**Series RMT–DS1**

Code No. **RSPL/1**

Roll No. ☐☐☐☐☐☐☐☐

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

- Please check that this question paper contains **12** 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 **38** questions.

- **Please write down the Serial Number of the question before attempting it.**

# MATHEMATICS (STANDARD)

*Time Allowed : 3 Hrs*                                   *Maximum Marks : 80*

*General Instructions :*

1. *This Question Paper has 5 Sections A, B, C, D and E.*

2. *Section **A** has 20 MCQs carrying 1 mark each.*

3. *Section **B** has 5 questions carrying 02 marks each.*

4. *Section **C** has 6 questions carrying 03 marks each.*

5. *Section **D** has 4 questions carrying 05 marks each.*

6. *Section **E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.*

7. *All Questions are compulsory. However, an internal choice in 2 Questions of 5 marks, 2 Questions of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.*

8. *Draw neat figures wherever required. Take $\pi = \dfrac{22}{7}$ wherever required if not stated.*
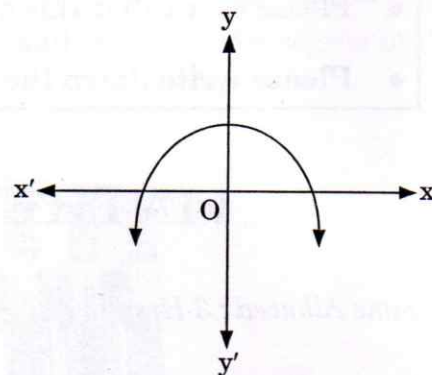
## SECTION – A

### Section A consists of 20 questions of 1 mark each.

1. $2^n \times 5^n$ end with the digit Zero for which value of n

   (a) All integers

   (b) All Natural Numbers

   (c) All Real Numbers

   (d) No value of n is possible

2. The graph of a polynomial $y = p(x)$, shown in figure. Write the number of Zeroes of the polynomial

   (a) 0

   (b) 1

   (c) 2

   (d) 3

3. The pair of linear equations $3x + qy = 7$ and $px + 10y = 15$ have no solutions, then value of pq is

   (a) 10      (b) 30      (c) 45      (d) 15

4. The roots of the quadratic equation $x^2 - 3x - (m + 2)(m + 5) = 0$, where m is a constant, are
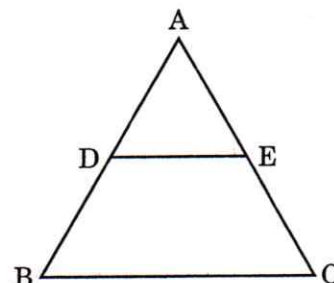
   (a) $(m + 2), (m + 5)$

   (b) $-(m + 5), (m + 2)$

   (c) $-(m + 2), (m + 5)$

   (d) $-(m + 2), -(m + 5)$

5. The 7th term from the end of the A.P $-13, -10, -7, -4, \ldots 119$ is

   (a) 95      (b) 98      (c) 111      (d) 101

**6.** In ΔABC, if DE ‖ BC, where D and E are the points on AB and AC respectively then

(a) $\dfrac{AB}{AD} = \dfrac{AC}{AE}$

(b) $\dfrac{AD}{DB} = \dfrac{DE}{BC}$

(c) $\dfrac{AD}{DB} = \dfrac{EC}{AE}$ ✗

(d) All the above are correct

**7.** A(0, 1) is a point equidistant from B(5, –3) and C(x, 6). Then value of x is

(a) +4      (b) –4      (c) ±4      (d) ±16

**8.** The distance of point P(x, y) from origin is

(a) $\sqrt{x^2 + y^2}$      (b) $x + y$      (c) $\sqrt{x^2 - y^2}$      (d) $x - y$

**9.** If $\tan \theta = \sqrt{3} - 1$, then $\sin \theta$ is

(a) $\sqrt{3} + 1$      (b) $\sqrt{5 - 2\sqrt{3}}$      (c) $\dfrac{\sqrt{3} - 1}{\sqrt{5 - 2\sqrt{3}}}$      (d) $\dfrac{\sqrt{3} - 1}{\sqrt{5 + 2\sqrt{3}}}$

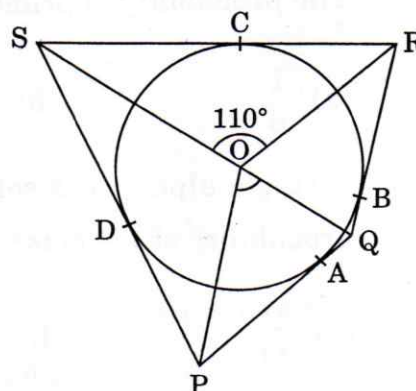**10.** If $\theta = 30°$, then $4\cos^3 \theta - 3\cos \theta$ is

(a) $\cos 30°$      (b) $\cos 60°$      (c) $\cos 90°$      (d) $\cos 0°$

**11.** If the ratio of shadow of a pole and its height is $\sqrt{3} : 1$, then angle of elevation of sun is
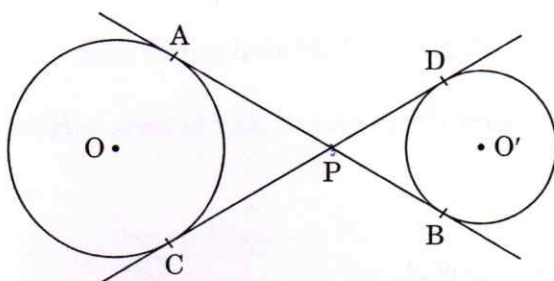
(a) 60°      (b) 30°      (c) 45°      (d) None of these

**12.** In figure, if ∠ROS = 110°, then ∠POQ is.
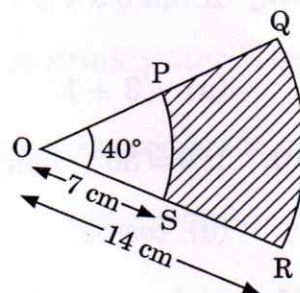
(a) 110°

(b) 70°

(c) 60°

(d) 180°

13. AB and CD are two tangents to two circles of unequal radii intersect each other at P, then



(a) AP = BP      (b) AB = CD      (c) AP = DP      (d) CP = BP

14. If area of a sector of a circle of radius 21 cm is 231 cm², then length of its corresponding arc is

(a) 11 cm      (b) 22 cm      (c) 21 cm      (d) 231 cm

15. In given figure, the perimeter of shaded area is



(a) $\dfrac{46}{3}$ cm      (b) $\dfrac{46}{9}$ cm

(c) $\dfrac{86}{4}$ cm      (d) $\dfrac{86}{3}$ cm

16. The class mark of a class is 45. Its class size is 10. The lower limit of the class is

(a) 45      (b) 40      (c) 50      (d) 10

17. The probability of prime number, when a die is thrown.

(a) $\dfrac{1}{6}$      (b) $\dfrac{1}{2}$      (c) $\dfrac{2}{3}$      (d) $\dfrac{1}{3}$

18. A single alphabet is selected at random from the word "PROBABILITY". The probability of vowel is

(a) $\dfrac{2}{11}$      (b) $\dfrac{7}{11}$      (c) $\dfrac{3}{11}$      (d) $\dfrac{4}{11}$

**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.

19. **Statement A (Assertion):** The sum of 18 terms of the A.P. series 3, 7, 11, 15 ... is 666.

    **Statement R (Reason):** Formula for calculating the sum of n terms of an A.P. series is $S_n = \frac{n}{2}[2a + (n - 1)d]$

    (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.

20. **Statement A (Assertion):** Volume of sphere of radius 6 cm is $\frac{6336}{7}$ cm$^3$.

    **Statement R (Reason):** Sphere is round object shaped like a ball, whose surface area is $4\pi r^2$.

    (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.

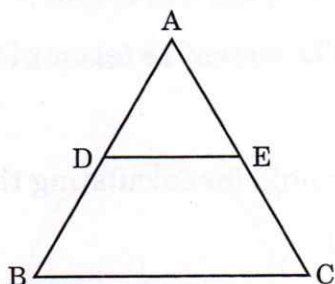    (d) Assertion (A) is false but reason (R) is true.

### SECTION – B

**Section B consists of 5 questions of 2 marks each.**

21. Composite numbers are those numbers which have more than two factors. So, explain why $7 \times 11 \times 17 \times 19 + 19$ is a composite number.
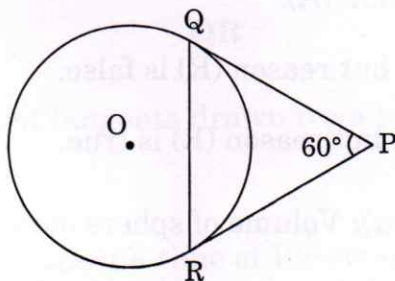
**22.** Using Basic Proportionality Theorem, In the given figure if DE || BC. Prove that

$$\frac{AB}{DB} = \frac{AC}{EC}$$



**23.** In the given figure, PQ and PR are two tangents to the circle with centre O and ∠QPR = 60°. Show that ΔPQR is an equilateral triangle.



**24.** Find the value of θ, if $\dfrac{1}{\sec\theta - 1} - \dfrac{1}{\sec\theta + 1} = \dfrac{2}{3}$, where $0° \leq \theta \leq 90°$

**OR**

Simplify

$$\frac{(1 - \text{cosec}^2\,\theta)(1 - \cos\theta)(1 + \cos\theta)}{1 - \sin^2\theta}$$

**25.** Two diameters of a circle having 14 cm in length perpendicular to each other. Then, find area enclosed by two opposite sectors.

**OR**

Find the length of arc of a circle of radius 21 cm with central angle 30°.

## SECTION – C

### Section C consists of 6 questions of 3 marks each.

26. Three containers containing 54 litres, 84 litres and 108 litres of milk. Find the measurement of largest cup that can measure the milk of the above containers exactly.

27. If $\dfrac{m}{2}$ and $\dfrac{n}{2}$ are the zeroes of quadratic polynomial $3x^2 + 5x + 7$, then find a quadratic polynomial whose zeroes are $2m + 3n$ and $3m + 2n$.

28. Find the value of k, if the system of linear equations

    $(5k - 9)x + (2k - 3)y = 1$

    $(2k + 1)x + (4k - 3)y = 5$
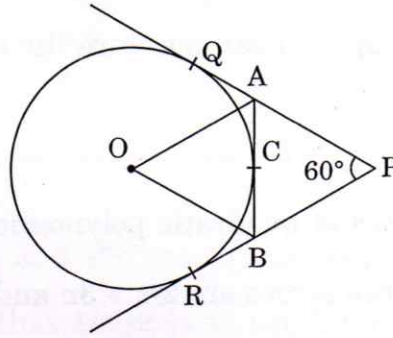
    has infinitely many solutions.

### OR

A train covered a certain distance with an uniform speed. Due to bad weather the speed of train reduced by 20 km/hr, it would have been taken 2 hrs more to cover the same distance. While returning from same journey, train driver increased its speed by 10 km/hr and takes $\dfrac{1}{2}$ hr less for same distance. Find length of the journey.

29. In a right angled triangle $\angle C$ is right angle. If $\tan (C - B - A) = 0$ and $\tan (B + C - A) = \sqrt{3}$, find the value of angle A and B.

**30.** In figure, PQ and PR are two tangents inclined each other at an angle of 60° to a circle with centre O. A and B are the points on PQ and PR respectively such that AB is a tangent with point of contact C. Then find ∠AOB.



**OR**

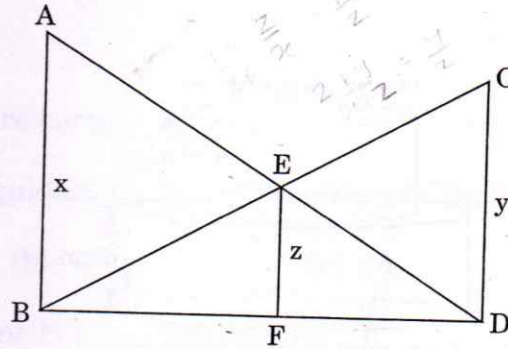Prove that the lengths of tangents drawn from an external point to a circle are equal.

**31.** The following table gives the life-time of 100 smart TVs. Find the mean life time of a smart TV by using assumed mean method.

| Life Time (in hrs) | No. of T.V. |
|---|---|
| 1000 – 1100 | 12 |
| 1100 – 1200 | 17 |
| 1200 – 1300 | 9 |
| 1300 – 1400 | 18 |
| 1400 – 1500 | 6 |
| 1500 – 1600 | 10 |
| 1600 – 1700 | 7 |
| 1700 – 1800 | 3 |
| 1800 – 1900 | 16 |
| 1900 – 2000 | 2 |

## SECTION – D

### Section D consists of 4 questions of 5 marks each.

**32.** In fig. AB || CD || EF, where AB = x units, CD = y units and EF = z units. Prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$.



**33.** Solve the following quadratic equation

$$25x^2 - 15(a-b)x + 2(a-b)^2 - ab = 0$$

### OR

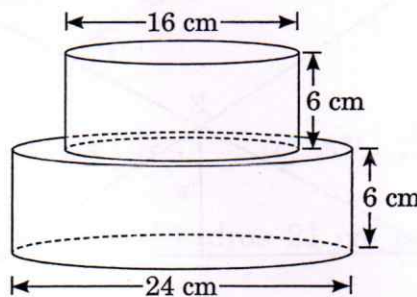Solve the following quadratic equation by factorisation method.

$$\frac{1}{2a+b+x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{x}, \text{ where } 2a+b \neq 0$$

**34.** In the following table, monthly income (in ₹) of 60 workers is given

| Monthly Income (in ₹) | No. of Workers |
|---|---|
| Income more than ₹ 12000 | 60 |
| Income more than ₹ 15000 | 47 |
| Income more than ₹ 18000 | 39 |
| Income more than ₹ 21000 | 21 |
| Income more than ₹ 24000 | 4 |
| Income more than ₹ 27000 | 1 |
| Income more than ₹ 30000 | 0 |

Calculate the median monthly income (in ₹).

**35.** Karan's Mother gives an order of cake for his 15th birthday in the shape of cylinder with box diameter 24 cm and height 6 cm, with another cylindrical top having diameter 16 cm with same height. She wants to cover the cake with blue whipped cream. Find the area of cake cover with cream.
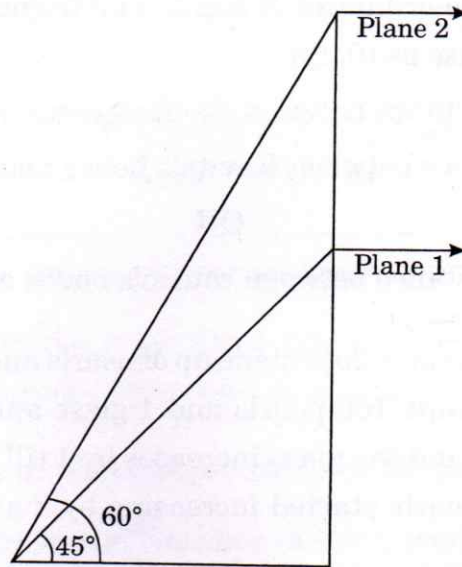


**OR**

A crow found a cylindrical vessel of base diameter 10 cm to drink water. The vessel was $\frac{3}{4}$th filled with water. If the crow uses 50 spherical shaped stone of diameter 2 cm to take water upto the brim, then find the height of the cylindrical vessel?

## SECTION – E

### Case study based questions are compulsory.

**36.** A plane is flying at the speed of 10 m/s and 5000 m above the ground and another plane is flying above of it at the speed of 20 m/s in the same direction . At an instant when the planes are exactly above each other, A person see the planes at the angle of elevation formed is 45° and 60° respectively.
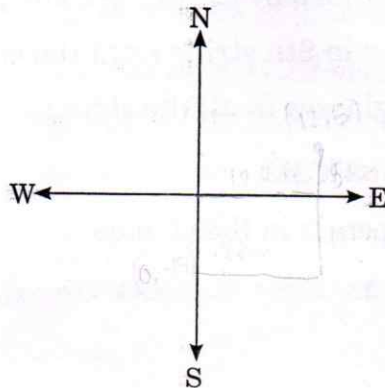
(i) How much distances are covered by the planes in next 20 seconds?

(ii) Find the distance between planes after 20 seconds.

(iii) Find the height of the above plane from the ground. (Use $\sqrt{3} = 1.73$)

**OR**

Find the distance between both the planes.

37. Kavita started travelling 12 km towards east then she turned to her left and walked 5 km and reached his cousin's house. Again, she started walking 20 km toward South, then she turned to her right and walked 12 km and reached his friend's house.
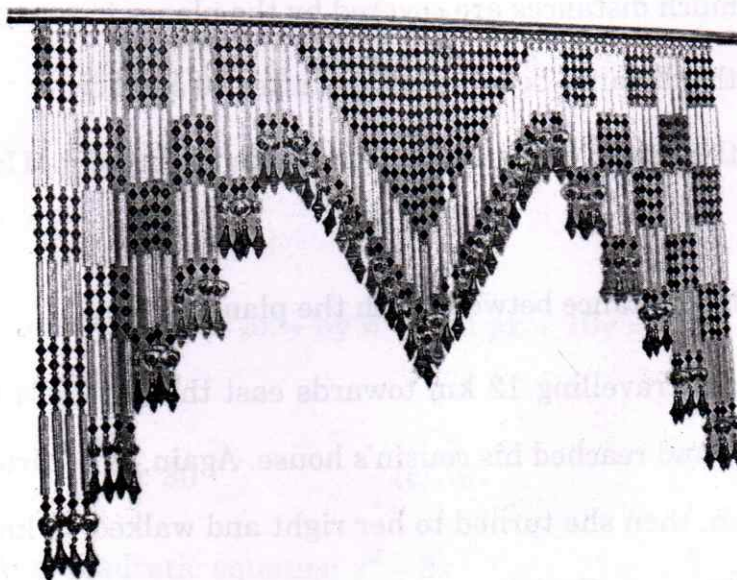
(i) What are the co-ordinates of cousin and friend's house? [Take co-ordinate of Kavita's house as (0, 0)]

(ii) What is the distance between Kavita's house and friend's house?

(iii) Find the distance between Kavita's house and cousin's house.

**OR**

What is the distance between cousin's house and friend's house?

**38.** 19 strings are hanging on a door made up of pearls and triangular shaped glasses. The first string contains 100 pearls and 1 glass and in the further strings the pearls decrease by 2 and the glass increases by 1 till the 10th string. 10th string onwards again the pearls started increasing by 2 and the glass decreases by 1 till 19th string.



(i) What type of sequence is formed by the glasses and pearls till 10th string?

(ii) Find the number of glasses in 9th string from the end.

(iii) Find the total number of glasses in all the strings.

**OR**

Find the total number of pearls in the strings.

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