km, some defect develops in the engine of the train and for this reason, its speed is reduced to $\frac{4}{5}$ of its original speed. The train reaches its destination late by 45 minutes. In case the defect had happened after covering 18 km more, the train would have reached just 36 minutes late. Find the speed of the train at the start and the total distance of the journey.

28. At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $\frac{5}{12}$. On walking 192 metres towards the tower, the tangent of the angle of elevation is $\frac{3}{4}$. Find the height of the tower.

29. 16 glass spheres each of radius 2 cm each are packed into a cuboidal box of internal dimensions 16 cm × 8 cm × 8 cm and then the box is filled with water. Find the volume of water filled in the box.

Or

A metallic right circular cone 20 cm high and whose vertical angle is 60° is cut into two parts at the middle of its height by a plane parallel to its base. If the frustum so obtained be drawn into a wire of diameter $\frac{1}{16}$ cm, find the length of the wire.

30. The following table shows the marks of 85 students of a class X in a school. Find the modal marks of the distribution.

Marks	No. of Students
Below 10	5
Below 20	9
Below 30	17
Below 40	29
Below 50	45

Marks	No. of Students
Below 60	60
Below 70	70
Below 80	78
Below 90	83
Below 100	85

Or

The maximum bowling speeds, in km per hour, of 33 players at a cricket coaching centre are given as follows. Calculate the median bowling speed.

Speed (km/h)	85-100	100-115	115-130	130-145
Number of players	11	9	8	5

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Strong Foundation for a bright future

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Mathematics

(Sample Paper - VI)

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

Section - A

(1 mark questions)

1. Write 315 as product of its prime factors.

2. The sum and product of the zeroes of a quadratic polynomial are $\sqrt{2}$ and $\frac{1}{3}$ repectively. What is the quadratic polynomial?

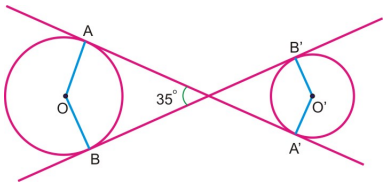
3. How many solutions does the pair of equations x + 2y + 5 = 0 and –3x – 6y + 1 = 0 has?

4. What is the value of (tan1° tan2° tan3° ... tan89°)?

5. If sin θ – cos θ = 0, then what is the value of ($\sin^4\theta + \cos^4\theta$)?

6. Area of a sector of a circle of radius 36 cm is 54 π cm^2. What is the length of the corresponding arc of the sector?

7. In the given figure, AA′ and BB′ are two common tangents of the two circles having their centres at O and O′. What is the value of ∠AOB + ∠A′O′B′.



8. A tower stands vertically on the ground. From a point on the ground which is 30 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 30°. How high is the tower?

9. The probability of getting a bad egg in a lot of 400 is 0.035. How many bad eggs are there in the lot?

10. For a data, the point of intersection of the 'more than' ogive and 'less than' ogive is (x = 37.3, y = 40). The cummulative frequencies are represented along the y-axis. Write the median of the data and the total frequency of the data.

Section - B

(2 marks questions)

11. Find a, b and c such that the following numbers are in AP: a, 7, b, 23, c.

12. A lot consists of 48 mobile phones of which 42 are good, 3 have only minor defects and 3 have major defects. Vinay will buy a phone if it is good but Rahul will only buy a mobile if it has no major defect. One phone is selected at random from the lot. What is the probability that it is
(i) acceptable to Vinay?
(ii) acceptable to Rahul?

13. Determine the values of a and b for which the following system of linear equations has infinitely many solutions: $3x - (a + 1)y = 2$; $5x + (1 - 2a)y - 3b = 0$.

14. Find the value of m if the points (5, 1), (–2, –3) and (8, $2m$) are collinear.

15. Check whether $x^2 + 3x + 1$ is a factor of $3x^4 + 5x^3 - 7x^2 + 2x + 2$.

Or

If the sum of the squares of zeroes of the polynomial $5x^2 + 3x + k$ is $-\frac{11}{25}$, find the value of k.

Section - C

(3 marks questions)

16. Show using the method of completing the square that the equation $4x^2 + 3x + 5 = 0$ has no real roots.

17. Radius of a circular track is 63 m. Two cyclists Madhav and Himanshu start together from the same position, at the same time and in the same direction with speeds 33 m/min and 44 m/min. After how many minutes they meet again at the starting point?

18. A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

19. Two line segments AB and AC include an angle of 60° where AB = 5 cm and AC = 7 cm. Locate points P and Q on AB and AC, respectively such that $AP = \frac{3}{4}$ AB and $AQ = \frac{1}{4}$ AC. Join P and Q and measure the length PQ.

20. Prove that: $(1 + \cot A + \tan A)(\sin A - \cos A) = \sin A \tan A - \cot A \cos A$.

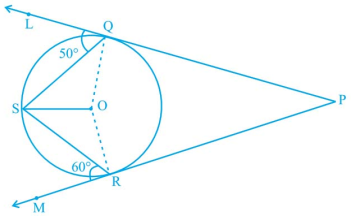
Or

In acute ΔABC, $\tan(A + B - C) = 1$ and $\sec(B + C - A) = 2$. Find the angles A, B and C of the ΔABC.

21. A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.

Or

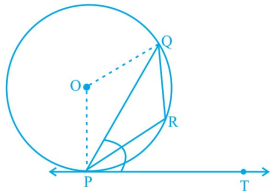
In the given Fig., PQL and PRM are tangents to the circle with centre O at the points Q and R, respectively and S is a point on the circle such that $\angle SQL = 50°$ and $\angle SRM = 60°$. Then find $\angle QSR$.



22. The line segment joining the points A(2, 1) and B(5, -8) is trisected at the points P and Q such that P is nearer to A. If P also lies on the line given by $2x - y + k = 0$, find the value of k.

23. Prove that the points A(-3, 0), B(1, -3) and C(4, 1) are the vertices of an isoscles right triangle.

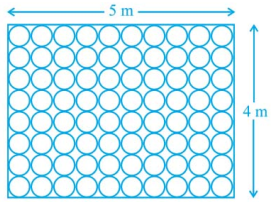
24. In the given Fig., PQ is a chord of a circle and PT is the tangent at P such that $\angle QPT = 60°$. Then find $\angle PRQ$.



25. The length of the minute hand of a clock is 5 cm. Find the area swept by the minute hand during the time period 6 : 05 AM and 6 : 40 AM.

Or

Floor of a room is of dimensions 5 m × 4 m and it is covered with circular tiles of diameters 50 cm each as shown in Fig. Find the area of floor that remains uncovered with tiles. (Use $\pi = 3.14$)



Section - D

(6 marks questions)

26. Prove that if in a triangle square on one side is equal to the sum of the squares on the other two sides, then the angle opposite the first side is a right angle.
A 5 m long ladder is placed leaning towards a vertical wall such that it reaches the wall at a point 4 m high. If the foot of the ladder is moved 1.6 m towards the wall, then find the distance by which the top of the ladder would slide upwards on the wall.

27. A train was moving with a uniform speed. After covering a distance of 30