



रोल नं.

Roll No.

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## नोट

- (I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 23 हैं।
- (II) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- (III) कृपया जाँच कर लें कि इस प्रश्न-पत्र में 38 प्रश्न हैं।
- (IV) कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में यथा स्थान पर प्रश्न का क्रमांक अवश्य लिखें।
- (V) इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक परीक्षार्थी केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे।

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## गणित (मानक)

### MATHEMATICS (STANDARD)

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80

30/3/1

1 | Page



P.T.O.

प्रश्न-पत्र कोड  
Q.P. Code **30/3/1**

परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें।

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

## NOTE

Please check that this question paper contains 23 printed pages.

(I) 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.

(II) Please check that this question paper contains 38 questions.

(III) Please write down the Serial Number of the question in the answer-book at the given place before attempting it.

(IV) 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.



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### General Instructions :

Read the following instructions very carefully and strictly 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, Questions no. 1 to 18 are Multiple Choice Questions (MCQs) and questions number 19 and 20 are Assertion-Reason based questions of 1 mark each.
- (iv) In Section B, Questions no. 21 to 25 are Very Short Answer (VSA) type questions, carrying 2 marks each.
- (v) In Section C, Questions no. 26 to 31 are Short Answer (SA) type questions, carrying 3 marks each.
- (vi) In Section D, Questions no. 32 to 35 are Long Answer (LA) type questions carrying 5 marks each.
- (vii) In Section E, Questions no. 36 to 38 are Case Study based questions carrying 4 marks each. Internal choice is provided in 2 marks questions 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 in Section E.
- (ix) Draw neat diagrams wherever required. Take  $\pi = \frac{22}{7}$  wherever required, if not stated.
- (x) Use of calculator is not allowed.

### SECTION A

This section has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.

$$20 \times 1 = 20$$

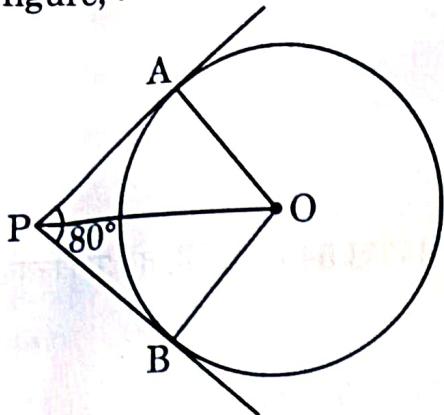
1. If  $\tan 3\theta = \sqrt{3}$ , then  $\frac{\theta}{2}$  equals :  
(A)  $60^\circ$       (B)  $30^\circ$   
(C)  $20^\circ$       (D)  $10^\circ$
2. If x is the LCM of 4, 6, 8 and y is the LCM of 3, 5, 7 and p is the LCM of x and y, then which of the following is true ?  
(A)  $p = 35x$       (B)  $p = 4y$   
(C)  $p = 8x$       (D)  $p = 16y$



3. The value of 'k' for which the system of linear equations  $6x + y = 3k$  and  $36x + 6y = 3$  have infinitely many solutions is :
- (A) 6      (B)  $\frac{1}{6}$   
 (C)  $\frac{1}{2}$       (D)  $\frac{1}{3}$
4. If  $\alpha$  and  $\beta$  are the zeroes of the polynomial  $p(x) = x^2 - ax - b$ , then the value of  $(\alpha + \beta + \alpha\beta)$  is equal to :
- (A)  $a + b$   
 (B)  $-a - b$   
 (C)  $a - b$   
 (D)  $-a + b$
5. If  $\frac{x}{12} - \frac{3}{x} = 0$ , then the values of  $x$  are :
- (A)  $\pm 6$       (B)  $\pm 4$   
 (C)  $\pm 12$       (D)  $\pm 3$
6. The line represented by  $\frac{x}{4} + \frac{y}{6} = 1$ , intersects x-axis and y-axis respectively at P and Q. The coordinates of the mid-point of line segment PQ are :
- (A) (2, 3)      (B) (3, 2)  
 (C) (2, 0)      (D) (0, 3)
7. Two of the vertices of  $\Delta PQR$  are P(-1, 5) and Q(5, 2). The coordinates of a point which divides PQ in the ratio 2 : 1 are :
- (A) (3, -3)  
 (B) (5, 5)  
 (C) (3, 3)  
 (D) (5, 1)



8. If tangents PA and PB drawn from an external point P to the circle with centre O are inclined to each other at an angle of  $80^\circ$  as shown in the given figure, then the measure of  $\angle POA$  is :

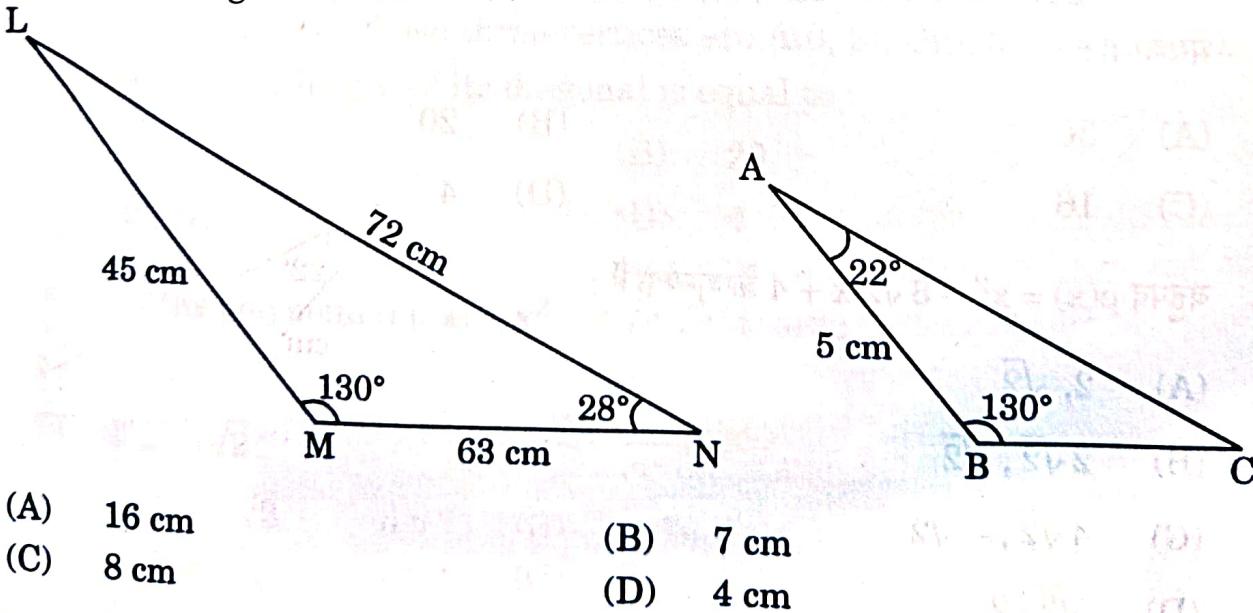


- (A)  $40^\circ$  (B)  $50^\circ$   
 (C)  $60^\circ$  (D)  $80^\circ$
9.  $(\cot \theta + \tan \theta)$  equals :
- (A) cosec  $\theta$  sec  $\theta$  (B) sin  $\theta$  sec  $\theta$   
 (C) cos  $\theta$  tan  $\theta$  (D) sin  $\theta$  cos  $\theta$

10. If in two triangles  $\Delta DEF$  and  $\Delta PQR$ ,  $\angle D = \angle Q$  and  $\angle R = \angle E$ , then which of the following is *not* true ?

- (A)  $\frac{DE}{QR} = \frac{DF}{PQ}$  (B)  $\frac{EF}{PR} = \frac{DF}{PQ}$   
 (C)  $\frac{EF}{RP} = \frac{DE}{QR}$  (D)  $\frac{DE}{PQ} = \frac{EF}{RP}$

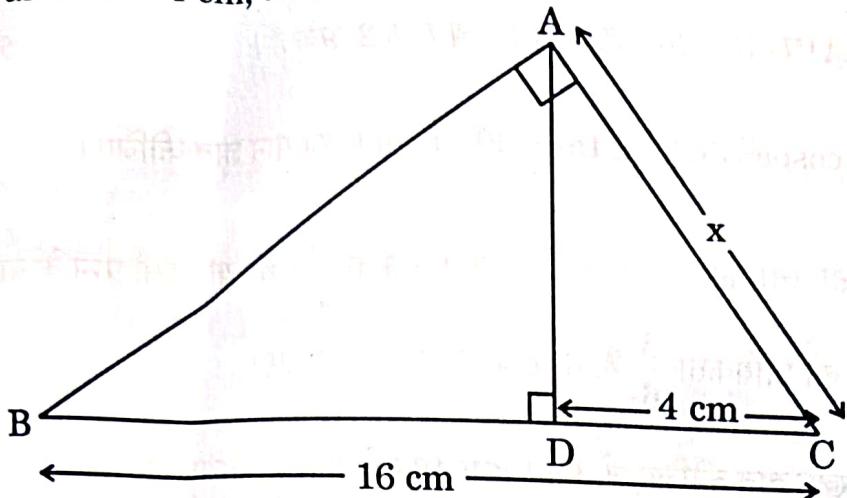
11. The measurements of  $\Delta LMN$  and  $\Delta ABC$  are shown in the figure given below. The length of side AC is :



12. If the volumes of two cubes are in the ratio 8 : 125, then the ratio of their surface areas is :
- (A) 8 : 125  
(B) 4 : 25  
(C) 2 : 5  
(D) 16 : 25
13. If the area of a sector of circle of radius 36 cm is  $54\pi \text{ cm}^2$ , then the length of the corresponding arc of the sector is :
- (A)  $8\pi \text{ cm}$       (B)  $6\pi \text{ cm}$   
(C)  $4\pi \text{ cm}$       (D)  $3\pi \text{ cm}$
14. A die is thrown once. The probability of getting a number which is **not** a factor of 36, is :
- (A)  $\frac{1}{2}$       (B)  $\frac{2}{3}$   
(C)  $\frac{1}{6}$       (D)  $\frac{5}{6}$
15. If the mean of 2, 9,  $x+6$ ,  $2x+3$ , 5, 10, 5 is 7, then the value of  $x$  is :
- (A) 9      (B) 6  
(C) 5      (D) 3
16. AOBC is a rectangle whose three vertices are A(0, 2), O(0, 0) and B(4, 0). The square of the length of its diagonal is equal to :
- (A) 36      (B) 20  
(C) 16      (D) 4
17. Zeroes of the polynomial  $p(x) = x^2 - 3\sqrt{2}x + 4$  are :
- (A)  $2, \sqrt{2}$   
(B)  $2\sqrt{2}, \sqrt{2}$   
(C)  $4\sqrt{2}, -\sqrt{2}$   
(D)  $\sqrt{2}, 2$



18. In the given figure, in  $\triangle ABC$ ,  $AD \perp BC$  and  $\angle BAC = 90^\circ$ . If  $BC = 16\text{ cm}$  and  $DC = 4\text{ cm}$ , then the value of  $x$  is :



- (A) 4 cm      (B) 5 cm  
 (C) 8 cm      (D) 3 cm

**Questions number 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.**

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the 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)** : A ladder leaning against a wall, stands at a horizontal distance of 6 m from the wall. If the height of the wall up to which the ladder reaches is 8 m, then the length of the ladder is 10 m.

**Reason (R)** : The ladder makes an angle of  $60^\circ$  with the ground.

20. **Assertion (A)** : If two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre of the circle.

**Reason (R)** : A parallelogram circumscribing a circle is a rhombus.



## SECTION B

This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each.

$$5 \times 2 = 10$$

21. If  $4k = \tan^2 60^\circ - 2 \operatorname{cosec}^2 30^\circ - 2 \tan^2 30^\circ$ , then find the value of k.
22. The probability of guessing the correct answer of a certain test question is  $\frac{x}{12}$ . If the probability of not guessing the correct answer is  $\frac{5}{6}$ , then find the value of x.
23. (a) Find the smallest number which is divisible by both 644 and 462.

OR

- (b) Two numbers are in the ratio 4 : 5 and their HCF is 11. Find the LCM of these numbers.
24. (a) Find the value(s) of 'k' so that the quadratic equation  $4x^2 + kx + 1 = 0$  has real and equal roots.
- OR
- (b) If 'α' and 'β' are the zeroes of the polynomial  $p(y) = y^2 - 5y + 3$ , then find the value of  $\alpha^4\beta^3 + \alpha^3\beta^4$ .
25. Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

## SECTION C

This section has 6 Short Answer (SA) type questions carrying 3 marks each.  $6 \times 3 = 18$

26. (a) If the mid-point of the line segment joining the points A(3, 4) and B(k, 6) is P(x, y) and  $x + y - 10 = 0$ , find the value of k.
- OR
- (b) Find the coordinates of the points which divide the line segment joining A(-2, 2) and B(2, 8) into four equal parts.



27. Prove that  $\left(5\sqrt{3} + \frac{2}{3}\right)$  is an irrational number given that  $\sqrt{3}$  is an irrational number.

28. (a) Prove that :  $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$

**OR**

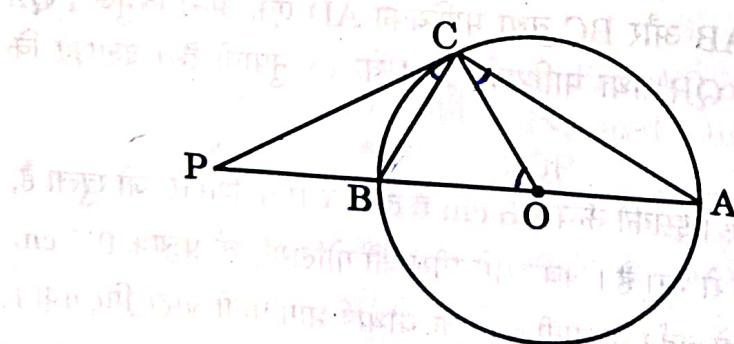
(b) Prove that :  $\left(\frac{1}{\cos A} - \cos A\right)\left(\frac{1}{\sin A} - \sin A\right) = \frac{1}{\tan A + \cot A}$

29. A chord of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding minor segment. [Use  $\pi = 3.14$ ]

30. Three unbiased coins are tossed simultaneously. Find the probability of getting :

- (a) exactly two tails
- (b) at least one head
- (c) at most two heads

31. In the given figure, PC is a tangent to the circle at C. AOB is the diameter which when extended meets the tangent at P. Find  $\angle CBA$  and  $\angle BCO$ , if  $\angle PCA = 110^\circ$ .



## SECTION D

This section has 4 Long Answer (LA) type questions carrying 5 marks each.

$4 \times 5 = 20$

32. The perimeter of an isosceles triangle is 32 cm. If each equal side is  $\frac{5}{6}$  th of the base, find the area of the triangle.

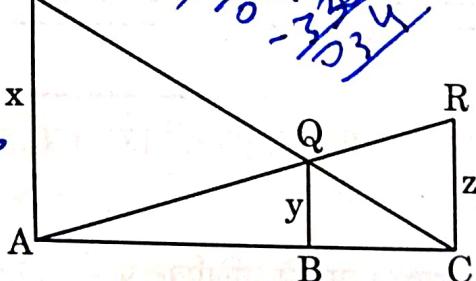
33. (a) The sum of the third term and the seventh term of an AP is 6 and their product is 8. Find the sum of the first sixteen terms of the AP.

**OR**

- (b) The minimum age of children eligible to participate in a painting competition is 8 years. It is observed that the age of the youngest boy was 8 years and the ages of the participants, when seated in order of age, have a common difference of 4 months. If the sum of the ages of all the participants is 168 years, find the age of the eldest participant in the painting competition.

34. (a) In the given figure, PA, QB and RC are perpendicular to AC. If  $PA = x$  units,  $QB = y$  units and  $RC = z$  units, prove that
- $$\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$$

$$\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$$



**OR**

- (b) Sides AB and BC and median AD of triangle ABC are respectively proportional to sides PQ and QR and median PM of  $\triangle PQR$ . Show that  $\triangle ABC \sim \triangle PQR$ .

35. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm, are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.



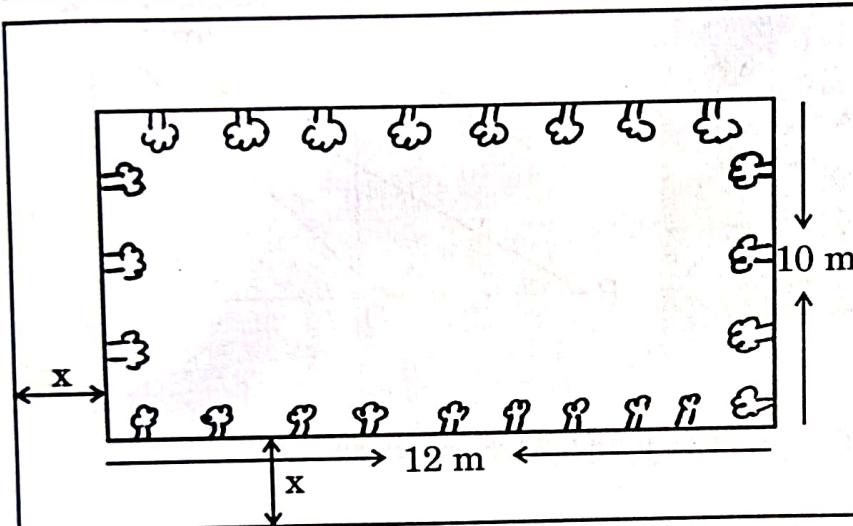
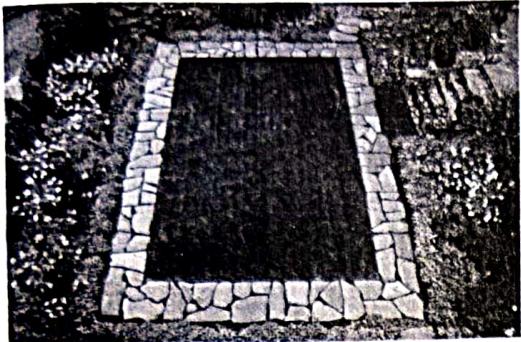
## SECTION E

This section has 3 Case Study based questions carrying 4 marks each.

$3 \times 4 = 12$

### Case Study - 1

36. A garden designer is planning a rectangular lawn that is to be surrounded by a uniform walkway.



The total area of the lawn and the walkway is 360 square metres. The width of the walkway is same on all sides. The dimensions of the lawn itself are 12 metres by 10 metres.

Based on the information given above, answer the following questions :

- (i) Formulate the quadratic equation representing the total area of the lawn and the walkway, taking width of walkway =  $x$  m. 1
- (ii) (a) Solve the quadratic equation to find the width of the walkway ' $x$ '. 2

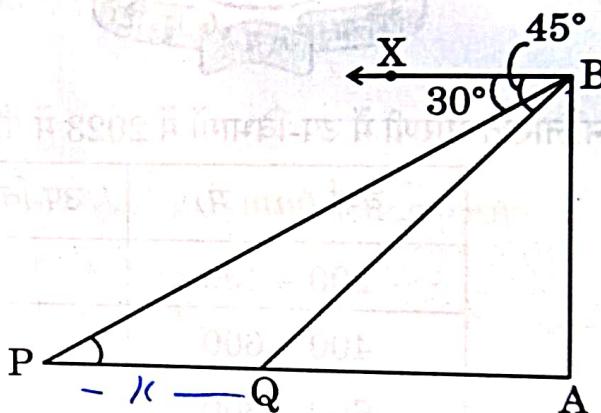
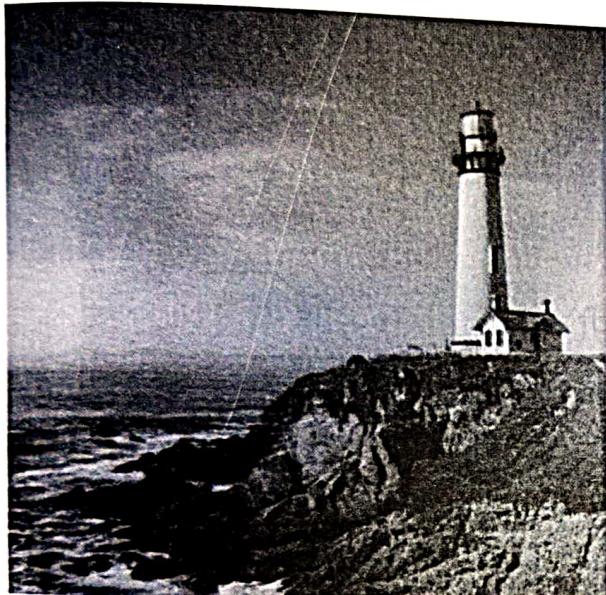
**OR**

- (b) If the cost of paving the walkway at the rate of ₹ 50 per square metre is ₹ 12,000, calculate the area of the walkway. 2
- (iii) Find the perimeter of the lawn. 1



### Case Study - 2

37. A lighthouse stands tall on a cliff by the sea, watching over ships that pass by. One day a ship is seen approaching the shore and from the top of the lighthouse, the angles of depression of the ship are observed to be  $30^\circ$  and  $45^\circ$  as it moves from point P to point Q. The height of the lighthouse is 50 metres.



Based on the information given above, answer the following questions :

- Find the distance of the ship from the base of the lighthouse when it is at point Q, where the angle of depression is  $45^\circ$ .
- Find the measures of  $\angle PBA$  and  $\angle QBA$ .
- (a) Find the distance travelled by the ship between points P and Q.

**OR**

- If the ship continues moving towards the shore and takes 10 minutes to travel from Q to A, calculate the speed of the ship in km/h, from Q to A.



### Case Study – 3

38. The India Meteorological Department observes seasonal and annual rainfall every year in different sub-divisions of our country. It helps them to compare and analyse the results.



The table below shows sub-divisions wise seasonal (monsoon) rainfall (in mm) in 2023.

Rainfall (mm)	No. of Sub-divisions
200 – 400	3
400 – 600	4
600 – 800	7
800 – 1000	4
1000 – 1200	3
1200 – 1400	3

Based on the information given above, answer the following questions :

- (i) Write the modal class.  
(ii) (a) Find the median of the given data.

**OR**

- (b) Find the mean rainfall in the season.  
(iii) If a sub-division having at least 800 mm rainfall during monsoon season is considered a good rainfall sub-division, then how many sub-divisions had good rainfall ?

1

2

2

1

