Mathematics
Class-X

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.

2. Which term of the AP: 3,15,27,39….. will be 132 more than its 54th term.

2. For what value of k is the H.C.F of $x^2 + x – (2k + 2)$ and $2x^2 + kx – 12$, $x + 4$?

3. Solve the following system of equations:

4. $\quad \frac{x+1}{2} + \frac{y-1}{3} = 8$ and $\frac{x-1}{3} + \frac{y+1}{2} = 9$

5. Solve : $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0$

6. Find the sum of the first n natural numbers.

7. A washing machine is available at Rs 6400 cash or for Rs 1400 cash down payment and five monthly instalments of Rs 1030 each. Calculate the rate of interest charged.

8. A T.V set is available for Rs 19650 cash payment or for Rs 3100 cash down payment and three equal annual instalments. If the shopkeeper charges interest at the rate of 10% p.a. compounded annually, calculate the amount of each instalments.

9. D is a point on the side BC of a tangle ABC such that $\angle ADC = \angle BAC$. Prove that $\frac{CA}{CD} = \frac{CB}{CA}$.

10. 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]

11. Show, graphically that the following system of equations had no solutions:

    $2x + 3y – 1 = 0$ and $x + \frac{3}{2}y - 2 = 0$.

12. If $S = \frac{n(n+1)}{2}$, Find n, if S = 276.

13. 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.

14. Prove: $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} + \frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta} = \frac{2}{1-2\cos^2\theta} = \frac{2}{2\sin^2\theta-1}$

15. 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 = 60º, whose side are $\frac{4}{5}$ th of the corresponding sides of ABCD.

16. 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 $(\frac{x_1+x_2+x_3}{3},$

    $\frac{y_1+y_2+y_3}{3})$.

17. 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.

18. 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 know. Find these frequencies.

Class: 0-20 20-40 40-60 60-80 80-00   Total
Fre(f): 17 f_1 32 f_2 19   120

19. The percentages of various categories of workers in a state are given in the following table. Present the information in the form of pie chart.

Category of Workers : Cultivators Agricultural-laborers Workers Comm. Workers
              Frequency: 40   25   12.5   19
                          Others
                            120

20. A bag contains 5 red glass and some blue balls. If the probability of drawing a blue ball is double that of a red ball, find the number of blue alls in the bag.

21. 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.

22. 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.

23. 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.

24. Prove, if two circles touch other internally, the point of contant lies on the lies on the line joining their centre.

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

25. Anil's salary is Rs 50000 per month. He contributes Rs 3000 per month towards PF and pays Rs 15000 as annual LIC premium. He invests Rs 14000 in NSC'S. He contributes Rs 8000 towards P.M'S National Relief Fund and also donates Rs 5000 to the school where he studied, earning deduction of 100% and 50% on the year. Use the following for calculating income tax:

1.(a) for men (Below 65 years)

     Taxable income   Rate
     (i) Upto Rs 100000   NIL
     (ii) Rs 100001 to 150000   10% of the exceeding Rs 100000
     (iii) Rs 150001 to Rs 250000 Rs 5000 + 20% of the amount exceeding Rs 150000

(iv) Exceeding Rs 250000   Rs 25000 + 30% of the amount exceeding Rs 250000

(b) For women (Below 65 years)

Taxable income	Rate
(i) Upto Rs 135000	NIL
(ii) Rs 135001 to Rs 250000	10% of the amount exceeding Rs 135000
(iii) Rs 150001 to Rs 250000	Rs 1500 + 20% of the amount exceeding Rs 150000
(iv) Exceeding Rs 250000	Rs 21500 + 30% of the exceeding Rs 250000.

2. Surcharge: 10% of the amount of tax payable if the taxable income exceeds Rs 1000000.

3. Educational cess : 2% of the amount of tax payable.

4. concession for saving : Notified saving (PF, LIC, PF, PPF etc). Upto a maximum of Rs 100000 are exempted from payments of income tax.