Total Number of Questions : 48

Time : 3.00 Hours

Max. Marks : 200

1. Find the quotient q and the remainder r when −123 is divided by 15. (3 Marks)

2. Find the polynomial when divided by x − 3 leaves quotient $x^2 + 4x − 3$ and remainder 93. (3 Marks)

3. Find roots of the quadratic equation in which the sum of the roots is −9 and the product of the roots is 20. (3 Marks)

4. Determine whether the order pair (−5, 3) is a solution to the system. (3 Marks)

   $2x − y = −13$

   $x + 6y = 20$

5. Find $\sqrt[3]{13824}$. (3 Marks)

6. The government revised the taxi fare in the following way :

   For first kilometer of traveling the fare is ₹ 18 and for each additional kilometer is ₹ 9. If a person wants to travel 100 kilometers, what is the total fare that the person has to give to the taxi ? (3 Marks)

7. A provisional merchant purchase 250 dozen apples at the rate of ₹ 54 per dozen. While transporting the apples, 56 dozen apples become rotten and not able to sell. If the merchant wishes to get a profit of ₹ 1,050, then at what rate per dozen should the merchant sell the apples ? (3 Marks)

8. A businessman has ₹ 67.5 with him and he has two siblings x and y of ages 16 and 11 respectively. If he wants to divide his money in the ratio of ages of his siblings, how much x and y will get ? (3 Marks)

9. To make a dish, one needs two parts of rice, one part of urad dal, two parts of beans and one part of chana dal. What percentage of rice and chana dal is needed in such a mixture ? (3 Marks)

10. Calculate the simple interest and amount on ₹ 750 at the rate of 3% for 6 years. (3 Marks)

11. Find the arithmetic mean of the following frequency distribution : (3 Marks)

x :	2	4	6	8	10	12	14
f :	10	15	20	5	23	15	12

12. A company's annual net profit is ₹ 60,000. Shareholders' required rate of return is 8%. It is expected that retained earnings, if distributed among the shareholders can be invested by them in securities of similar type carrying return of 8% p.a. Shareholders also have to incur by way of brokerage and commission is 4% of the net dividend received by them. Rate of tax is 30%. Calculate the cost of retained earnings. (3 Marks)

13. Find the area of the shaded region as given in the following figure. (3 Marks)


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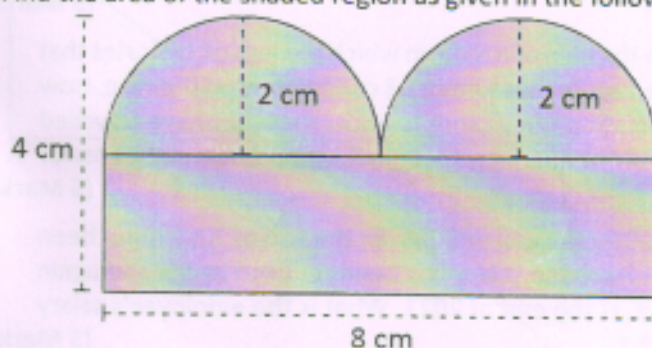
14. Find the measure of each angle in the triangle $\triangle ABC$ where $\angle A = (10a + 6)^\circ$, $\angle B = (10a - 6)^\circ$ and $\angle C = (10a)^\circ$. (3 Marks)

15. Find the volume of solid obtained by revoling the region bounded by the curves $y = x^4$, $y = 10$ and $x = 0$ about y-axis. (3 Marks)

16. A person 'X' is standing outside next to a flagpole. The sun casts a 5 feet shadow of 'X' and a 10 feet shadow of the flagpole. If 'X' is 6 feet tall, how tall is the flagpole ? (3 Marks)

17. If $\cos\theta = \dfrac{2xy}{x^2 + y^2}$, then find the values of $\sin\theta$ and $\tan\theta$. (3 Marks)

18. A line is of length 5 of which one end is at the point (2, 1). If the abscissa of the other end is 5, then what are the possible ordinates ? (3 Marks)

19. At t seconds after liftoff, the height of the rocket is $9t^2$ feet. How fast is the rocket climbing 20 seconds after liftoff ? (3 Marks)

20. For all sets A, B, C is it true that $(A \cap B) \cup C = A \cap (B \cup C)$. Justify your answer. (3 Marks)

21. Show that $\sqrt{5}$ is irrational. (5 Marks)

22. Find all positive integers p such that $p^2 + 1$ is divisible by $p + 1$. (5 Marks)

23. Find that polynomial in x of the third degree which vanishes when $x = 5$ and $x = -9$ and takes the values -280 and 48 when $x = 1$ and $x = -3$ respectively. (5 Marks)

24. Find roots of the quadratic equation $x^2 - 8x + 12 = 0$. (5 Marks)

25. Solve the following system of linear equations using graphical method. (5 Marks)

$$\begin{cases} 2x + y = 9 \\ 5x - y = 19 \end{cases}$$

26. A sports field in which its length is the 5 times its breadth having area 3125 m². Find the perimeter of this sports field. (5 Marks)

27. The sum of first 28 terms of an AP starting with 20 is 6230. Find the sum of the terms from 20 to 50 of this AP. (5 Marks)

28. A merchant purchase 115 units of an item at ₹ 555 per unit. He sells 39 units of this item at the rate of ₹ 595 and another 34 units at the rate of ₹ 573 and remaining items he sell at the rate of ₹ 600 per item. What is the total profit that this merchant gained while selling this item ? (5 Marks)

29. The price of a laptop is ₹ 40,000. The seller earns a 25% of profit after giving a 15% discount. What is the cost of this laptop ? (5 Marks)

30. Mr. X and Y started walking through a forest with the help of a map, in which the legend indicates that 1.3 centimeters represent 2.6 kilometers and their route measures 11.3 centimeters on the map. How long is their route ? But after reaching the destination, they came to know that they have travelled 33 kilometers, in that case what will be the measure of their new route in the map ? Round the answer to one decimal place. (5 Marks)

31. An employee of a company has a salary of ₹ 1,000 by the end of 2018. By the end of 2019 it has been increased by 15%. Due to Corona, at the end of 2020 the salary has been reduced by 5% and again due to corona, the salary is again reduced by 5% at the end of 2021. What is the employee's salary (round to one decimal place) at the end of 2021 ? (5 Marks)

32. Production of rice by a country in 2020 is increased by 15% and increased again by 20% in 2021. Calculate the single increase of the production. (5 Marks)

33. Find the compound interest on ₹ 50 at 2% per annum for 2 years. Also find the amount. (5 Marks)

34. A certain principal is trippled in 2 years. What is the rate of compound interest ? (5 Marks)

35. The average salary of female employees of a firm is 1100 and that of male employees is 800. The average salary of all employees is 1000. Find the percentage of male and female employees. (5 Marks)

36. Construct less than cumulative frequency table and draw the Ogive for the data given below. (5 Marks)

Marks	1 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Students	2	6	18	26	8

37. A Company's share is currently quoted in market at ₹ 75 with an expected dividend is ₹ 5 per share and investors expect a growth rate of 8% per year. Calculate : (5 Marks)

    a) The company's cost of equity capital.

    b) The indicated market price per share, if anticipated growth rate is 10%.

    c) The market price, if the company's cost of equity capital is 10%, anticipated growth rate is 6% per year and dividend of ₹ 2 per share is to be maintained.

38. Government has two playgrounds of circular shape having diameters 60 m and 80 m. The government plans to have a circular playground whose area is the sum of the areas of the two playgrounds. Help the government by finding the diameter and area of the new playground is to be built. (5 Marks)

39. Check whether the equation $x^2 + y^2 - 6x - 2y - 30 = 0$ represents the circle whose diameter is the intercept with the circle $x^2 + y^2 - 50 = 0$ makes with $3x + y - 10 = 0$. (5 Marks)

40. Find the area of the sector and segment of a circle given that r = 20 centimeter and $\theta = \frac{\pi}{4}$. (5 Marks)

41. The lengths of the sides of a cyclic quadrilateral form an arithmetic sequence with the common difference 1. Its area is 3. Find the length of each side. (5 Marks)

42. What will be the surface area of a sphere of radius 5 cm ? (5 Marks)

43. Consider the following figure where AB ⊥ BD and BD ⊥ DE and AC = DE. What is the relationship between the segments BC and BE ? (5 Marks)
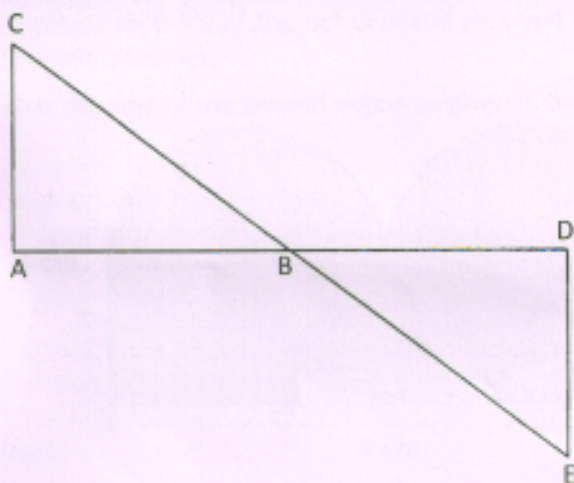
44. From the top of a mountain of 600 feet height, the angles of depression of the top and bottom of a clock tower are observed to be 30° and 60° each. What will be the height of that clock tower ?   **(5 Marks)**

45. Find the co-ordinates of the point which divides, internally and externally, the line joining (1, 2) to (6, 8) in the ratio 3 : 5. Also find the equation of the line joining (1, 2) to (6, 8).   **(5 Marks)**

46. Mr. X drives 67.5 km from work at speed of 50 km/hr and Mrs. X drives 84 km from her work place at a speed of 60 km/hr. If they both leave their respective work place at the same time, determine who will arrive the home first and how many minutes later the second person reach the home ?   **(5 Marks)**

47. Among the three persons A, B, C, it is seen that A and B can do a piece of work in 9 days, B and C can do it in 12 days and C and A can finish it in 18 days. If A, B, C works together, in how many days will they finish the work ? In how many days will each one of them finish it, working alone ?   **(5 Marks)**

48. Using the set theoretic properties, prove that for all sets A, B $A - (A \cap B) = A - B$.   **(5 Marks)**