Series RMT–DS2

Set ~ 2

Q.P. Code RSPL/2

Roll No.

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

- Please check that this question paper contains **11** printed pages.

- Please check that this question paper contains **38** questions.

- Q.P. Code 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 write down the serial number of the question in the answer-book before attempting it.**

- **15** minute time has been allotted to read this question paper. During this time, the students will read the question paper only and will not write any answer on the answer-book.

MATHEMATICS (STANDARD)

Time allowed : 3 hours   *Maximum Marks : 80*

General Instructions :

Read the following instructions carefully and follow them:

   (i)   *This question paper contains **38** questions. **All** questions are **compulsory**.*

   (ii) *This question paper is divided into **five** Sections – **A, B, C, D** and **E**.*

   (iii) *In **Section A**, Question numbers **1** to **18** are multiple choice questions (MCQs) and question numbers **19** and **20** are Assertion – Reason based questions of **1** mark each.*

   (iv) *In **Section B**, Question numbers **21** to **25** are very short answer (VSA) type questions carrying **2** marks each.*

(v) In **Section C**, Question numbers **26** to **31** are short answer (SA) type questions carrying **3** marks each.

(vi) In **Section D**, Question numbers **32** to **35** are long answer (LA) type questions carrying **5** marks each.

(vii) In **Section E**, Question numbers **36** to **38** are **case-study based integrated** questions carrying **4** marks each. Internal choice is provided in **2** marks question in each case-study.

(viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section **B**, 2 questions in Section **C**, 2 questions in Section **D** and 3 questions of 2 marks in Section **E**.

(ix) Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.

(x) Use of calculators is **NOT allowed**.

SECTION – A   20×1=20

This section consists of 20 questions of 1 mark each.

1. The number of polynomials having zeroes 3 and – 2 is   1

(a) 2   (b) 3   (c) 0   (d) infinite

2. If $31x + 43y = 117$ and $43x + 31y = 105$, then the value of $x + y$ is   1

(a) 3   (b) 2   (c) 0   (d) None of these

3. Which of the following statements is not true?   1

(a) Two triangles are said to be similar if their corresponding angles are equal.

(b) Two triangles are said to be similar if their corresponding sides are proportional.

(c) All congruent triangles are similar but the similar triangles need to be congruent.

(d) If three or more parallel lines are intersected by two transversal then the intercepts made by then on the transversal are proportional.

4. If (-3) is one of the zeroes of the quadratic polynomial, $(k - 1) x^2 + kx - 3$, then the sum of the zeroes of the quadratic polynomial is   1

(a) 2   (b) 3   (c) 1   (d) -2

5. The areas of two concentric circles forming a ring are 154 cm^2 and 616 cm^2, then the breadth of the ring is   1

(a) $\dfrac{7}{2}$ cm   (b) 14 cm   (c) 7 cm   (d) 21 cm

6. If $\sec \theta + \tan \theta = m$, then $\sec^4 \theta - \tan^4 \theta - 2 \sec \theta \tan \theta$ equals to   1

(a) m^2 (b) $- m^2$ (c) $\dfrac{1}{m^2}$ (d) $-\dfrac{1}{m^2}$

7. If TP and TQ are the two tangents to a circle with centre O so that $\angle POQ = 110°$, then $\angle PTQ$ is equal to   1

(a) 60°   (b) 70°   (c) 80°   (d) 90°

8. The roots of the equation $x^2 + 3x - 10 = 0$ are   1

(a) 2, -5 (b) -2, 5   (c) 2, 5   (d) -2, -5

9. The mean of given data is 7 and median 4, then mode of the data is   1

(a) 3   (b) 11   (c) not possible   (d) 13

10. In the given figure, DE || BC and BD = AE, then value of BD is   1
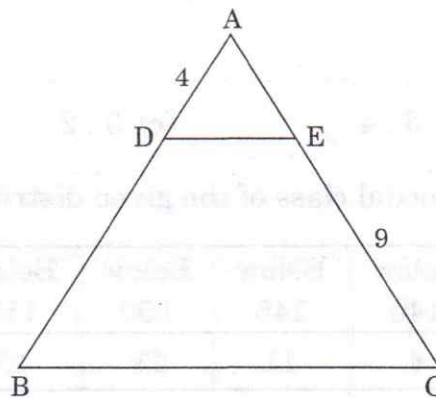
(a) 9   (b) 6   (c) ± 6 (d) 36

11. A general quadratic equation whose roots are equal in magnitude and opposite in signs is **1**

(a) $ax^2 + bx + c = 0$, a, b, c > 0

(b) $ax^2 + c = 0$, a > 0, c < 0

(c) $ax^2 + bx = 0$, a, b > 0

(d) $ax^2 + c = 0$, a < 0, c < 0

12. If $\sec \alpha = \dfrac{2}{\sqrt{3}}$, then value of $\dfrac{3\sin \alpha - 2\cos \alpha}{3\sin \alpha + 2\cos \alpha}$ is **1**

(a) $\dfrac{3\sqrt{3} - 2}{3\sqrt{3} + 2}$

(b) $\dfrac{3 - 2\sqrt{3}}{3 + 2\sqrt{3}}$

(c) $\dfrac{3 + 2\sqrt{3}}{3 - 2\sqrt{3}}$

(d) $\dfrac{3\sqrt{3} + 2}{3\sqrt{3} - 2}$

13. The length of the minute hand of a wall clock is 7 cm, then how much area does it sweep in 20 minutes? **1**

(a) $51\ cm^2$

(b) $49.33\ cm^2$

(c) $51.33\ cm^2$

(d) $52\ cm^2$

14. 2000 tickets of a lottery were sold and there are 16 prizes on these tickets. Abhinav has purchased one lottery ticket. The probability that Abhinav wins a prize is **1**

(a) 10.08

(b) 0.07

(c) 0.008

(d) 0.080

15. The line segment joining the points P(–3, 2) and Q(5, 7) is divided by the y-axis in the ratio **1**

(a) 3 : 1

(b) 3 : 4

(c) 3 : 2

(d) 3 : 5

16. The upper limit of the modal class of the given distribution is: **1**

Height [in cm]	Below 140	Below 145	Below 150	Below 155	Below 160	Below 165
Number of girls	4	11	29	40	46	51

(a) 165

(b) 160

(c) 155

(d) 150

17. If three points $(0, 0)$, $(3, \sqrt{3})$ and $(3, k)$ form an equilateral triangle, then k =   **1**

   (a) 2   (b) -3

   (c) $-\sqrt{3}$ (d) $-\sqrt{2}$

18. If $\Sigma f_i = 11$, $\Sigma f_i x_i = 2p + 52$ and the mean of any distribution is 6, then the value of p is   **1**

   (a) 4   (b) 5   (c) 6   (d) 7

Direction: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option.

   (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

   (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A).

   (c) Assertion (A) is true but reason (R) is false.

   (d) Assertion (A) is false but reason (R) is true.

19. Assertion (A): The HCF of two numbers is 9 and their LCM is 2016. If one of the number is 306, then the other is 54.

   Reason (R): For any positive integers a and b, we have:

   Product of two numbers = HCF × LCM   **1**

20. Assertion (A): The curved surface area of a cone of base radius 6 cm and slant height 10 cm is 60π cm^2.

   Reason (R): Curved surface area of a cone = $\pi r^2 h$, where r be the radius and h be the height of cone.   **1**

SECTION – B

This section consists of 5 questions of 2 marks each.

21. Prove that $2 + \sqrt{3}$ is an irrational number. 2

22. (a) A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be (i) red? (ii) white? 2

OR

(b) 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one. 2

23. (a) Prove that: $\dfrac{\tan\theta}{1-\cot\theta} + \dfrac{\cot\theta}{1-\tan\theta} = 1 + \tan\theta + \cot\theta$. 2

OR

(b) Two boats approach a lighthouse in mid-sea from opposite directions. The angles of elevation of the top of the lighthouse from two boats are 30° and 45° respectively. If the distance between two boats is 100 m, find the height of the lighthouse. 2

24. Find the coordinates of the point which divides the join of (–1, 7) and (4, –3) in the ratio 2 : 3. 2

25. Find the linear relation between x and y such that P(x, y) is equidistant from the points A(1, 4) and B(–1, 2). 2

SECTION – C

This section consists of 6 questions of 3 marks each.

26. (a) PA and PB are tangents drawn to a circle of centre O from an external point P. Chord AB makes an angle of 30° with the radius at the point of contact.
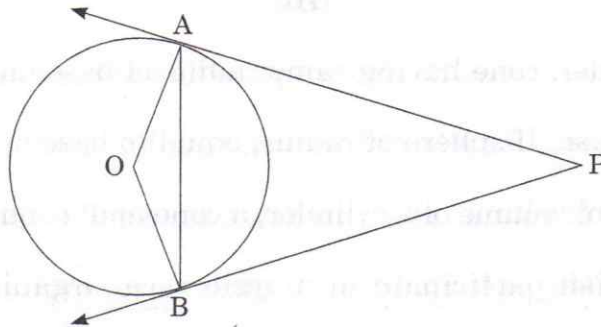
If length of the chord is 6 cm, find the length of the tangent PA and the length of the radius OA. **3**

OR

(b) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2 \angle OPQ$. **3**

27. Solve for x : **3**

$$\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0 \; ; x \neq 3, \frac{-3}{2}$$

28. Find the zeroes of the polynomial $4\sqrt{3}x^2 + 4\sqrt{3}x - 3\sqrt{3}$. Also, verify the relationship between the zeroes and the coefficients. **3**

29. If $\sin (A + 2B) = \frac{\sqrt{3}}{2}$ and $\cos (A + 4B) = 0$, $A > B$, and $A + 4B \leq 90°$, then find A and B. **3**

30. (a) A circus tent was erected in a village for circus shows. Tent is cylindrical surmounted by a conical tent. The diameter of circular tent is 120 m and height 15 m. The total height of tent is 26 m. Find the canvas required to make the circus tent. If it costs ₹ 200 per metre of length with standard width of 15 m. Find the total cost in erecting the tent.   3

OR

(b) Given a cylinder, cone having same radius of base and height equal to diameter of base. If sphere of radius, equal to base of cylinder is taken find the ratio of volume of a cylinder, a cone and a sphere.   3

31. Manju and Manish participate in a cycle race, organised for National integration. Manju takes 18 minutes to complete one round, while Manish takes 12 minutes for the same. Suppose they both start at the same time and go in the same direction. After how many minutes, will they meet again at the starting point?   3

SECTION – D

This section consists of 4 questions of 5 marks each.

32. (a) The first and the last terms of an AP are 6 and 348 respectively. If the common difference is 9, how many terms are there and what is their sum?   5

OR

(b) If 9th term of an AP is zero, prove that its 29th term is double of its 19th term.   5

33. ABCD is a parallelogram. AB is divided at P and CD at Q so that AP : PB = 3 : 2 and CQ : QD = 4 : 1. If PQ meets AC at R, then prove that $AR = \dfrac{3}{7} AC$.   5

34. (a) A straight highway leads to the foot of a tower. A man standing on the top of the 75 m high tower observes two cars at angles of depression of 30° and 60°, which are approaching the foot of the tower. If one car is exactly behind the other on the same side of the tower, find the distance between the two cars. (use $\sqrt{3}$ = 1.73)

5

OR

(b) From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 30°. Determine the height of the tower.

5

35. The monthly expenditure on milk in 200 families of a Housing Society is given below:

5

Monthly Expenditure (in ₹)	Number of families
1000-1500	24
1500-2000	40
2000-2500	33
2500-3000	x
3000-3500	30
3500-4000	22
4000-4500	16
4500-5000	7

Find the value of x and also, find the median and mean expenditure on milk.

SECTION – E

This section consists of 3 Case-Study Based Questions of 4 marks each.

36. Two schools 'P' and 'Q' decided to award prizes to their students for two games of Hockey ₹ x per student and Cricket ₹ y per student. school 'P' decided to award a total of ₹ 9,500 for the two games to 5 and 4 students respectively; while school 'Q' decided to award ₹ 7,370 for the two games to 4 and 3 students respectively.


Based on the above information, answer the following questions :

  (i) Represent the following information algebraically (in terms of x and y). **1**

  (ii) (a) What is the prize amount for hockey? **2**

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

      (b) Prize amount on which game is more and by how much? **2**

 (iii) What will be the total prize amount if there are 2 students each from two games? **1**

37. Raghav has been selected by his school to design logo for sports Day T-shirts for students and staff. The logo design is as given in the figure and he is working on the fonts and different colours according to the theme. In given figure, a circle with centre O is inscribed in a $\triangle ABC$, such that it touches the sides AB, BC and CA at points D, E and F respectively. The lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm respectively.
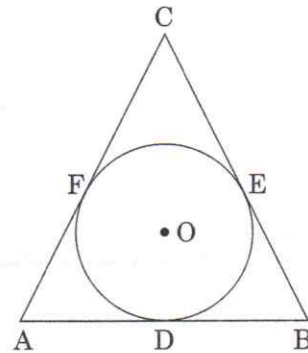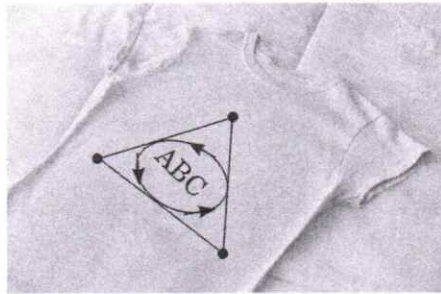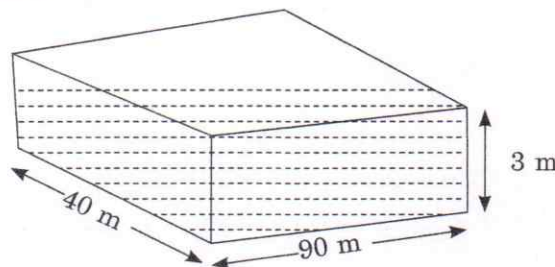
Now answer the following

   (i) Find the length of AD.   1

  (ii) Find the length of BE.   1

 (iii) (a) If radius of the circle is 4 cm, Find the area of ∆OAB.   2

OR

      (b) Find area of ∆ABC.   2

38. A cuboidal swimming pool is constructed near canal.

The dimensions of swimming pool is shown in the picture.

Answer the questions based on above:

   (i) How much water can be filled completely in the swimming pool?   1

  (ii) Is it possible to fill 10000 m^3 of water in the swimming pool?   1

 (iii) (a) If 100 men take a dip at a time, then what will be the rise in water level, if average displacement of water by a man is 8 m^3?   2

OR

      (b) In place of cuboidal swimming pool, if a hemispherical pool of radius 14 m is constructed, then how much water is required to fill the hemispherical pool?   2