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SAMPLE PAPER TEST 02 (2019-20) (ANSWERS)

SUBJECT: MATHEMATICS
MAX. MARKS : 80
CLASS : X
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 ratio between the LCM and HCF of 5, 15, 20 is:
   (a) 9 : 1  (b) 4 : 3  (c) 11 : 1  (d) 12 : 1
   Ans: (d)

2. HCF of $5^2 \times 3^2$ and $3^3 \times 5^3$ is:
   (a) $5^3 \times 3^3$  (b) $5 \times 3^3$  (c) $5^3 \times 3^2$  (d) $5^2 \times 3^2$
   Ans: (d)

3. A pair of linear equations which has a unique solution $x = 2, y = -3$ is
   (a) $x + y = -1; 2x - 3y = -5$  (b) $2x + 5y = -11; 4x + 10y = -22$
   (c) $2x - y = 1; 3x + 2y = 0$  (d) $x - 4y - 14 = 0; 5x - y - 13 = 0$
   Ans: (b)

4. If $\tan \theta = \cot (30^\circ + \theta)$, find the value of $\theta$.
   (a) $30^\circ$  (b) $45^\circ$  (c) $60^\circ$  (d) none of these
   Ans: (a)

5. If $\tan A = 5/12$, find the value of $(\sin A + \cos A) \cdot \sec A$.
   (a) $12/5$  (b) $17/12$  (c) $7/12$  (d) none of these
   Ans: (c)

6. If $\sin \theta = 1/3$, then find the value of $(2 \cot^2 \theta + 2)$
   (a) 5  (b) 12  (c) 9  (d) 18
   Ans: (d)

7. The upper limit of modal class of the data given below is

<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>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students</td>
<td>9</td>
<td>11</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

   (a) 10  (b) 20  (c) 30  (d) 40
   Ans: (b)

8. A circle drawn with origin as the centre passes through $(\frac{13}{2}, 0)$. The point which does not lie in the interior of the circle is
   (a) $(-\frac{3}{4}, 1)$  (b) $(2, \frac{7}{3})$  (c) $(5, -\frac{1}{2})$  (d) $(-6, \frac{5}{2})$
   Ans: (d)

Prepared by: M. S. KumarSwamy, TGT(Maths)
9. If the distance between the points (4, p) and (1, 0) is 5 units, then the value of p is 
   (a) 4 only  
   (b) ± 4  
   (c) −4 only  
   (d) 0  
   Ans: (b)  

10. AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0) and B(5, 0). The length of its 
    diagonal is 
    (a) 5  
    (b) 3  
    (c) \sqrt{34}  
    (d) 4  
    Ans: (c)  

11. 7th term of an AP is 40. The sum of its first 13th terms is 520.  

12. If the product of the zeroes of \( x^2 - 3kx + 2k^2 - 1 \) is 7, then values of k are 2 and -2. 
    OR  
    If the roots of the equation \( 12x^2 + mx + 5 = 0 \) are in the ratio 3 : 2, then m equals \( 5\sqrt{10} \).  

13. Two cylindrical cans have equal base areas. If one of the can is 15 cm high and other is 20 cm 
    high, then the ratio of their volumes is 3 : 4.  

14. Two coins are tossed simultaneously, then the probability of getting exactly one head is \( \frac{1}{2} \).  

15. \( \Delta ABC \sim \Delta PQR \). Area of \( \Delta ABC = 81 \text{ cm}^2 \) and area of \( \Delta PQR = 121 \text{ cm}^2 \). If altitude \( AD = 9 \text{ cm} \), 
    then PM = 11 cm.  

16. In the above right sided figure if \( \angle ATO = 40^\circ \), find \( \angle AOB \).  
    Ans: \( \angle AOB = 100^\circ \)  
    OR  
    From a point P, the length of the tangent to a circle is 15 cm and distance of P from the centre of 
    the circle is 17 cm. Then what is the radius of the circle?  
    Ans: radius = 8 cm  

17. If \( \frac{p}{q} \) is a rational number (q ≠ 0), what is condition of q so that the decimal representation of is 
    terminating?  
    Ans: For any rational number \( p/q \) with terminating decimal representation, the prime 
    factorisation of q is of the form \( 2^n.5^n \), where m and n are non-negative integers.  

18. The lengths of the diagonals of a rhombus are 30 cm and 40 cm. Find the side of the rhombus. 
    Ans: 25 cm  

19. If \( ax^2 + bx + c = 0 \) has equal roots, what is the value of c?  
    Ans: Since the quadratic equation has equal roots, then \( b^2 - 4ac = 0 \), then \( c = b^2/4a \)  

20. For what value of p, are 2p + 1, 13, 5p - 3 three consecutive terms of an AP? 
    Ans: If terms are in AP, then \( 13 - (2p + 1) = (5p - 3) - 13 \)  
    \( \Rightarrow 13 - 2p - 1 = 5p - 3 - 13 \)  
    \( \Rightarrow 28 = 7p \)  
    \( \Rightarrow p = 4 \)  

SECTION – B 
Questions 21 to 26 carry 2 marks each.  

21. O is any point inside a rectangle ABCD (see below left figure). Prove that OB^2 + OD^2 = OA^2 + 
    OC^2.
OR

In the above right sided figure, $ABC$ and $DBC$ are two triangles on the same base $BC$. If $AD$ intersects $BC$ at $O$, show that

$$\frac{ar(\triangle ABC)}{ar(\triangle DBC)} = \frac{AO}{DO}$$

(NCERT Exercise 6.4 Q3)

22. A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be (i) red ? (ii) green or white ?

Ans: (i) $\frac{5}{17}$ (ii) $\frac{12}{17}$

OR

Cards numbered 1, 2, 3, ..., 16 are put in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the card drawn bears (i) an even number (ii) a perfect square number.

Ans: (i) $\frac{8}{16} = \frac{1}{2}$ (ii) $\frac{4}{16} = \frac{1}{4}$

23. Mayank made a bird-bath for his garden in the shape of a cylinder with a hemispherical depression at one end (see the below figure). The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of the bird-bath.

NCERT Surface Areas and Volumes: Example 4 p-244

24. Rahul went to excursion along with his friends. He saw a tower stands vertically on the ground (see above right sided figure). He observes that from a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be $\theta$ such that $\cos \theta = 0.5$. Find the height of the tower.

Ans: $\cos \theta = 0.5 \Rightarrow \theta = 60^0$.  \[ \frac{\tan 60^0 = AB/BC}{\sqrt{3}} = \frac{AB}{15} \Rightarrow AB = 15\sqrt{3} \text{ m} \]

25. Find the 20th term from the last term of the AP : 4, 9, 14, . . ., 254.

Ans: 159
26. Prove that "The lengths of the two tangents from an external point to a circle are equal."

SECTION – C

Questions 27 to 34 carry 3 marks each.

27. Prove that $\sqrt{5}$ is an irrational number.
   (NCERT Exercise 1.3 Q1)

   OR

   Find HCF and LCM of 625, 1125 and 2125 using fundamental theorem of arithmetic.
   Ans: HCF = 125, LCM = 95625

28. In the given figure ABCD is a square of side 14 cm. Find the area of the shaded region.

   Ans: Area of shaded region = Area of square – Area of 4 circles = $a^2 - 4\pi r^2$
   = $196 - 4 \times \frac{22}{7} \times 3.5 \times 3.5 = 196 - 154 = 42$ cm$^2$

29. The Class X students of a secondary school in Krishinagar have been allotted a rectangular plot of land for their gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1m from each other. There is a triangular grassy lawn in the plot as shown in the above right sided figure. The students are to sow seeds of flowering plants on the remaining area of the plot. Taking A as origin, find the area of the triangle PQR.
   Ans: NCERT Coordinate Geometry Exercise 7.4 Q5 p-171

30. Prove that $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \cos ec A + \cot A$.
   (NCERT Exercise 8.4 Q5 (v) p-194)

   OR

   If $\tan (A + B) = \sqrt{3}$ and $\tan (A - B) = \frac{1}{\sqrt{3}}$; $0^\circ < A + B \leq 90^\circ$; $A > B$, find A and B.
   (NCERT Exercise 8.2 Q3)

31. If the sum of first seven terms of an AP is 49 and that of seventeen terms is 289. Find the sum of first n terms.
   Ans: $n^2$

32. If two zeroes of the polynomial $2x^4 - 3x^3 - 3x^2 + 6x - 2$ are $\sqrt{2}$ and $-\sqrt{2}$, find the other zeroes of the polynomial.
   Ans: $\frac{1}{2}, 1$  
   [$p(x) = (x^2 - 2)(2x^2 - 3x + 1)$]

33. Solve the following pair of linear equations: $152x - 378y = -74$ and $-378x + 152y = -604$
   (NCERT Exercise 3.7 Q7 (v))

   OR

   Draw the graphs of the equations $5x - y = 5$ and $3x - y = 3$. Determine the co-ordinates of the vertices of the triangle formed by these lines and the y axis.
   (NCERT Exercise 3.7 Q6)
34. The following data gives the information on the observed lifetimes (in hours) of 225 electrical components:

<table>
<thead>
<tr>
<th>Lifetimes (in hours)</th>
<th>0 – 20</th>
<th>20 – 40</th>
<th>40 – 60</th>
<th>60 – 80</th>
<th>80 – 100</th>
<th>100 – 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>10</td>
<td>35</td>
<td>52</td>
<td>61</td>
<td>38</td>
<td>29</td>
</tr>
</tbody>
</table>

Determine the modal lifetimes of the components. **Ans: Modal Lifetime = 65.625 hrs**

SECTION – D

Questions 35 to 40 carry 4 marks each.

35. A highway leads to the foot of 300 m high tower. An observatory is set at the top of the tower. It sees a car moving towards it at an angle of depression of 30°. After 15 seconds angle of depression becomes 60°. Find the distance travelled by the car during this time.

**Ans:** \(200\sqrt{3} \text{ m} = 200 \times 1.732 = 346.4 \text{ m}\)

36. A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

**Ans:** \(x^2 + 48x - 324 = 0 \Rightarrow x = 6 \text{ or } -54. \text{ Neglecting } x = -54 \text{ as speed is never negative we have } x = 6 \text{ km/hr}\)

OR

A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

**Ans:** \(x^2 + 5x - 1800 = 0 \Rightarrow x = 40 \text{ or } -45. \text{ Neglecting } x = -45 \text{ as speed is never negative we have } x = 40 \text{ km/hr}\)

37. Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

38. Construct a triangle of sides 5 cm, 6 cm, 7 cm and then a triangle similar to it whose sides are \(7/5\) of the corresponding sides of the first triangle, also write the steps of construction.

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.

39. A container, opened from the top and made up of a metal sheet, is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm, respectively. Find the cost of the milk which can completely fill the container, at the rate of Rs 20 per litre. Also find the cost of metal sheet used to make the container, if it costs Rs 8 per 100 cm\(^2\). (Take \(\pi = 3.14\))

**Ans:** Cost of milk = Rs. 209, Cost of metal sheet = Rs. 156.75

OR

Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed? (NCERT Exercise 13.3 Q8)

40. The following distribution gives the daily income of 50 workers of a factory.

<table>
<thead>
<tr>
<th>Daily income (in Rs)</th>
<th>100 – 120</th>
<th>120 – 140</th>
<th>140 – 160</th>
<th>160 – 180</th>
<th>180 – 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers</td>
<td>12</td>
<td>14</td>
<td>8</td>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

Convert the distribution above to a less than type cumulative frequency distribution, and draw its ogive.

**Ans:** Converting the frequency distribution table to less than cumulative frequency distribution

<table>
<thead>
<tr>
<th>Marks</th>
<th>No. of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than to 120</td>
<td>12</td>
</tr>
<tr>
<td>Less than to 140</td>
<td>26</td>
</tr>
<tr>
<td>Less than to 160</td>
<td>34</td>
</tr>
<tr>
<td>Less than to 180</td>
<td>40</td>
</tr>
<tr>
<td>Less than to 200</td>
<td>50</td>
</tr>
</tbody>
</table>

Choosing proper scale and then Plotting the points (120, 12), (140, 26), (160, 34), (180, 40), (200, 50)