PRE-BOARD EXAMINATION 2021
CLASS –X
MATHEMATICS (STANDARD)

Time:3 hrs   Marks: 80

General Instruction:
1. This question paper contains two parts A and B.

Part – A:
1. It consists three sections- I and II.
2. Section I has 16 questions of 1 mark each.
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.

PART - A
SECTION-I
Questions 1 to 16 carry 1 mark each.

1. Find whether the following pair of linear equations is consistent or inconsistent:
$x + 2y = 4$, $3x + 6y = 12$

2. Given HCF $(306, 657) = 9$, find LCM $(306, 657)$.

OR

The decimal expansion of the rational number $\dfrac{43}{2^4 5^3}$ will terminate after how many places of decimal?

3. If $x = 2$ is a root of $ax^2 + ax + 6 = 0$, find the value of a.

4. If the sum of the zeroes of the quadratic polynomial $3x^2 - kx + 6$ is 3, then find the value of k.

5. Find whether -150 is a term of the A.P. $17, 12, 7, 2, ...$?

OR

Which term of the progression $4, 9, 14, 19, ...$ is 109?
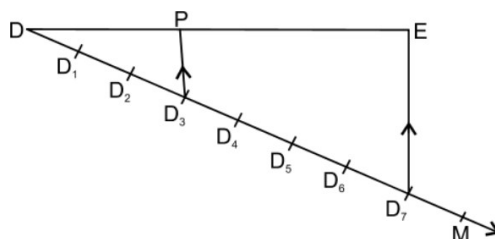
6. Find the roots of the equation $x^2 + 7x + 10 = 0$.

7. For what values of k, the equation $9x^2 + 6kx + 4 = 0$ has equal roots?

OR

If 1 is a root of the equations $ay^2 + ay + 3 = 0$ and $y^2 + y + b = 0$, then find the value of a, b.

8. In the figure, D_1, D_2, D_3........ are points on ray DM at equal distances and $D_3P \parallel D_7E$. What will be the ratio of DE to DP?

9. If two tangents inclined at an angle 60° are drawn to a circle of radius 3 cm, then what will be the length of each tangent?

OR

In the given figure, AR AQ and BC are tangents to the circle. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then calculate the length of AP.
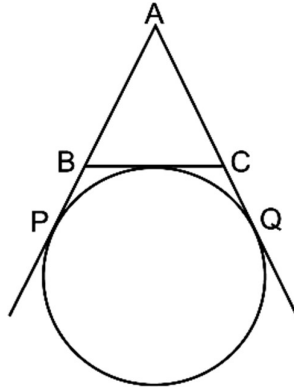
10. Let $\triangle ABC \sim \triangle DEF$. If ar($\triangle ABC$) = 225 cm^2, BC = 3 cm and EF = 7 cm, then find ar($\triangle DEF$).

11. In $\triangle ABC$, D and E are points on side AB and AC respectively such that DE ∥ BC. If AE = 2 cm, AD = 3 cm and BD = 4.5 cm, then find CE.

12. If $\tan \theta + \cot \theta = 5$, find the value of $\tan^2 \theta + \cot^2 \theta$.

13. Given $\sqrt{3} \tan 5\theta = 1$, find the value of θ.

14. The length of an arc of a circle of radius 12 cm is 4π cm. Find the central angle of this arc.

15. A letter is chosen at random from the letters of the message 'HEY DUDE WASSUP'. What is the probability that the chosen letter is a consonant?

OR

Two different dice are tossed together. Find the probability that the product of the two numbers on the top of the dice is 6.

16. The diameter of a metallic sphere is 6 cm. The sphere is melted and drawn into long wire of uniform circular cross-section. If the length of the wire is 36 cm, find its radius.

SECTION-II
Case study-based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. **Case Study based-1:**
Four students A, B, C and D are visited a Park on Sunday along with their Mathematics teacher. The teacher instructed all four students to attempt Sample paper test 06. They are sitting at the corners of a park, which is in the shape of a quadrilateral and started solving the test paper.

Please give answers to these questions.

(a) Write the coordinates of A and B.
    (i) A(–3, 1), B(1, 4)   (ii) A(–3, 1), B(–1, 4)
    (iii) A(3, 1), B(–1, 4)   (iv) A(–3, –1), B(–1, 4)

(b) Write the coordinates of C and D.
    (i) C(–3, 2), D(1, 2)   (ii) C(–3, 2), D(1, 2)
    (iii) C(3, 2), D(–1, –2)   (iv) C(3, 2), D(1, –2)

(c) Distance of point A from the origin is:
    (i) √10   (ii) √20   (iii) √15   (iv) none of these

(d) The distance from A to B is:
    (i) √15   (ii) √13   (iii) √7   (iv) √5

(e) Which of the following may be true if B, C and D become collinear?
    (i) BC = CD + BD   (ii) BC = AC + CD
    (iii) CD = BC + AB   (iv) none of these

18. **Case Study based-2:**
Ashok went to restaurant along with his friend Shyam and he ordered one small size pizza for him and one bigger size pizza for his friend for a dinner party. Instead of eating this they are comparing the slices of the pizza. And then a lot of questions came into his mind. Answer the following questions:

(a) The slices of smaller pizza and bigger pizza are similar using :
    (i) AA rule   (ii) SAS rule   (iii) SSS rule   (iv) slices are not similar

(b) The scale factor is:
    (i) 2   (ii) 3   (iii) 4   (iv) 1

(c) What will affect 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

(d) The ratio of area of smaller slices to bigger slice is
   (i) 1 : 2   (ii) 1 : 8   (iii) 1 : 4   (iv) 1 : 16

(e) 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
   (ii) Their altitudes have a ratio a : b
   (iii) Their medians have a ratio a/2 : b
   (iv) Their angle bisectors have a ratio a² : b²

19. Case Study based-3:
One day, due to heavy storm an electric wire got bent as shown in the figure. It followed some mathematical shape of curve. Answer the following questions below.
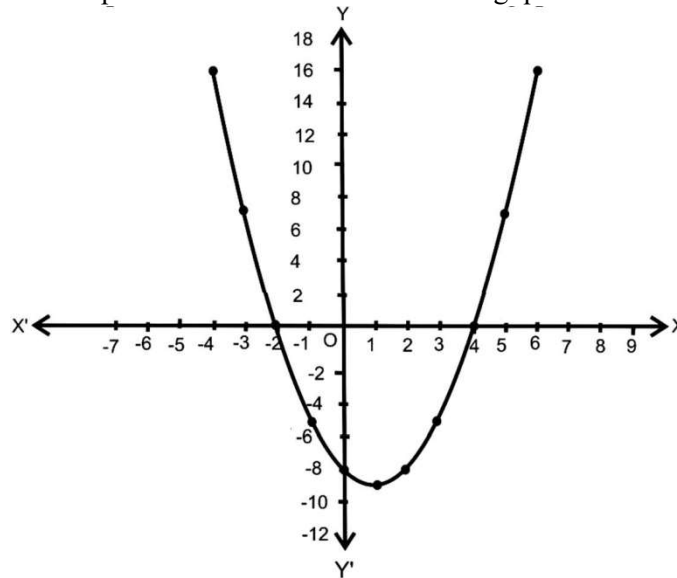
(a) How many zeroes are there for the polynomial (shape of the wire)
   (i) 2   (ii) 3   (iii) 4   (iv) 5

(b) Find the zeroes of the polynomial.
   (i) 0, 4   (ii) -2, 4   (iii) 4, 2   (iv) None of these

(c) Find the expression of the polynomial in the above graph.
   (i) $x^2 + 2x + 8$ (ii) $x^2 - 2x - 8$
   (iii) $x^2 - 2x + 8$ (iv) None of these

(d) Name the type of expression of the polynomial?
   (i) quadratic   (ii) cubic   (iii) linear   (iv) bi-quadratic

(e) If one zero of the polynomial $x^2 - ax - 12$ is 6 then find the other zero.
   (i) 2   (ii) -2   (iii) 4   (iv) -4

20. Case Study based-4:
A group of students decided to make a project on Statistics. They are collecting the life time of neon lamps from a factory. After collecting the life time data of 400 neon lamps, they arranged the data in the following frequency distribution table:

Life time (in hrs)	Number of lamps
1500 – 2000	14
2000 – 2500	56
2500 – 3000	60
3000 – 3500	86
3500 – 4000	74
4000 – 4500	62
4500 – 5000	48

(a) What is the lower limit of median class?
   (i) 3000   (ii) 3500   (iii) 2500   (iv) 4000

(b) What is the upper limit of modal class?
   (i) 3000   (ii) 3500   (iii) 2500   (iv) 4000

(c) What is the mean of lower limit of median and upper limit of modal class?
   (i) 3000   (ii) 3500   (iii) 3250   (iv) 4250

(d) What is the cf of the class preceding the median class?
   (i) 130   (ii) 70   (iii) 216   (iv) none of these

(e) The median is :
   (i) 3406.98 cm   (ii) 3446.98 cm   (iii) 3306.98 cm   (iv) 3206.98 cm

PART – B
(Question No 21 to 26 are Very short answer Type questions of 2 mark each)

21. Two tankers contain 620 litres and 840 litres of diesel respectively. Find the maximum capacity of a container which can measure the diesel of both the tankers in exact number of times.

22. Find the ratio in which y-axis divides the line segment joining the points A(5, –6), and

    B(– 1, –4).

OR

Three vertices of a parallelogram taken in order are (–1, 0), (3, 1) and (2, 2) respectively. Find the coordinates of fourth vertex.

23. Find a quadratic polynomial whose zeroes are $5 - 3\sqrt{2}$ and $5 + 3\sqrt{2}$.

24. Draw two tangents to a circle of radius 3.5 cm, from a point P at a distance of 6.2 cm firm its centre.

25. If cos (A + B) = 0 and sin (A – B) = $\dfrac{1}{2}$, then find the value of A and B, where A and B are

    acute angles.

OR

For $\theta = 30°$ verify that $\cos\theta = \dfrac{1}{\sqrt{1+ \tan^2 \theta}}$

26. Two tangents PQ and PR are drawn from an external point to a circle with centre O. Prove that QORP is a cyclic quadrilateral.

**(Question no 27 to 33 are Short Answer Type questions of 3 marks each)**

27. If $\sqrt{3}$ is an irrational number prove that $\dfrac{2\sqrt{3}}{5}$ is an irrational number.

28. For what values of k, the roots of the quadratic equation $(k + 4)x^2 + (k + 1) x + 1 = 0$ are equal?
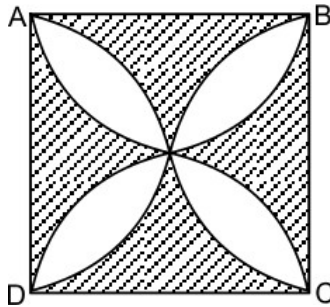
OR

Solve for x: $4x^2 - 4ax + (a^2 - b^2) = 0$

29. In the figure, a circle is inscribed in an equilateral triangle ABC of side 12 cm. Find the radius of inscribed circle and the area of the shaded region. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)
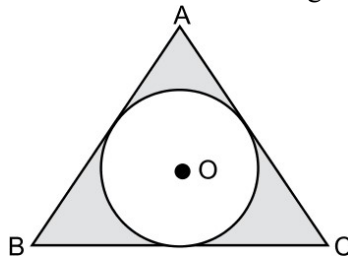
OR

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.

30. Find the median of the following data

Marks obtained	Number of students
80 – 90	9
90 -100	17
100 – 110	19
110 – 120	45
120 – 130	33
130 – 140	15
140 – 150	12
Total	**150**

31. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, find the length of the corresponding side of the second triangle.

32. Prove that $\dfrac{\sin\theta}{1-\cos\theta} + \dfrac{\tan\theta}{1+\cos\theta} \dfrac{1}{} = \sec\theta \cos ec\theta + \cot\theta$

33. Size of agricultural holdings in a survey of 200 families is given in the following table :

Size of agricultural holding (in ha)	Number of families
0 – 5	10
5 – 10	15
10 – 15	30
15 – 20	80
20 – 25	40
25 – 30	20
30 – 35	5

Find the mode of the data.

(Question no 34 to 36 are Long Answer Type questions of 5 marks each.)

34. A motorboat covers a distance of 16 km upstream and 24 km downstream in 6 hours. In the same time it covers a distance of 12 km upstream and 36 km downstream. Find the speed of the boat in still water and that of the stream.

35. Water is flowing at the rate of 15 km/hour through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in the pond rise by 21 cm?

36. As observed from the top of a 100 m height light house from the sea level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the light house, find the distance between the two ships.

OR

An aeroplane is flying at a height of 300 m above the ground. Flying at this height, the angles of depression from the aeroplane of two points on both banks of a river in opposite directions are 45° and 60° respectively. Find the width of river [use √3 = 1.732]