Time: 3 Hours **MATHS TEST 2** **Max. Marks: 80**

General Instructions:

(1) *All questions are compulsory.*

(2) *The Question Paper consists of thirty questions divided into 4 Sections A, B, C and D. Section A comprises of ten questions of 1 mark each, Section B comprises of five questions of 2 marks each, Section C comprises of ten questions of 3 marks each and Section D comprises of five question of 6 marks each.*

(3) *All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.*

(4) *There is no overall choice. However, internal choice has been provided in one question of 2 marks each, three questions of 3 marks each and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.*

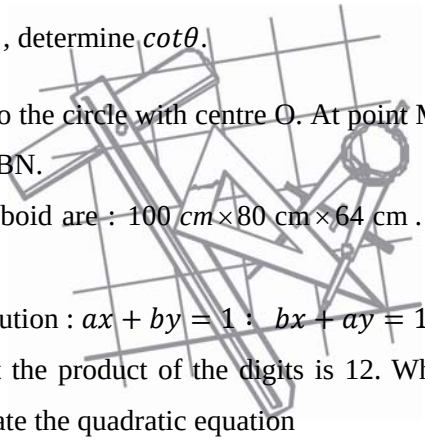
(5) *In question on construction, drawings should be neat and exactly as per the given measurements.*

(6) *Use of calculators is not permitted. However, you may ask for mathematical tables.*

SECTION A

1. In the trapezium ABCD, AB || CD & diagonals meets at O and AB = 2 CD. If area of ΔAOB = 84 cm^2, find the area of ΔCOD.

2. If $\sin\theta + \cos\theta = \sqrt{2}\cos(90^0 - \theta)$, determine $cot\theta$.



3. PA and PB are tangents from P to the circle with centre O. At point M, a tangent is drawn cutting PA at K and PB at N. Prove that KN = AK + BN.

4. The dimensions of a metallic cuboid are : $100\ cm \times 80\ cm \times 64\ cm$. It is melted and recast into a cube. Find the surface area of the cube.

5. Find the condition for unique solution : $ax + by = 1 : \ bx + ay = 1 + c$

6. A two digit number is such that the product of the digits is 12. When 36 is added to the number the digits interchange their places. Formulate the quadratic equation

7. Let ABCD be a square of side 2a. Find the coordinates of the vertices of this square when A coincides with the origin and AB and AD are along OX and OY respectively.

8. A jar contains 24 marbles some are green are others are blue. If a marble is drawn at random from the jar, the probability that it is green is $\frac{2}{3}$. Find the number of blue marbles in the jar

9. What can you say about the prime factorizations of the denominators of: $43.\overline{123456789}$

10. What is the probability that a leap year has 52 Mondays?

SECTION B

11. A lot of 20 bulbs contain 4 defective ones. One bulb is drawn at random from the lot. Suppose the bulb drawn in is not defective and is not replaced. Now one bulb is drawn at random from the rest. What is the probability that this bulb is not defective?

12. Show that the quadrilateral whose vertices are (2, -1), (3, 4), (-2, 3) and (-3, -2) is a rhombus.

13. If the point (x, y) is equidistant from the points (a + b, b – a) and (a – b, a + b), prove that bx = ay.

OR

Show that the points (1, -1), (5, 2) and (9, 5) are collinear.

14. From an external point P, two tangents PA and PB are drawn to the circle with centre O. Prove that OP is the perpendicular of AB.

15. If α and β are the zeros of the quadratic polynomial $f(x) = 3x^2 - 4x + 1$, find a quadratic polynomial whose zeros are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$.

SECTION C

16. Let ABC be a right triangle in which AB = 3 cm, BC = 4 cm and $\angle B = 90^o$. BD is the perpendicular from B on AC. The circle through B, C, D is drawn. Construct the tangents from A to this circle.

17. The 4^{th} term of an A.P. is three times the first and the 7^{th} term exceeds twice the third term by 1. Find the first term and the common difference.

18. It is proposed to add to a square lawn measuring 58 cm on a side, two circular ends. The centre of each circle being the point of intersection of the diagonals of the square. Find the area of the whole lawn.

OR

ABCD is a field in the shape of a trapezium. AB || DC and $\angle ABC = 90^o$, $\angle DAB = 60^o$. Four sectors are formed with centres A, B, C and D. the radius of each sector is 17.5 m. Find the

(i) total area of the four sector.

(ii) area of remaining portion given that AB = 75 m and CD = 50 m.

19. Let A be one point of intersection of two intersecting circles with centres O and Q. The tangents at A to the two circles meet the circles again at B and C, respectively. Let the point P be located so that AOPQ is a parallelogram. Prove that P is the circum centre of the triangle ABC.

20. Three wheels can complete 60, 36, 24 revolutions per minute respectively. There is a red spot on each wheel that touches the ground at time zero. After how much time, all these spots will simultaneously touch the ground again

OR

Show that one and only one out of n, n + 2 or, n + 4 are divisible by 3, where n is any positive integer.

21. Akhila went to a fair in her village. She wanted to enjoy rides on the Giant Wheel and play Hoopla (a game in which you throw a ring on the items kept in the stall, and if the ring covers any object completely you get it). The number of times she played Hoopla is half the number of rides she had on the Giant Wheel. Each ride costs Rs.3, and a game of Hoopla costs Rs.4. If she spend Rs.20 in the fair, represent this situation algebraically and graphically.

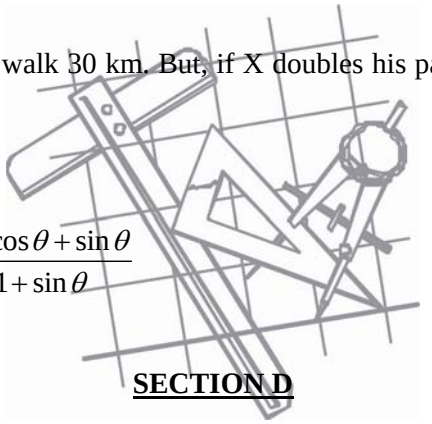
22. If -5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.

23. In what ratio is the line segment joining the points (-2, -3) and (3, 7) divided by the y-axis ? Also, find the coordinates of the point of division.

OR

The line segment joining the points (3, -4) and (1, 2) is trisected at the points P and Q. If the coordinate of P and Q are (p, -2) and $\left(\frac{5}{3}, q\right)$ respectively. Find the values of p and q.

24. X takes 3 hours more than Y to walk 30 km. But, if X doubles his pace, he is ahead of Y by $1\frac{1}{2}$ hours. Find their speed of walking.



25. Prove that $\frac{2Sin\theta}{1+\cos\theta+\sin\theta} = \frac{1-\cos\theta+\sin\theta}{1+\sin\theta}$

SECTION D

26. A frequency distribution of the life times of 400 T.V. picture tubes tested in a tube company is given below. Find the average life of tube.

Life time(In Hours)	Frequency	Life time(In Hours)	Frequency
300-399	14	800-899	62
400-499	46	900-999	48
500-599	58	1000-1099	22
600-699	76	1100-1199	6
700-799	68		

27. Prove Pythagoras theorem.

Using the above if ABCD is a rhombus, prove that $AB^2 + BC^2 + CD^2 + DA^2 = AC^2 + BD^2$.

OR

In $\Delta ABC, \angle A$ is obtuse, $PB \perp AC$ and $QC \perp AB$. Prove that :

(i) $AB \times AQ = AC \times AP$

(ii) $BC^2 = (AC \times CP + AB \times BQ)$

28. From the top of a tower, the angles of depression of two objects on the same side of the tower are found to be α and β ($\alpha > \beta$). If the distance between the objects is 'p' metres, show that the height 'h' of the tower is given by $h = \dfrac{p \tan\alpha \tan\beta}{\tan\alpha - \tan\beta}$ Also determine the height of the tower, if p = 50 m & $\alpha = 60^0, \beta = 30^0$

OR

The tallest tower in the city is 100m & a multistoryed hotel at the city centre is 20m high. The angle of elevation of the top of the tower at the top of hotel is 5^0. A building h metre high, is situated on the road connecting the tower with the city centre at a distance of 1 km. from the tower. Find the value of h if the top of the hotel, the top of the building & the top of the tower are in a straight line. Also find the distance of the tower from the city centre.(Use $\tan 5^0 = 0.0875$)

29. There is a square field whose side is 44 m. A square flower bed is prepared in its centre leaving a gravel path all round the flower bed. The total cost of laying the flower bed and gravelling the path at Rs.2.75 per square metre, respectively, is Rs.4904. Find the width of the gravel path.

30. The radius of the base of a right circular cone is r. It is cut by a plane parallel to the base at a height h from the base. The distance of the boundary of the upper surface from the centre of the base of the frustum is $\sqrt{h^2 + \dfrac{r^2}{9}}$

Show that the volume of the frustum is $\dfrac{13}{27}\pi r^2 h$.