what value(s) of k, the quadratic equation $3x^2 - kx + 3 = 0$ has equal roots?
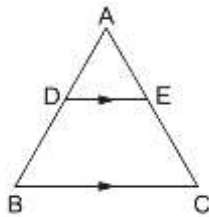
OR

Find the discriminant of the quadratic equation $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$.

5. If $-\frac{5}{7}$, a, 2 are consecutive terms in an Arithmetic Progression, then find the value of a.

6. Find the distance between the points (0, 0) and (a – b, a + b).

OR

A circle has its centre at (4, 4). If one end of a diameter is (4, 0), then find the coordinates of the other end.

7. In ∆ABC, DE ∥ BC such that $\frac{AD}{DB} = \frac{3}{5}$. If AC = 5.6 cm then find AE.

8. If $\sin\theta = \cos\theta$, then find the value of $tan^2\theta + cot^2\theta$.

9. If sin A + sin² A = 1, then find the value of the expression (cos² A + cos⁴ A).

10. A tower stands vertically on the ground. From a point on the ground, which is 80 m away from the foot of the tower, the angle of elevation of the tower is found to be 30º. Find the height of the tower.

11. In the figure, if B1, B2, B3, …... and A1, A2, A3, ….. have been marked at equal distances. In what ratio C divides AB?
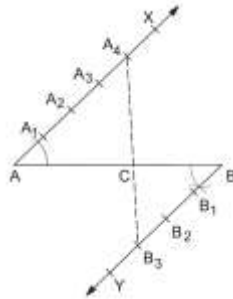
12. In the figure, if tangents PA and PB from an external point P to a circle with centre O, are inclined to each other at an angle of 80°, then find ∠AOB.
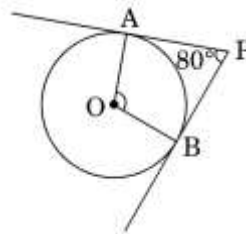
13. Find the area of a quadrant of a circle whose circumference is 22 cm.

14. The capacity of a cylindrical glass tumbler is 125·6 cm^3. If the radius of the glass tumbler is 2 cm, then find its height. (Use $\pi = 3·14$)

OR

A solid spherical ball fits exactly inside the cubical box of side 2a, then calculate the volume of the ball.

15. If mean and median of a distribution are 14 and 15 respectively, then find the value of mode.

16. Two dice are thrown simultaneously. Find the probability that the sum of two numbers appearing on the top of the dice is less than 12.

OR

Find the probability that a leap year selected at random will contain 53 Sundays.

Case study-based questions are compulsory. Attempt any 4 sub parts out of 5 sub parts of each question. Each subpart carries 1 mark.

17. Case Study Based- 1

100m RACE

A stopwatch was used to find the time that it took a group of students to run 100 m.

Time (Seconds)	0 – 20	20 – 40	40 – 60	60 – 80	80 -100
No. of Students	8	10	13	6	3

a) What will be the upper limit of the modal class ?

   (i) 20   (ii) 40   (iii) 60   (iv) 80

b) The construction of cummulative frequency table is useful in determining the

   (i) Mean   (ii) Median   (iii) Mode   (iv) All of the above

c) The sum of lower limits of median class and modal class is

   (i) 60   (ii) 100   (iii) 80   (iv) 140

d) How many students finished the race within 1 minute?

   (i) 18   (ii) 37   (iii) 31   (iv) 8

e) Estimate the mean time taken by a student to finish the race.

   (i) 54   (ii) 63   (iii) 43   (iv) 50

**18. Case Study Based- 2**
Applications of Parabolas

A bridge is parabolic in shape.

Parabola

A parabola is the graph that results from $p(x) = ax^2 + bx + c$

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Parabolas are symmetric about a vertical line known as the Axis of Symmetry.

The Axis of Symmetry runs through the maximum or minimum point of the parabola which is called the **vertex**.
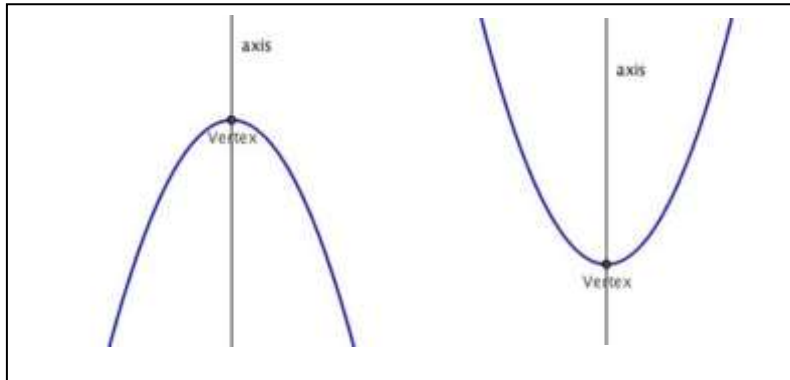
a) The bridge is represented graphically.

Zeroes of a polynomial can be expressed graphically. Number of zeroes of polynomial is equal to number of points where the graph of polynomial

(i) Intersects x-axis

(ii) Intersects y-axis

(iii) Intersects y-axis or x-axis

(iv) None of the above

b) If the highway overpass is represented by $x^2 – 2x – 8$. Then its zeroes are

(i) (2, -4)   (ii) (4, -2)   (iii) (-2, -2)   (iv) (-4, -4)

c) Graph of a quadratic polynomial is a

(i) straight line   (ii) circle   (iii) parabola   (iv) ellipse

d) The representation of bridge whose one zero is 6 and sum of the zeroes is 0, is

(i) $x^2 – 6x + 2$ (ii) $x^2 – 36$ (iii) $x^2 – 6$ (iv) $x^2 – 3$

e) The number of zeroes that polynomial $f(x) = (x – 2)^2 + 4$ can have is:

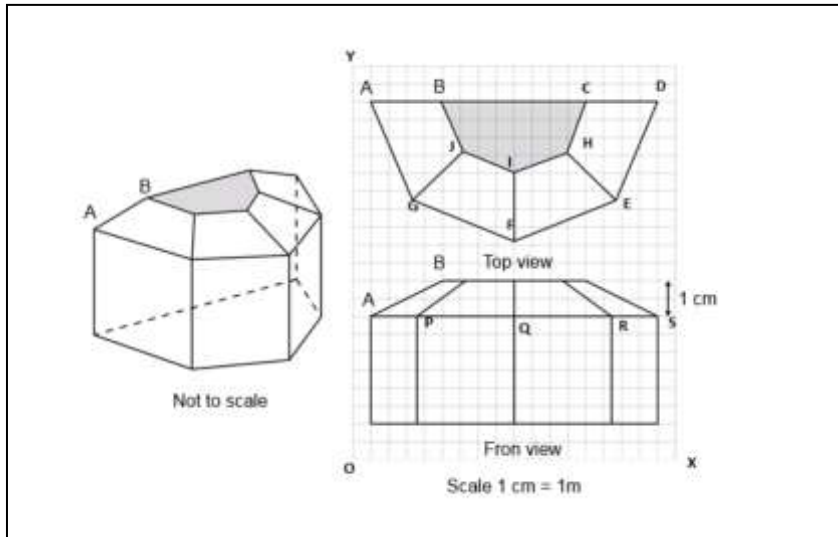(i) 1   (ii) 2   (iii) 0   (iv) 3

19. **Case Study based-1**

SUN ROOM

The diagrams show the plans for a sun room. It will be built onto the wall of a house. The four walls of the sunroom are square clear glass panels. The roof is made using

• Four clear glass panels, trapezium in shape, all the same size

• One tinted glass panel, half a regular octagon in shape

a) Refer to Top view, find the mid-point of the segment joining the points J (6, 17) and I (9, 16).

  (i) (33/2, 15/2)   (ii) (3/2, 1/2)   (iii) (15/2, 33/2)   (iv) (1/2, 3/2)

b) Refer to Top view, the distance of the point P from the y-axis is

  (i) 4   (ii) 15   (iii) 19   (iv) 25

c) Refer to Front view, the distance between the points A and S is

  (i) 4   (ii) 8   (iii) 16   (iv) 20

d) Refer to Front view, find the co-ordinates of the point which divides the line segment joining the points A and B in the ratio 1:3 internally.

  (i) (8.5, 2.0)   (ii) (2.0, 9.5)   (iii) (3.0, 7.5)   (iv) (2.0, 8.5)

e) Refer to Front view, if a point (x, y) is equidistant from the Q (9,8) and S (17,8), then

  (i) x + y = 13   (ii) x -13 = 0   (iii) y -13 = 0   (iv) x – y = 13

20. **Case Study Based- 2**

**SCALE FACTOR AND SIMILARITY**

SCALE FACTOR

A scale drawing of an object is the same shape as the object but a different size.

The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio.

SIMILAR FIGURES

The ratio of two corresponding sides in similar figures is called the scale factor.

$$Scale\ factor = \frac{length\ in\ image}{corresponding\ length\ in\ object}$$

Resize	**Rotation or Turn**	**Reflection or Flip**	**Translation or Slide**
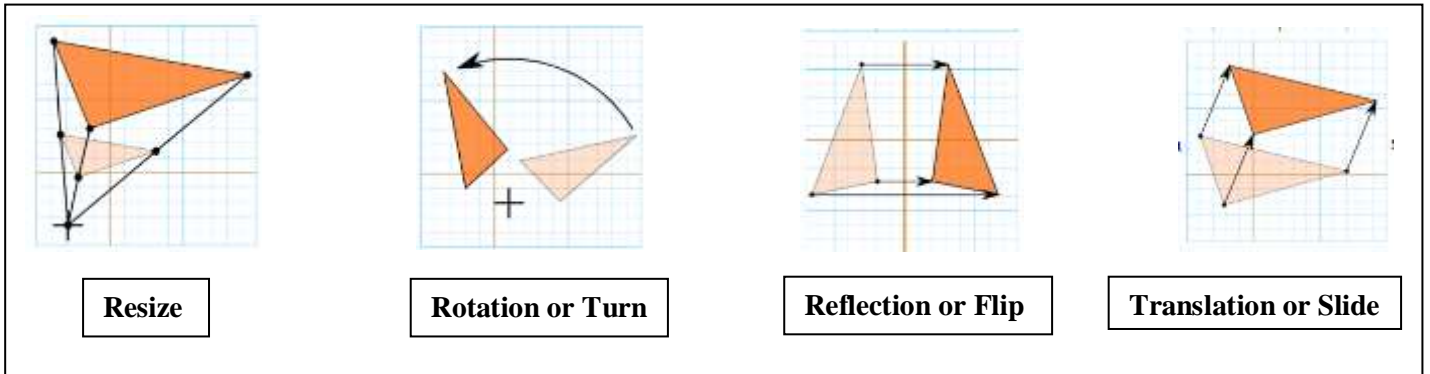
If one shape can become another using Resizing then the shapes are Similar.

Hence, two shapes are Similar when one can become the other after a resize, flip, slide or turn.

a) A model of a boat is made on the scale of 1: 4. The model is 120 cm long. The full size of the boat has a width of 60 cm. What is the width of the scale model?

    (i) 20 cm   (ii) 25 cm   (iii) 15 cm   (iv) 240 cm

b) What will effect the similarity of any two polygons?

    (i) They are flipped horizontally

    (ii)They are dilated by a scale factor

    (iii)They are translated down

    (iv)They are not the mirror image of one another

c) If two similar triangles have a scale factor of a : b. Which statement regarding the two triangles is true?

    (i) The ratio of their perimeters is 3a : b

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(ii) Their altitudes have a ratio a : b

(iii) Their medians have a ratio $a/2$: b

(iv) Their angle bisectors have a ratio a^2 : b^2

d) The shadow of a person 5m long is 2 m. At the same time the shadow of a tree 12.5 m high is
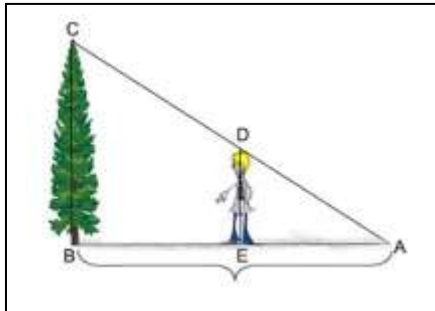
(i) 3m

(ii) 3.5m

(iii) 4.5m

(iv) 5m

e) An aeroplane leaves an airport and flies due north at a speed of 1000 km per hour. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1200 km per hour. How far apart will be the two planes after $1\frac{1}{2}$ hours?

(i) $30\sqrt{61}$ km   (ii) $100\sqrt{61}$ km   (iii) $300\sqrt{61}$ km   (iv) $3\sqrt{61}$ km
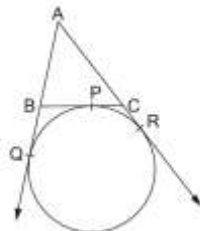
PART – B

Question numbers 21 to 26 carry 2 marks each.

21. If α and β are zeroes of the polynomial $2x^2 - 5x - 4$, then find $\frac{1}{\alpha} + \frac{1}{\beta}$.

22. Solve for *x:* $4\sqrt{3}\,x^2 + 5x - 2\sqrt{3} = 0$.

23. Given 15 cot A = 8, find the values of sin A and sec A.

OR

Evaluate: $\sin^2 60^o + 2 \tan 45^o – \cos^2 30^o$

24. If AQ = 28 cm, then find the perimeter of ΔABC.

25. Find the mode of the following distribution:

Class Interval	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40
Frequency	45	30	75	20	35	15

26. A jar contains 18 marbles. Some are red and others are yellow. If a marble is drawn at random from the jar, the probability that it is red is 2/3. Find the number of yellow marbles in the jar.

OR

A die is thrown twice. What is the probability that

(i) 5 will come up at least once, and

(ii) 5 will not come up either time?

Question numbers 27 to 33 carry 3 marks each.

27. Prove that $\sqrt{2}$ is an irrational number.

28. Find the sum of first 16 terms of an Arithmetic Progression whose 4th and 9th terms are -15 and -30 respectively. **OR**

If the sum of first 14 terms of an Arithmetic Progression is 1050 and its fourth term is 40, find its 20th term.

29. Find the ratio in which the Y- axis divides the line segment joining the points $(5, -6)$ and $(-1, -4)$. Also find the point of intersection.

30. Prove that: $\dfrac{1+\tan A}{2\sin A} + \dfrac{1+\cot A}{2\cos A} = \sec A + \operatorname{cosec} A$.

31. In a right triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the other two sides. **OR**

If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

32. Draw a pair of tangents to a circle of radius 3 cm, which are inclined to each other at an angle of 60°.

33. In the figure, ABCD is a square of side 14 cm. Semi-circles are drawn with each side of square as diameter. Find the area of the shaded region.
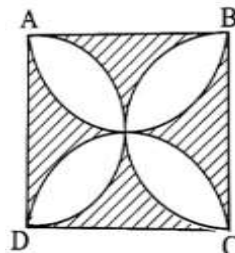
Question numbers 34 to 36 carry 5 marks each.

34. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h; it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.

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35. Two poles of equal heights are standing opposite each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles.

36. A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form a platform. Find the height of the platform. (Take π = 22/7)

OR

A wooden toy rocket is in the shape of a cone mounted on a cylinder, as shown in Figure. The height of the entire rocket is 26 cm, while the height of the conical part is 6 cm. The base of the conical portion has a diameter of 5 cm, while the base diameter of the cylindrical portion is 3 cm. If the conical portion is to be painted orange and the cylindrical portion yellow, find the area of the rocket painted with each of these colours. (Take π = 3.14)