HALF YEARLY MODEL QUESTION PAPER - 2022 - 2023.

10th STANDARD - PART - III – MATHEMATICS

Time Allowed: 3 Hours **Maximum Marks: 100**

Instructions: (1) Check the Question paper for fairness of printing. If there is any lack of fairness, inform the Hall supervisor immediately.
(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

Part I – Choose the Best Answer **14 X 1 = 14**

1. The range of the relation R = {(x, x2) | x is a prime number less than 13} is
   (1) {2, 3, 5, 7} (2) {2, 3, 5, 7, 11} (3) {4, 9, 25, 49, 121} (4) {1,4,9,25,49,121}
2. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
   (1) 2025 (2) 5220 (3) 5025 (4) 2520
3. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is
   (1) 3 (2) 5 (3) 8 (4) 11
4. A system of three linear equations in three variables is inconsistent if their planes
   (1) intersect only at a point (2) intersect in a line
   (3) coincides with each other (4) do not intersect
5. The solution of $(2x - 1)^2 = 9$ is equal to
   (1) -1 (2) 2 (3) $-1, 2$ (4) None of these
6. If the roots of the equation $q^2x^2 + p^2x + r^2 = 0$ are the squares of the roots of the equation $qx^2 + px + r = 0$, then q, p, r are in _____
   (1) A.P (2) G.P (3) Both A.P and G.P (4) none of these
7. The solution set of the equation $(x-3)^2 = 9$ is
   (1) {0, 3} (2) {3, 3} (3) {3, 6} (4) {0, 6}
8. Two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m, what is the distance between their tops?
   (1) 13 m (2) 14 m (3) 15 m (4) 12.8 m
9. The x-intercept of the line $3x - 2y + 12 = 0$ is
   (1) 6 (2) -6 (3) 4 (4) -4
10. when proving that a quadrilateral is a trapezium, it is necessary to show
    (1) Two sides are parallel. (2) Two parallel and two non-parallel sides.
    (3) Opposite sides are parallel. (4) All sides are of equal length.
11. A tower is 60 m height. Its shadow is x meters shorter when the sun's altitudeis 45° than when it has been 30°, then x is equal to
    (1) 41.92 m (2) 43.92 m (3) 43 m (4) 45.6 m
12. A shuttle cock used for playing badminton has the shape of the combination of
    (1) a cylinder and a sphere (2) a hemisphere and a cone
    (3) a sphere and a cone (4) frustum of a cone and a hemisphere

13. In a hollow cylinder, the sum of the external and internal radii is 14 cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is
(1) 5600 p cm^3 (2) 11200 p cm^3 (3) 56p cm^3 (4) 3600 p cm^3
14. In a family of 3 children, probability of having atleast one boy is
(1) 1/3 (2) 7/8 (3) 3/8 (4) ½

Part II – 2 Marks – Qn No 28 is Compulsory **10 X 2 = 20**

15. If B × A = {(– 2, 3), (– 2, 4), (0, 3), (0, 4), (3, 3), (3, 4)} find A and B
16. If 3 + k, 18 − k, 5k + 1 are in A.P. then find k.
17. Find the square $4x^2 + 20x + 25$
18. Determine the nature of the roots for the quadratic equations 15x2 + 11x + 2 = 0
19. Find 'k' if the following equations have real & equal roots. $2x^2 - 10x + k = 0$
20. What length of ladder is needed to reach a height of 7 ft along the wall when the base of the ladder is 4 ft from the wall? Round off your answer to the next tenth place.
21. A man goes 18 m due east and then 24 m due north. Find the distance of his current position from the starting point?
22. If the three points (3, –1), (a, 3) and (1, –3) are collinear, find the value of a.
23. Find the equation of a straight line passing through (5, –3) and (7, – 4).
24. Find the angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of a tower of height 10 √3 m.
25. The radius of a spherical balloon increases from 12 cm to 16 cm as air being pumped into it. Find the ratio of the surface area of the balloons in the two cases
26. If the ratio of radii of two spheres is 4 : 7, find the ratio of their volumes.
27. What is the probability that a leap year selected at random will contain 53 saturdays.
28. Find the least number that is divisible by the first ten natural numbers

Part III – 5 Marks – Qn No 42 is Compulsory **10 X 5 = 50**

29. If A = {5, 6}, B = {4, 5, 6}, C = {5, 6, 7}. Show that A × A = (B × B) ∩ (C × C).
30. Use Euclid's Division Algorithm to find the Highest Common Factor (HCF) of 867 and 255
31. The sum of three consecutive terms that are in A.P. is 27 and their product is 288. Find the three terms.
32. Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$
33. Solve $x^2 - 3x - 2 = 0$
34. If a, b are real then show that the roots of the equation
$(a - b)\,x^2 - 6\,(a + b)\,x - 9\,(a - b) = 0$ are real and unequal
35. ABCD is a trapezium in which AB || DC and P,Q are points on AD and BC respectively, such that PQ || DC if PD = 18 cm, BQ = 35 cm and QC = 15 cm, find AD.

36. Show that in a triangle, the medians are concurrent
37. If the points A(-3, 9) , B (a, b) and C(4,-5) are collinear and if a + b = 1 , then find a and b.
38. From the top of a tower 50 m high, the angles of depression of the top and bottom of a tree are observed to be 30° and 45° respectively. Find the height of the tree. ($\sqrt{3}$ = 1.732)
39. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum
40. A vessel is in the form of a hemispherical bowl mounted by a hollow cylinder. The diameter is 14 cm and the height of the vessel is 13 cm. Find the capacity of the vessel.
41. Two dice are numbered 1,2,3,4,5,6 and 1,1,2,2,3,3 respectively. They are rolled and the sum of the numbers on them is noted. Find the probability of getting each sum from 2 to 9 separately.
42. If the points A (2, 2), B (–2, –3), C (1, –3) and D (x, y) form a parallelogram then find the value of x and y.

Part IV – 8 Marks – All Questions are Compulsory **2 X 8 = 16**

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to 2 / 3 of the corresponding sides of the triangle PQR (scale factor 2 / 3). (or)
    b) Draw a tangent at any point R on the circle of radius 3.4 cm and centre at P?
44. a) Discuss the nature of solutions of the quadratic equations. $x^2 + 2x + 5 = 0$ (or)
    b) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve $x^2 + 3x - 4 = 0$