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PREBOARD QUESTION PAPER (STANDARD) (2019-20)

SUBJECT: MATHEMATICS
CLASS : X
MAX. MARKS : 80
DURATION : 3 HRS

General Instruction:
(i) All the questions are compulsory.
(ii) The question paper consists of 40 questions divided into 4 sections A, B, C, and D.
(iii) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.
(iv) There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
(v) Use of calculators is not permitted.

SECTION – A
Questions 1 to 20 carry 1 mark each.

1. The decimal expansion of the rational number \( \frac{11}{2^4 \times 5^3} \) will terminate after:
   (a) one decimal place  
   (b) two decimal places  
   (c) three decimal places  
   (d) more than three decimal places.

2. If \( n \) is an even natural number, then the largest natural number by which \( n(n + 1)(n + 2) \) is divisible is
   (a) 6  
   (b) 8  
   (c) 12  
   (d) 24

3. For what value of \( k \), does the pair of linear equations given below has a unique solution?
   \( 2x + ky = 6 \) and \( 4x + 6y = 0 \)
   (a) \( k = 3 \)  
   (b) \( k \neq 3 \)  
   (c) \( k = -3 \)  
   (d) none of these

4. The point which divides the line segment joining the points (7, –6) and (3, 4) in ratio 1 : 2 internally lies in the
   (a) I quadrant  
   (b) II quadrant  
   (c) III quadrant  
   (d) IV quadrant

5. If the points (7, –2), (5, 1) and (3, k) are collinear then the value of \( k \) is
   (a) 4  
   (b) 10  
   (c) –4  
   (d) 0

6. The point on x-axis which is equidistant from points (–1, 0) and (5, 0) is
   (a) (0, 2)  
   (b) (2, 0)  
   (c) (3, 0)  
   (d) (0, 3)

7. The value of the expression \[ \frac{\sin^2 22^0 + \sin^2 68^0}{\cos^2 22^0 + \cos^2 68^0} + \sin^2 63^0 + \cos 63^0 \sin 27^0 + \tan^2 45^0 \] is
   (a) 3  
   (b) 0  
   (c) 1  
   (d) 2

8. If \( \sin 3A = \cos (A – 26^0) \), where \( 3A \) is an acute angle, find the value of \( A \).
   (a) 29^0  
   (b) 30^0  
   (c) 26^0  
   (d) 36^0

9. In a right triangle ABC, right-angled at B, if \( \tan A = 1 \), then the value of \( 2 \sin A \cos A = \)
   (a) 0  
   (b) 1  
   (c) \( \frac{1}{2} \)  
   (d) not defined
10. For the following distribution:

<table>
<thead>
<tr>
<th>Class</th>
<th>0 – 5</th>
<th>5 – 10</th>
<th>10 – 15</th>
<th>15 – 20</th>
<th>20 – 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>10</td>
<td>15</td>
<td>12</td>
<td>20</td>
<td>9</td>
</tr>
</tbody>
</table>

The sum of lower limits of the median class and the modal class is
(a) 15  (b) 25  (c) 30  (d) 35

11. In an AP, if a = 3, n = 8, Sₙ = 192, then the value of d is ______

12. If the probability of an event is p, the probability of its complementary event will be ______

13. A shuttle cock used for playing badminton has the shape of the combination of ___________

14. P and Q are points on the sides AB and AC respectively of a triangle ABC. PQ is parallel to BC and divides the triangle ABC into 2 parts, equal in area. The ratio of PA:AB =______

15. The value(s) of k for which the equation \(x^2 + 5kx + 16 = 0\) has real and equal roots is ______
   OR
   If one of the zeroes of the cubic polynomial \(x^3 + ax^2 + bx + c = -1\), then the product of the other two zeroes is ______

16. AB and CD are two common tangents to circles which touch each other at a point C. If D lies on AB such that CD = 4 cm then find AB.
   OR
   TP is a tangent to the circle with centre O. If \(\angle TOQ = 120^0\), find the diameter of the circle when OT = 10 cm.

17. Show that \(12^n\) cannot end with the digit 0 or 5 for any natural number \(n\).

18. Find the value(s) of k, if the quadratic equation \(3x^2 - k\sqrt{3}x + 4 = 0\) has equal roots.

19. Find the eleventh term from the last term of the AP: 27, 23, 19, ..., –65.

20. A girl walks 200 towards East and the she walks 150m towards North then find the distance of the girl from the starting point.

**SECTION – B**

Questions 21 to 26 carry 2 marks each.

21. In an equilateral triangle ABC, AD is drawn perpendicular to BC meeting BC in D. Prove that \(AD^2 = 3BD^2\).
   OR
   Prove that the area of an equilateral triangle described on one side of a square is equal to half the area of the equilateral triangle described on one of its diagonals.

22. If the sides AB, BC and CA of \(\Delta ABC\) touch a circle at F, D and E respectively, then prove that \(AF + BD + CE = \frac{1}{2} \times \text{Perimeter of } \Delta ABC\).
23. From a point P on the ground the angle of elevation of the top of a 50 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff.

![Diagram of building and flagstaff](image)

24. Two dairy owners A and B sell flavoured milk filled to capacity in mugs of negligible thickness, which are cylindrical in shape with a raised hemispherical bottom. The mugs are 14 cm high and have diameter of 7 cm as shown in given figure. Both A and B sell flavoured milk at the rate of Rs. 80 per litre. The dairy owner A uses the formula \( \pi r^2h \) to find the volume of milk in the mug and charges Rs. 43.12 for it. The dairy owner B is of the view that the price of actual quantity of milk should be charged. What according to him should be the price of one mug of milk?

![Mug with hemispherical bottom](image)

25. For what value of \( n \), are the \( n \)th terms of two APs: 63, 65, 67, \ldots and 3, 10, 17, \ldots equal?

26. A card is drawn at random from a well shuffled deck of 52 cards. Find the probability of getting
   (i) neither a red card nor a queen (ii) not a black face card.

   **OR**

   Two different dice are tossed together. Find the probability:
   (i) of getting a doublet
   (ii) of getting a sum 10, of the numbers on the two dice.

   **SECTION – C**

   Questions 27 to 34 carry 3 marks each.

27. Show that exactly one of the numbers \( n \), \( n + 2 \) or \( n + 4 \) is divisible by 3.

   **OR**

   Use Euclid’s division lemma to show that the cube of any positive integer is of the form \( 9m \), \( 9m + 1 \) or \( 9m + 8 \).

28. Solve the following pair of linear equations:

   \[(a - b)x + (a + b)y = a^2 - 2ab - b^2\]
   \[(a + b)(x + y) = a^2 + b^2\]

   **OR**

   The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Find the number of students in the class.
29. Find all zeroes of the polynomial \((2x^4 - 9x^3 + 5x^2 + 3x - 1)\) if two of its zeroes are \((2 + \sqrt{3})\) and \((2 - \sqrt{3})\).

30. In a classroom, 4 friends are seated at the points A, B, C and D as shown in below figure. Champa and Chameli walk into the class and after observing for a few minutes Champa asks Chameli, “Don’t you think ABCD is a square?” Chameli disagrees. Chameli performed certain calculations and claimed that ABCD is a square. State how did she arrive at this conclusion.

31. Prove that \(\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = \frac{1}{\sec \theta - \tan \theta}\)

OR

If \(\sec \theta + \tan \theta = p\), then find the value of cosec \(\theta\).

32. The houses of a row are numbered consecutively from 1 to 49. Show that there is a value of \(x\) such that the sum of the numbers of the houses preceding the house numbered \(x\) is equal to the sum of the numbers of the houses following it. Find this value of \(x\).

33. In the given figure, \(\triangle ABC\) is right triangle in which \(\angle A = 90^0\). Semicircles are drawn on AB, AC and BC as diameters. Find the area of the shaded region.
34. Anil selected a project to prepare more than and less than ogive of the marks obtained by the 100 students in Mathematics Board Examination of the class. After collecting the data, he analyzed the data and prepared a report on the marks of the class. Using the report, he drew the following graph as given below:

Based on the above graph, answer the following questions:
(i) Identify less than type ogive and more than type ogive from the given graph.
(ii) Find the median marks of the class.
(iii) Obtain the Mode marks of the data if mean marks of the class is 57.5.

SECTION – D

Questions 35 to 40 carry 4 marks each.

35. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. Six seconds later, the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point.

36. A right triangle, whose sides are 3 cm and 4 cm (other than hypotenuse) is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. (Take π =3.14)

OR

A metallic right circular cone 20 cm high and whose vertical angle is 60° is cut into two parts at the middle of its height by a plane parallel to its base. If the frustum so obtained be drawn into a wire of diameter \(\frac{1}{16}\) cm, find the length of the wire.

37. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.
38. Two water taps together can fill a tank in $\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

**OR**

A train, travelling at a uniform speed for 360 km, would have taken 48 minutes less to travel the same distance if its speed were 5 km/h more. Find the original speed of the train.

39. Draw a triangle ABC with side BC = 7 cm, $\angle B = 45^0$, $A = \angle 105^0$. Then, construct a triangle whose sides are $\frac{7}{4}$ times the corresponding sides of $\Delta ABC$.

**OR**

Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points P and Q.

40. The following data indicates the marks of 54 students in Mathematics.

<table>
<thead>
<tr>
<th>Marks</th>
<th>0 – 10</th>
<th>10 – 20</th>
<th>20 – 30</th>
<th>30 – 40</th>
<th>40 – 50</th>
<th>50 – 60</th>
<th>60 – 70</th>
<th>70 – 80</th>
<th>80 – 90</th>
<th>90 – 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Students</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Draw more than type ogive for the data above and hence find the median.