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Time :2 hrs Class X

Mathematics

M.M. 100

1. Write a rational expression whose numerator is a quadratic polynomial with zeros 2 and -1 and whose denominator is a quadratic polynomial with zeros $\frac{1}{2}$ and 3. (4)
2. Which term of the AP: 3,15,27,39..... will be 132 more than its 54th term. (4)
3. For what value of k is the H.C.F of $x^2 + x - (2k + 2)$ and $2x^2 + kx - 12$ is $x + 4$? (4)
4. Solve the following system of equations: (4)
$$\frac{x+1}{2} + \frac{y-1}{3} = 8 \text{ and } \frac{x-1}{3} + \frac{y+1}{2} = 9$$
5. Solve : $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0$ (4)
6. Find the sum of the first n natural numbers. (5)
7. D is a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$. Prove that $\frac{CA}{CD} = \frac{CB}{CA}$ (5)
8. The circle passing through the vertices A, B and C of a parallelogram ABCD intersects side CD at the point P. Prove that $AP = AD$. [3] (5)
9. Show, graphically that the following system of equations had no solutions: (5)
 $2x + 3y - 1 = 0$ and $x + \frac{3}{2}y - 2 = 0$.
10. If $S = \frac{n(n+1)}{2}$, Find n, if $S = 276$. (5)
11. A petrol tank is a cylinder of base diameter 21 cm and length 18 cm fitted with conical ends each of axis-length 9 cm. Determine the capacity of the tank. (5)
12. Prove: $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} + \frac{\sin \theta - \cos \theta}{\sin \theta + \cos \theta} = \frac{2}{1 - 2\cos^2 \theta} = \frac{2}{2\sin^2 \theta - 1}$ (5)
13. Construct a quadrilateral similar to a given quadrilateral ABCD in which $AB = 6.3$ cm, $BC = 5.2$ cm, $CD = 5.6$ cm, $DA = 7.1$ cm and angle B = 60° , whose sides are $\frac{4}{5}$ th of the corresponding sides of ABCD. (5)
14. If the vertices A, B and C of the triangle ABC be (x_1, y_1) , (x_2, y_2) and (x_3, y_3) respectively. Prove that the coordinates of centroid be $(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3})$ (5)
15. The length of a line-segment is 10. If one end at (2, -3) and the abscissa of the second end is 10, show that its ordinate is either 3 or -9. (5)
16. The mean of the following frequency table is 50, but the frequencies f_1 and f_2 in classes 20 – 40 and 60 – 80 respectively are not known. Find these frequencies. (5)
Class: 0-20 20-40 40-60 60-80 80-100 Total
Fre(f): 17 f_1 32 f_2 19 120



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17. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball, find the number of blue balls in the bag. (5)
18. Prove, there is one and only one circle passing through three non-collinear point. Two chords AB and CD of lengths 5 cm and 11 cm respectively of a circle are parallel to each other and are on the same side of its centre. If the distance between AB and CD is 3 cm, find the radius of the circle. (5)
19. As observed from the light house, 100 m high above sea level, the angle of depression of a ship, sailing directly towards it, changes from 30° to 45° . Determine the distance traveled by the ship during the period of observation. (5)
20. Water in a canal, 30 dm wide and 12 dm deep is flowing with velocity of 10 km per hour. How much area will it irrigate in 30 min., if 8 cm of standing water is required. (5)
21. Prove, if two circles touch other internally, the point of contact lies on the line joining their centre. (5)

AB is a line-segment and M is its mid-point. Semicircles are drawn with AM, MB and AB as diameters on the same side of the line AB. A circle is drawn to touch all the three semicircles. Prove that its radius r is given by $r = \frac{1}{6} AB$.