hours, only half the pool can be filled. How long would it take for each pipe to fill the pool separately?

27. A ladder rests against a vertical wall at an inclination α to the horizontal. Its foot is pulled away from the wall through a distance p so that its upper end slides a distance q down the wall and then the ladder makes an angle β to the horizontal. Show that: $\dfrac{p}{q} = \dfrac{\cos\beta - \cos\alpha}{\sin\alpha - \sin\beta}$

28. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

    Using the above result, prove the following:

    ABCD is a trapezium with AB ∥ DC. E and F are points on sides AD and BC respectively such that EF ∥ AB. Prove that: $\dfrac{AE}{ED} = \dfrac{BF}{FC}$.

    <div align="center">Or</div>

    Prove that in a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.
    Making use of the above, prove the following:
    In a rhombus ABCD, $4\,AB^2 = AC^2 + BD^2$.

29. A pen stand made of wood is in the shape of a cuboid with four conical depressions and a cubical depression to hold the pens and pins, respectively. The dimensions of the cuboid are 10 cm, 5 cm and 4 cm. The radius of each of the conical depressions is 0.5 cm and the depth is 2.1 cm. The edge of the cubical depression is 3 cm. Find the volume of the wood in the entire stand.

    <div align="center">Or</div>

    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?

30. The mean of the following frequency distribution is 50, but the frequencies f_1 and f_2 in classes 20-40 and 60-80, respectively are not known. Find these frequencies if the sum of all the frequencies is 120.

Class	0-20	20-40	40-60	60-80	80-100
Frequency	17	f_1	32	f_2	19

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Mathematics
(Sample Paper - II)

Time: 3 hours   **Max Marks: 80**

Section - A
(1 mark questions)

1. The HCF of two numbers is 5 and their LCM is 1750. If one of the numbers is 35, find the other.

2. If –3 is one of the zeroes of the quadratic polynomial $(k-1)x^2 + kx + 1$, then what is the value of k?

3. If two of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ are 0, then find the third zero of the polynomial.

4. If D be the discriminant of a quadratic equation with real coefficients, what is the condition for both roots to be real and unequal?

5. What will be the diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 24 cm and 7 cm?

6. In adjoining figure, CD is tangent to the circle at Q. If PB = 8 cm and CQ = 2.5 cm, find the length of CP.
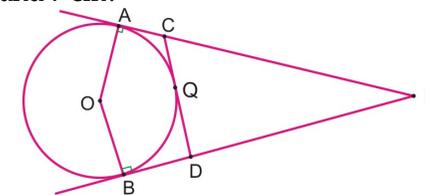
7. Which measure of central tendency is given by the abscissa of the point of intersection of the less than type and of the more than type cumulative frequency curves of a grouped data?

8. If a pair of dies is thrown once, what is the probability of getting the same number on both the dies?

9. In adjoining figure, AB is a chord of the circle and AOC is its diameter such that ∠ACB = 50°. If AT is the tangent to the circle at the point A, then what is the value of ∠BAT?
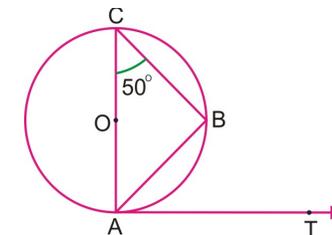
10. Find the angle of elevation of the sun when the shadow of a pole, *h* metres high is √3 h metres long.

Section - B
(2 marks questions)

11. Find the 12th term from the end of the AP: −2, −4, −6,..., −100.

12. If $\sin \theta + \cos \theta = \sqrt{3}$, then prove that $\tan \theta + \cot \theta = 1$

Or

Show that: $\dfrac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta)\tan(30^\circ - \theta)} = 1.$

13. In adjoining figure, if ∠ACB = ∠CDA, AC = 8 cm and AD = 3 cm, find BD.
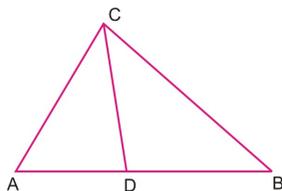
14. Find the area of the triangle ABC with A (1, −4) and the mid-points of sides through A being (2, − 1) and (0, − 1).

15. Box A contains 25 slips of which 19 are marked Re 1 and other are marked Rs 5 each. Box B contains 50 slips of which 45 are marked Re 1 each and others are marked Rs 13 each. Slips of both boxes are poured into a third box and reshuffled. A slip is drawn at random. What is the probability that it is marked other than Re 1?

Section - C
(3 marks questions)

16. Find all the zeroes of the polynomial x⁴ + x³ − 9 x² − 3 x + 18 if it is given that two of its zeroes are √3 and -√3.

17. A circular field has a circumference of 360 km. Three cyclists start together and can cycle 60 km, 72 km and 90 km a day, around the field. After how many days will they meet again at the starting point?

18. For which values of *a* and *b*, will the following pair of linear equations have infinitely many solutions?

    4x + 5y = 2

    (2*a* + 7*b*)x + (*a* + 8*b*)y = 2*b* − *a* + 1.

Or

A shopkeeper gives books on rent for reading. She takes a fixed charge for the first two days and an additional charge for each day thereafter. Latika paid Rs 22 for a book kept for six days, while Anand paid Rs 16 for the book kept for four days. Express this situation in form of linear equations and use elimination method to find the fixed charges and the charge for each extra day.

19. Solve the equation (find x): 1 + 4 + 7 + 10 + …… + x = 287

Or

390 plants are planted in a garden in a number of rows. There are 40 plants in the first row, 38 plants in the second row, 36 plants in the third row and so on. Each next row has two plants less than those in the previous row. In how many rows the 390 plants are planted? Also find the number of plants in the last row.

20. Prove that: $\dfrac{1 + \sec\theta - \tan\theta}{1 + \sec\theta + \tan\theta} = \dfrac{1 - \sin\theta}{\cos\theta}.$

21. Find the coordinates of the points which divide the line segment joining A(−2, 2) and B(2, 8) into four equal parts.

Or

The centre of a circle is (2a, a − 7). Find the values of *a* if the circle passes through the point (11, −9) and has diameter 10√2 units.

22. In figure, ABCD is a parallelogram. E is a point on the side AD such that AE $= \dfrac{3}{5}$ AD. Find the coordinates of the point E.
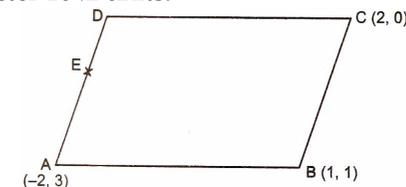
23. Draw a circle of radius 4 cm. Construct a pair of tangents to it, the angle between which is 60°. Also justify the construction.

24. If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that:

    AQ = ½(BC + CA + AB).
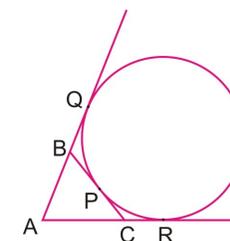
25. A calf is tied with a rope of length 6 m at the corner of a square grassy lawn of side 20 m. If the length of the rope is increased by 5.5m, find the increase in area of the grassy lawn in which the calf can graze.

Section - D
(6 marks questions)

26. It takes 12 hours to fill a swimming pool using two pipes. If the pipe of larger diameter is used for 4 hours and the pipe of smaller diameter for 9