

Series RMT-DS2

Code No. RSPL/3

Roll No.

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Candidates must write the Code on the title page of the answer-book.

- Please check that this question paper contains 8 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 40 questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minutes time has been allotted to read this question paper.

MATHEMATICS (STANDARD)

Time Allowed : 3 Hours

Maximum Marks : 80

General Instructions :

- All the questions are compulsory.*
- The question paper consists of 40 questions divided into four sections—A, B, C and D.*
- Section—A comprises of 20 questions of 1 mark each. Section—B comprises of 6 questions of 2 marks each. Section—C comprises of 8 questions of 3 marks each. Section—D comprises of 6 questions of 4 marks each.*
- There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.*
- Use of **calculators** is not permitted.*

SECTION - A

(Q1 - Q 10) are multiple choice questions. Select the most appropriate answer from the given options.

- If $5005 = a \times b \times c \times d$, a, b, c and d being positive integers and $a < b < c < d$, then the value of c is
(a) 5 (b) 11 (c) 7 (d) 13
- Arithmetic mean of the given data is p , mode is q and median is r , then
(a) $r = \frac{2p+q}{3}$ (b) $q = 3r + 2p$ (c) $2p = 3r + q$ (d) $r = \frac{2p-q}{3}$
- The LCM of the smallest two digit composite number and the largest two digit prime number is
(a) 1089 (b) 970 (c) 1162 (d) 120
- One of the pair of linear equations is $x - 3y = 7$ and if the pair of linear equations is consistent, the other equation is
(a) $kx - 3ky = 7k, k \neq 0$ (b) $3x - y = 7$
(c) $x - 3y = 8$ (d) $x = 3y - 7$
- Given $\sin A = \frac{\sqrt{3}}{2}$ and $\cos B = \frac{1}{2}$, then the value of $\tan(A - B)$ is
(a) 1 (b) $\sqrt{3}$ (c) 0 (d) not defined
- If $\tan A = \sqrt{2}$, then the value of $\frac{\cos A - \sin A}{\cos A + \sin A}$ is
(a) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ (b) $2\sqrt{2}+3$ (c) $\frac{1+\sqrt{2}}{1-\sqrt{2}}$ (d) $2\sqrt{2}-3$
- If $\sin \theta + \cos \theta = p$ and $\sin \theta - \cos \theta = q$, then
(a) $p = -q$ (b) $p = q$ (c) $p^2 + q^2 = 2$ (d) $p^2 - q^2 = 2$
- AB is diameter of a circle with centre $P(-1, 3)$ and coordinates of one end point are $B(2, 0)$, then coordinates of other end point A are
(a) (0, 2) (b) (-4, 6) (c) (3, -1) (d) (-3, 3)

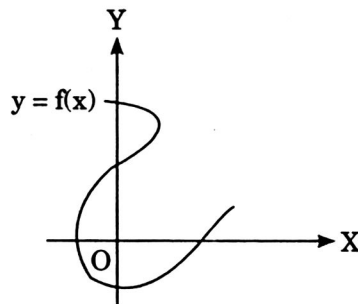
9. Distance of the point whose ordinate is 3 and abscissa is -4 from the origin is
 (a) 3 (b) -3 (c) 5 (d) 1
10. If three given points A, B and C are collinear, then we find distances AB, BC and CA and show that
 (a) $BC = AB + AC$
 (b) One distance is equal to the sum of other two distances
 (c) $AB = AC + BC$
 (d) $AC = AB + BC$

(Q11 - Q 15) Fill in the blanks

11. If r_1 and r_2 , ($r_1 < r_2$) are the radii of upper circular end and the base of the frustum and h is the height of the frustum, then its slant height is _____.
12. If α and β are the roots of a quadratic equation $3x^2 - 2x + 5k = 0$, such that $\alpha \cdot \beta$ is 5, then the value of k is _____.

OR

The graph of a polynomial $y = f(x)$ is shown. The number of zeroes of $f(x)$ are _____.

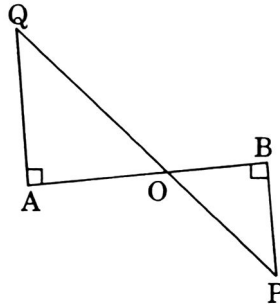


13. The areas of two similar triangles ΔABC and ΔDFE are in the ratio 16:49, then 7:4 is the ratio of _____ : BC.
14. If three numbers 12, k^2 , 20 are in AP then the value of k is _____.

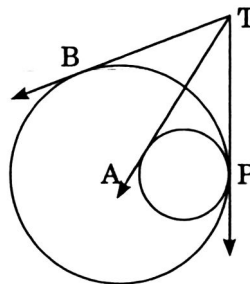
15. A number is chosen at random from the numbers 12 to 50, the probability that the number leaves remainder 2 when divided by 7 is _____.

(Q16 - Q 20) Answer the following

16. If a and b are two given co-prime numbers. Find the least number divisible by both a and b .
17. In the given figure, QA and PB are perpendicular to AB . If $OA = 10$ cm, $BO = 6$ cm and $PB = 9$ cm, find AQ .

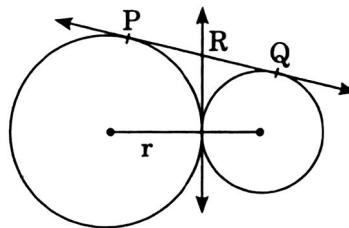


18. In the given figure, $TB = 5$ cm, find TA .



OR

In the given figure, show that R is mid-point of PQ .



19. If a , b and c are in AP, show that $b + c$, $c + a$, $a + b$ are also in AP.
20. Solve the equation $ax^2 + 2abx = 0$, $a, b \neq 0$. using factorisation.

SECTION - B

21. The n th term of an AP $\{a_n\}$ is $a_n = 8 - 5n$, find the sum of first seven terms of the AP.
22. Three friends Shristhi, Janya and Mehul were pondering over one situation which their teacher discussed in class. They went home, did not even take their lunch, took a sheet and drew a circle and a point on the sheet outside the circle. From this point they drew two tangents to the circle using ruler and measured the lengths of the tangents, they found these tangents to be of equal length.
- (i) Prove the above observation geometrically.
- (ii) Check whether the angles formed by the tangents and the radii, passing through points of contact of tangents, at the centre the circle, are supplementary or not.
23. Show that the ratio of perimeters of two similar triangles is the same as the ratio of their corresponding sides.

OR

Prove that any line parallel to parallel sides of a trapezium divides the non parallel sides proportionally.

24. If $A = 30^\circ$, verify that $\cos 2A = \frac{1 - \tan^2 A}{1 + \tan^2 A}$.
25. A bag contains x red balls and 12 black balls. 3 red balls are added to the bag and then a ball is drawn from the bag. If the probability of drawing a red ball is $\frac{1}{3}$. Find the number of red balls in the bag initially.

OR

A coin is tossed three times, find the probability of getting heads and tails alternately.

26. Janya and Charvi went for a shopping. In one shop they saw two beautiful coloured cylindrical cans, the radius of base of one can and its height are 3.5 cm and 7 cm respectively and for the other can these are 7 cm and 3.5 cm respectively.

They both purchased one each but of different dimensions. On the way back they started arguing about the capacities of cans. Let's try to answer their queries.

- (i) Which can has more curved surface area?
- (ii) Which can has more capacity and by how much?

SECTION - C

- 27. Prove that $5 - \sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.
- 28. If S_n denotes the sum of first n terms of an AP, prove that $S_{12} = 3(S_8 - S_4)$.
- 29. Find the solution of pair of equations, $\frac{x}{a} + \frac{y}{b} = a + b$, $\frac{x}{a^2} + \frac{y}{b^2} = 2$, $a, b \neq 0$.

OR

2 men and 5 boys can together finish a work in 4 days while 3 men and 6 boys can finish it in 3 days, find the time taken by one man alone to finish the work.

- 30. If α and β are the zeroes of the quadratic polynomial $p(x) = ax^2 + bx + c$, $a \neq 0$, evaluate $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$.

OR

What must be subtracted from $p(x) = 8x^4 + 14x^3 - 2x^2 + 8x - 12$ so that $4x^2 + 3x - 2$ is a factor of $p(x)$?

- 31. An exhibition is being organised in the school premises to highlight 'Swatchhh Bharat Abhiyan' and 'Say no to plastic'. Material concerning these is displayed at the positions represented by the points $A(-4, 0)$ and $B(4, 0)$. A spot light is placed at a point represented by $P(a, b)$ such that A, B and P are equidistant from each other.
 - (i) Help me in finding the position of point P by finding the values of a and b .
 - (ii) The distance of point P from line segment AB .
- 32. If $\sin \theta + \cos \theta = \sqrt{2} \cos \theta$, show that $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$.

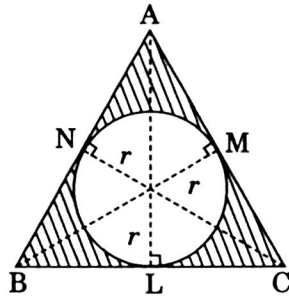
OR

Without using trigonometric tables, evaluate

$$\frac{\cos^2 20^\circ + \cos^2 70^\circ}{\sec^2 50^\circ - \cot^2 40^\circ} + 2 \operatorname{cosec}^2 58^\circ - 2 \cot 58^\circ \cdot \tan 32^\circ$$

$$- 4 \tan 13^\circ \cdot \tan 37^\circ \cdot \tan 45^\circ \cdot \tan 53^\circ \cdot \tan 77^\circ.$$

33. A circle is inscribed in an equilateral triangle ABC of side 12 cm, touching its sides. Find the radius of the inscribed circle and the area of the shaded part.



34. 'Swasth Bharat' dream will be fulfilled if our children are healthy. Many programmes in this respect are organised through different activities and at different intervals check-up is also necessary. School organised a medical check-up and during the medical check-up of 35 students of a class, their weights were recorded as follows:

| Weight (in kg) | Number of students |
|----------------|--------------------|
| Less than 38 | 0 |
| Less than 40 | 3 |
| Less than 42 | 5 |
| Less than 44 | 9 |
| Less than 46 | 14 |
| Less than 48 | 28 |
| Less than 50 | 32 |
| Less than 52 | 35 |

- Draw 'more than type' cumulative curve for the given data.
- Find the median using 'more than type' cumulative curve.
- What does median represent?

SECTION - D

35. Construct an isosceles triangle ABC whose base is 8 cm and altitude is 4 cm. Construct another triangle A'BC' whose sides are $\frac{3}{2}$ times the corresponding sides of the triangle ABC.

OR

Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other at an angle of 60° .

36. State and prove converse of Pythagoras Theorem.
37. Divide 16 into two parts such that twice the square of the larger part exceeds the square of the smaller part by 164.

OR

A person on a tour has ₹ 360 for his expenses. If he extends the tour by 4 days he has to cut down his daily expenses by ₹ 3. Find the original duration of the tour.

38. A solid toy is in the form of a hemisphere surmounted by a right circular cone. Height of the cone is 2 cm and diameter of the base of the cone and the hemisphere is 4 cm. If a right circular cylinder circumscribes the solid toy, find how much more space it will cover.

OR

A solid sphere of radius 3 cm is melted and then recast into smaller spherical balls each of diameter 0.6 cm. Find (i) the number of smaller balls thus formed (ii) the difference of surface areas of the solid sphere and the total surface area of the smaller balls.

39. The angle of elevation θ of the top of a lighthouse as seen by a person on the ground is such that $\tan \theta = \frac{5}{12}$. When a person moves a distance of 240 m towards the lighthouse the angle of elevation becomes ϕ , such that $\tan \phi = \frac{3}{4}$. Find the height of the lighthouse.
40. Calculate the median for the following frequency distribution:

| | | | | | | | | | | |
|-----------------------|-----|-----|------|-------|-------|-------|-------|-------|-------|-------|
| Class interval | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 | 25-28 | 29-32 | 33-36 | 37-40 |
| Frequency | 2 | 5 | 8 | 9 | 12 | 14 | 14 | 15 | 11 | 13 |