

Series : EF3GH



SET~1

रोल नं.
Roll No.



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- (I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **27** 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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प्रश्न-पत्र कोड
Q.P. Code

430/3/1

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

- (I) Please check that this question paper contains **27** printed pages.
- (II) 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.
- (III) Please check that this question paper contains **38** questions.
- (IV) Please write down the Serial Number of the question in the answer-book at the given place before attempting it.
- (V) 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.



गणित (बुनियादी)

MATHEMATICS (BASIC)

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80



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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 $p = 2^3 \times 3^2 \times 5$ and $q = 2^2 \times 3^3$, then the LCM of p and q is :
- (A) $2^3 \times 3^3$
 - (B) $2^2 \times 3^2$
 - (C) $2^2 \times 3^2 \times 5$
 - (D) $2^3 \times 3^3 \times 5$
2. 3^n , where n is a natural number, cannot end with the digit :
- (A) 3
 - (B) 5
 - (C) 7
 - (D) 9



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3. A prime number has :
- (A) exactly two prime factors
 - (B) exactly one prime factor
 - (C) at least one prime factor
 - (D) at least two prime factors
4. For what value(s) of k does the system of equations $kx + 2y = 3$ and $2x + y = 5$ have a unique solution ?
- (A) $k =$ a real number
 - (B) $k \neq 8$
 - (C) $k \neq 4$
 - (D) $k = 4$
5. If $x = \sqrt{x}$, ($x \neq 0$) is expressed as a quadratic equation in the form $ax^2 + bx + c = 0$, then the value of $a + b + c$ is :
- (A) 0
 - (B) 1
 - (C) 2
 - (D) 3
6. If point $(1, 2)$ is the mid-point of the line segment joining the points $(3, 5)$ and $(2a, b)$, then $(a, b) =$
- (A) $(-1, -1)$
 - (B) $\left(-\frac{1}{2}, -\frac{1}{2}\right)$
 - (C) $\left(-\frac{1}{2}, -1\right)$
 - (D) $\left(-1, -\frac{1}{2}\right)$
7. The distance of point $(-3, 4)$ from y -axis is :
- (A) -3
 - (B) 3
 - (C) 4
 - (D) 5
8. The value of $\frac{\sec^2 30^\circ + \tan^2 30^\circ}{\sin^2 45^\circ + \cos^2 45^\circ}$ is :
- (A) 1
 - (B) $\frac{5}{3}$
 - (C) $\frac{13}{3}$
 - (D) 7

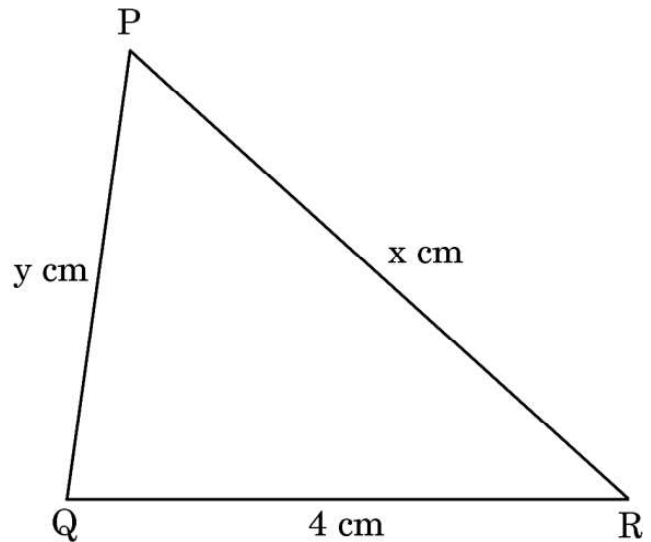
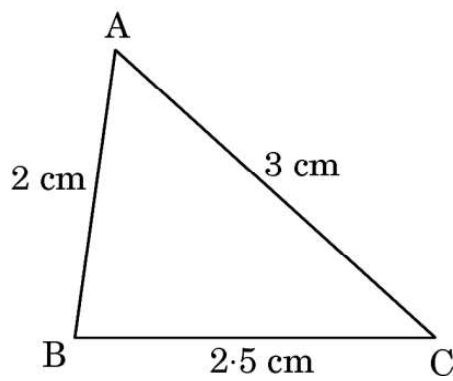


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9. Which types of triangles are always similar ?

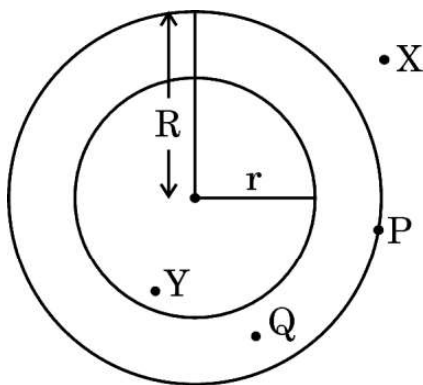
- (A) Right-angled triangles
- (B) Acute-angled triangles
- (C) Isosceles triangles
- (D) Equilateral triangles

10. What values of x and y will make $\triangle ABC$ similar to $\triangle QRP$ in the figures given below ?



- (A) $x = 6, y = 5$
- (B) $x = 5, y = 6$
- (C) $x = 6, y = 6$
- (D) $x = 12, y = 3.2$

11. In the given figure, from which point can the tangent **not** be drawn to the circle with radius r ?

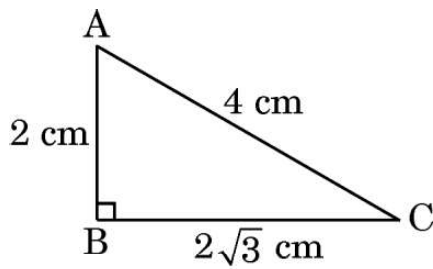


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|-------|-------|
| (A) X | (B) P |
| (C) Q | (D) Y |



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12. In the given figure, the angle of elevation of point A from point C is :



- (A) 30° (B) 45°
(C) 60° (D) Cannot be determined
13. The angle of the sector of a circle whose area is one-eighth of the area of the circle is :
(A) $22\frac{1}{2}^\circ$ (B) 45°
(C) 60° (D) 90°
14. The perimeter of a quadrant of a circle of circumference 22 cm is :
(A) 29 cm
(B) 22 cm
(C) 12.5 cm
(D) 5.5 cm
15. A cone and cylinder have same height and same radius. The volume of the cone and the volume of the cylinder are in the ratio :
(A) 1 : 1 (B) 1 : 3
(C) 3 : 1 (D) 1 : 2
16. The following table shows the marks scored by 23 students of a class.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Number of Students	5	3	4	8	3

The lower limit of the modal class is :

- (A) 10 (B) 20
(C) 30 (D) 40



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17. For a distribution, if mean = 15 and mode = 12, then its median is :
- (A) 12
(B) 13
(C) 14
(D) 15
18. A pair of dice is thrown simultaneously. Let E denote the event that “The sum of numbers obtained on both dice is at least 9.” The number of outcomes in favour of event E is :
- (A) 4
(B) 6
(C) 10
(D) 26

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 Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but 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) :* For $\sin \theta = 1$, $\cos \theta$ must be 0.
Reason (R) : $\sin^2 \theta - \cos^2 \theta = 1$.
20. *Assertion (A) :* Every quadratic equation has two real roots.
Reason (R) : A quadratic polynomial can have at most two zeroes.



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SECTION B

This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each. 5×2=10

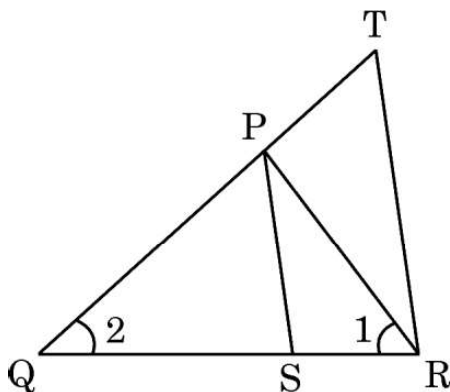
21. Solve the following system of equations graphically :

$$2x - 3y = -6 \text{ and } x = 3$$

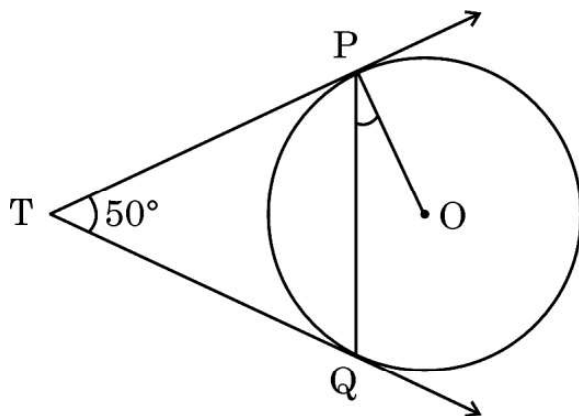
22. (a) A vertical pole of height 10 m casts a shadow of 15 m on the ground and at the same time, a tower casts a shadow of 45 m on the ground. Find the height of the tower.

OR

- (b) In the given figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Prove that $\triangle PQS \sim \triangle TQR$.



23. In the given figure, TP and TQ are two tangents. If $\angle PTQ = 50^\circ$, then find the measure of $\angle OPQ$.



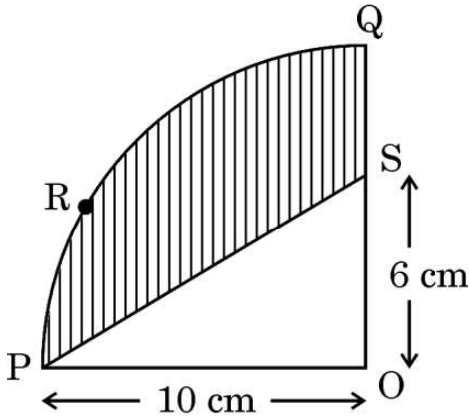
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24. (क) यदि $\sin 3A = 1$ है, तो $\cos 2A - \tan^2 45^\circ$ का मान ज्ञात कीजिए।

अथवा

- (ख) यदि $(\sec A + \tan A)(1 - \sin A) = k \cos A$ है, तो k का मान ज्ञात कीजिए।

25. दी गई आकृति में, OPRQ, एक वृत्त जिसका केन्द्र O और त्रिज्या 10 cm है, का एक चतुर्थांश है। यदि OP = 10 cm और OS = 6 cm हो, तो छायांकित भाग का क्षेत्रफल ज्ञात कीजिए। ($\pi = 3.14$ प्रयोग कीजिए)



खण्ड ग

इस खण्ड में 6 लघु-उत्तरीय (SA) प्रकार के प्रश्न हैं, जिनमें प्रत्येक के 3 अंक हैं।

6×3=18

26. (क) सिद्ध कीजिए कि $\sqrt{2}$ एक अपरिमेय संख्या है।

अथवा

- (ख) ज्ञात कीजिए कि निम्नलिखित संख्याओं a , b और c में से कौन-सी भाज्य संख्या/संख्याएँ है/हैं।

$$a = 7 \times 11 \times 13 + 13$$

$$b = 6 \times 5 \times 4 + 4$$

$$c = 7 \times 13 + 6$$

27. बहुपद $9s^2 - 6s + 1$ के शून्यक ज्ञात कीजिए और दिए गए बहुपद के शून्यकों तथा गुणांकों के बीच संबंध की सत्यता की जाँच कीजिए।



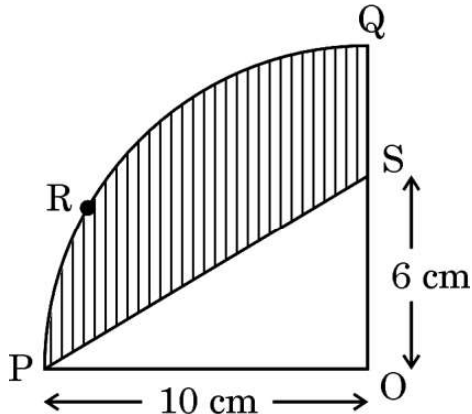
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24. (a) If $\sin 3A = 1$, then find the value of $\cos 2A - \tan^2 45^\circ$.

OR

- (b) If $(\sec A + \tan A)(1 - \sin A) = k \cos A$, then find the value of k .

25. In the given figure, OPRQ is a quadrant of a circle with centre O and radius 10 cm. If OP = 10 cm and OS = 6 cm, find the area of the shaded region. (Use $\pi = 3.14$)



SECTION C

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

26. (a) Prove that $\sqrt{2}$ is an irrational number.

OR

- (b) Find which among the following numbers a , b and c is/are composite numbers.

$$a = 7 \times 11 \times 13 + 13$$

$$b = 6 \times 5 \times 4 + 4$$

$$c = 7 \times 13 + 6$$

27. Find the zeroes of the polynomial $9s^2 - 6s + 1$ and verify the relationship between the zeroes and the coefficients of the given polynomial.



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28. (क) एक भिन्न $\frac{1}{3}$ हो जाता है, जब उसके अंश से 1 घटाया जाता है और वह $\frac{1}{4}$ हो जाता है, जब उसके हर में 8 जोड़ दिया जाता है। वह भिन्न ज्ञात कीजिए।

अथवा

- (ख) k का वह मान ज्ञात कीजिए जिससे निम्नलिखित रैखिक समीकरणों के युग्म के अपरिमित रूप से अनेक हल हैं :

$$kx + 3y - (k - 3) = 0 \text{ और } 12x + ky - k = 0$$

इस प्रकार प्राप्त समीकरण युग्म के कोई दो हल ज्ञात कीजिए।

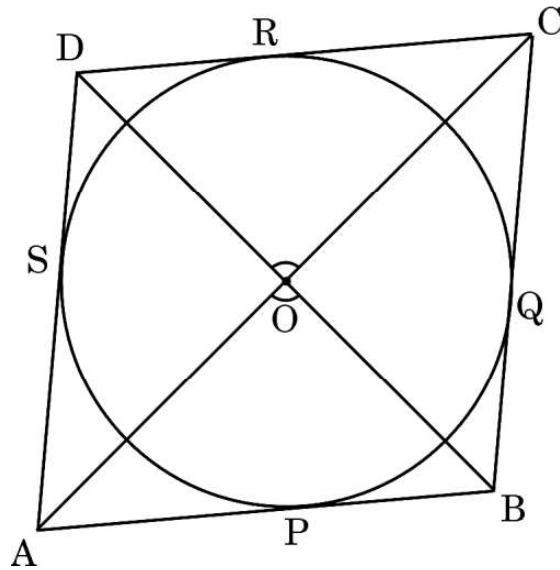
29. सिद्ध कीजिए कि :

$$\frac{1 + \operatorname{cosec} A}{\operatorname{cosec} A} = \frac{\cos^2 A}{1 - \sin A}$$

30. एक डिब्बे में 6 नीले, 4 सफेद और 8 लाल कंचे हैं। एक कंचा इस डिब्बे से यादृच्छया निकाला जाता है। प्रायिकता ज्ञात कीजिए कि निकाला गया कंचा :

- (i) सफेद है
- (ii) सफेद या लाल है
- (iii) लाल नहीं है

31. दी गई आकृति में, एक चतुर्भुज ABCD में एक वृत्त बना है जो चतुर्भुज की भुजाओं AB, BC, CD और DA को क्रमशः बिन्दुओं P, Q, R तथा S पर स्पर्श करता है। सिद्ध कीजिए कि $\angle AOB + \angle COD = 180^\circ$.



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28. (a) A fraction becomes $\frac{1}{3}$, when 1 is subtracted from the numerator and it becomes $\frac{1}{4}$, when 8 is added to its denominator. Find the fraction.

OR

- (b) Find the value of k for which the following pair of linear equations will have infinitely many solutions :

$$kx + 3y - (k - 3) = 0 \text{ and } 12x + ky - k = 0$$

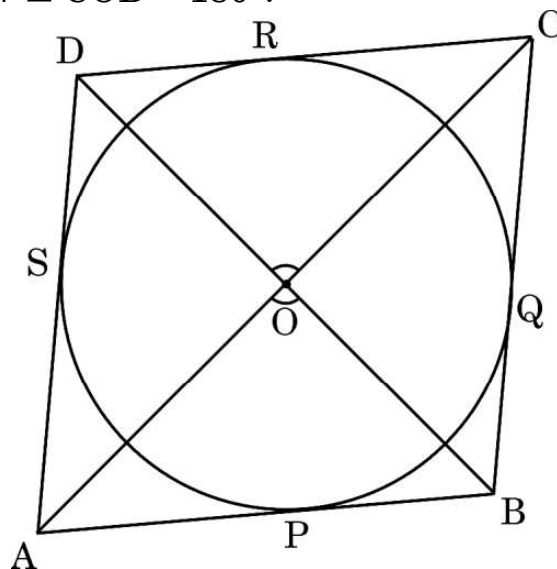
Hence, find any two solutions of the given pair of equations.

29. Prove that :

$$\frac{1 + \operatorname{cosec} A}{\operatorname{cosec} A} = \frac{\cos^2 A}{1 - \sin A}$$

30. A box contains 6 blue, 4 white and 8 red marbles. A marble is drawn at random from this box. Find the probability that the marble so drawn is :
- (i) white
 - (ii) white or red
 - (iii) not red

31. In the given figure, a circle is inscribed in a quadrilateral ABCD which touches the sides AB, BC, CD and DA at P, Q, R and S respectively. Prove that $\angle AOB + \angle COD = 180^\circ$.



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SECTION D

This section has 4 Long Answer (LA) type questions carrying 5 marks each. $4 \times 5 = 20$

32. (a) Find two consecutive odd integers, sum of whose squares is 290.

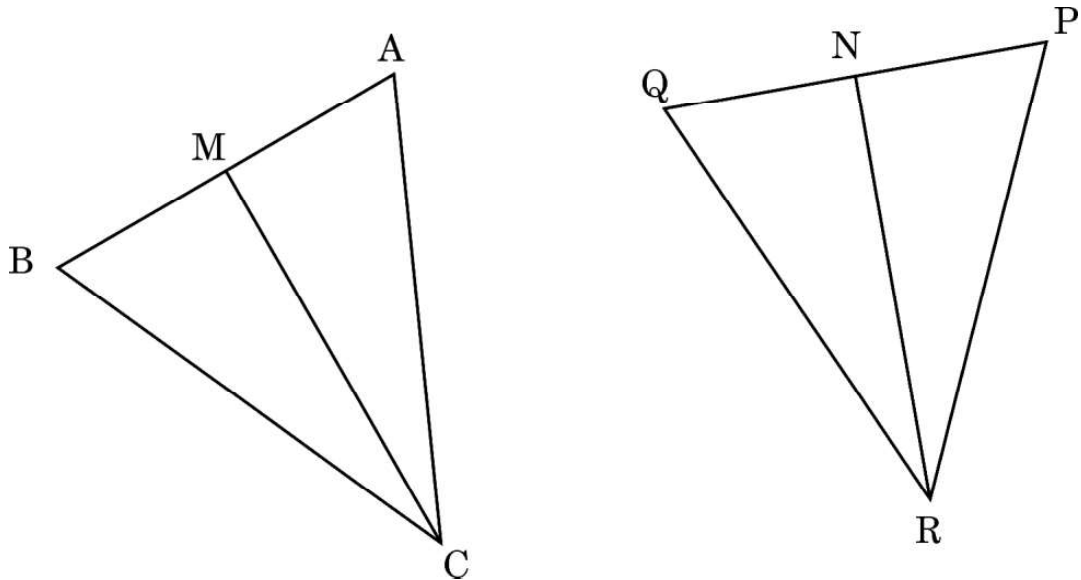
OR

- (b) A charity trust decides to build a rectangular hall having an area of 300 m^2 . The length of the hall is one metre more than twice its width. Find the length and breadth of the hall.

33. (a) State and Prove “Basic Proportionality Theorem”.

OR

- (b) In the given figure, CM and RN are respectively, the medians of $\triangle ABC$ and $\triangle PQR$. If $\triangle ABC \sim \triangle PQR$, prove that :

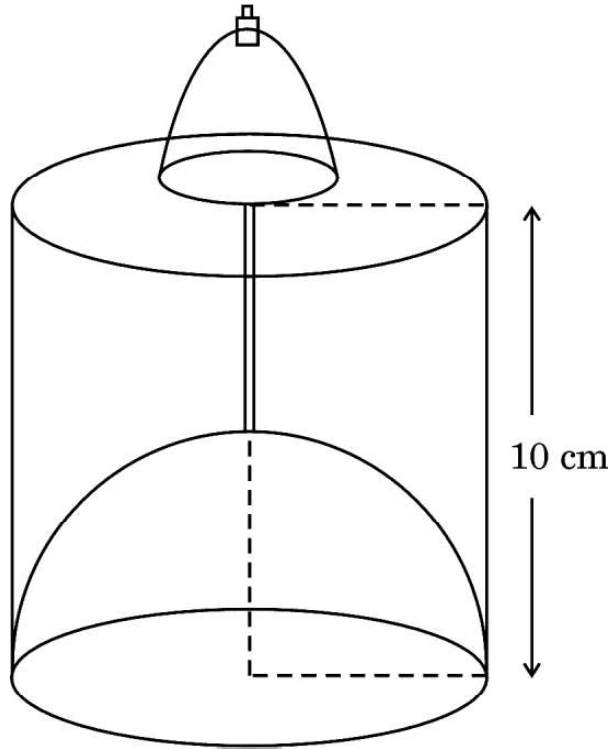


- (i) $\triangle AMC \sim \triangle PNR$
- (ii) $\angle BCM = \angle QRN$
- (iii) $\triangle BMC \sim \triangle QNR$



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34. A perfume bottle is in the form of a cylinder but the bottom of the bottle has a hemispherical raised portion to reduce the capacity of the bottle. The inner diameter of the bottle is 5 cm and the height of the bottle is 10 cm. Find the capacity of the perfume bottle in mL. (Use $\pi = 3.14$ and $1 \text{ cm}^3 = 1 \text{ mL}$)



35. The weights of 30 students of a class are given in the following distribution table :

Weight (in kg)	Number of students
40 – 45	2
45 – 50	5
50 – 55	8
55 – 60	6
60 – 65	6
65 – 70	3

Find the median weight of the students.



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SECTION E

This section has 3 case study based questions carrying 4 marks each.

3×4=12

Case Study – 1

36. In a society, a yoga instructor was hired to train the people of the society to live a healthy lifestyle. Yoga sessions were held daily from 5 p.m. to 7 p.m. in the society park. On day one, 5 people joined the yoga session, on day two, 3 more people joined, on day three, another 3 people joined and in this manner every next day, 3 more people kept on joining.



Based on the given information, answer the following questions :

- | | | |
|-------|---|---|
| (i) | On which day did 59 people join the yoga session ? | 1 |
| (ii) | How many people joined the yoga session on the 31 st day ? | 1 |
| (iii) | (a) The yoga instructor was paid ₹100 for each person attending the yoga session. On which day would he earn ₹5,000 ? | 2 |

OR

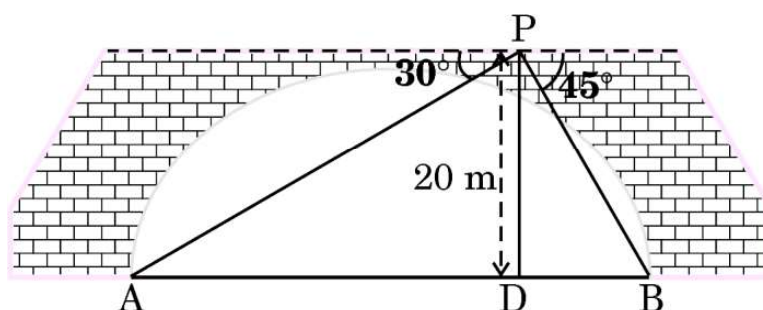
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| (b) | What was the total amount earned by the yoga instructor in 16 days ? | 2 |
|-----|--|---|



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Case Study – 2

37. Two motorboats A and B are waiting at the opposite banks of a river in order to reach the opposite side. From a point P on the bridge, 20 m above the river, the angles of depression of the boats are 30° and 45° respectively, as shown in the figure given below. Both the boats leave at the same time at the speed of 10 m/s and 5 m/s, respectively



Based on the above information, answer the following questions :

- (i) Find the distance travelled by boat A to reach point D in the river, vertically below the point P. (Use $\sqrt{3} = 1.73$) 1
- (ii) What is the width of the river ? 1
- (iii) (a) Which boat will reach point D first, and how much earlier, than the other boat ? 2

OR

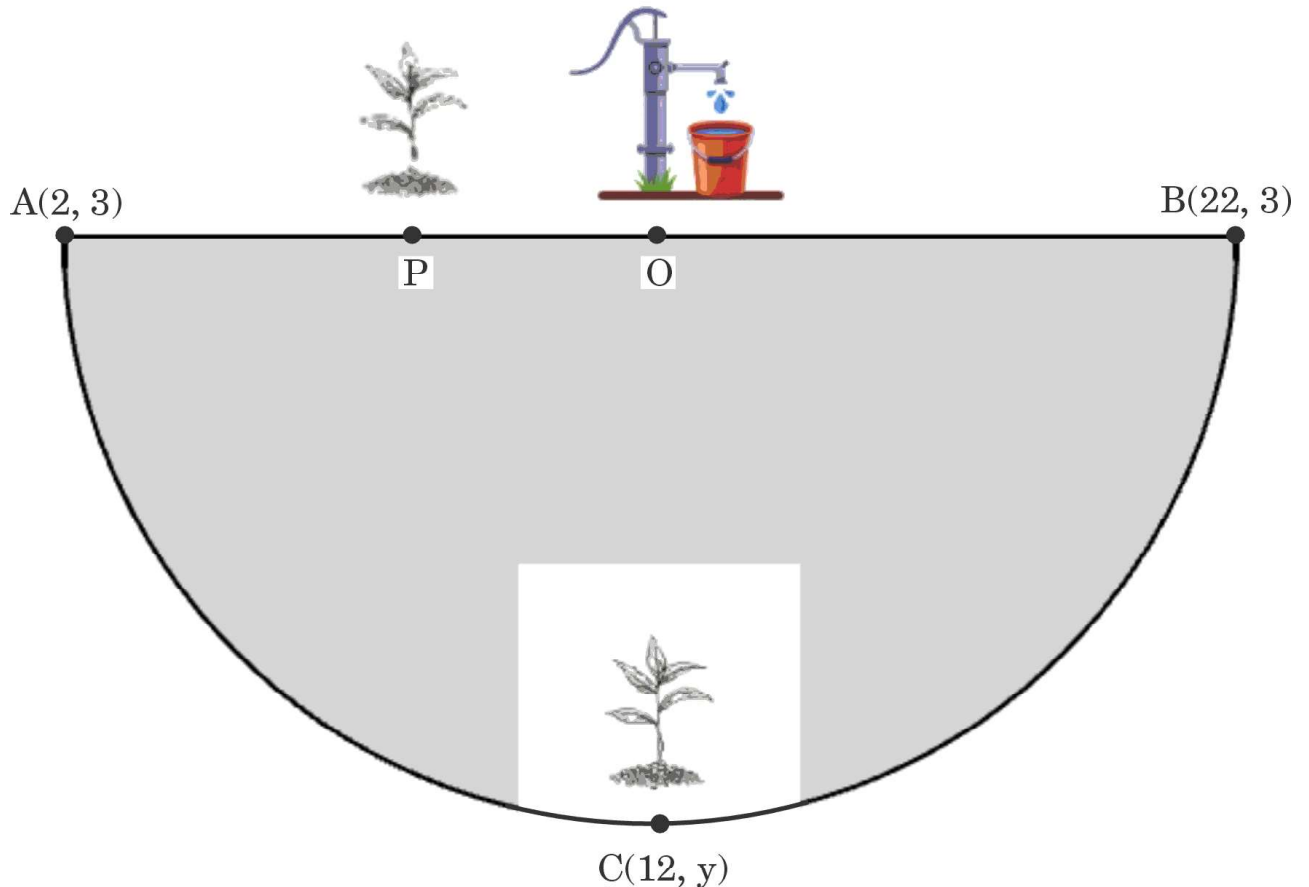
- (b) What is the distance between the two boats after 3 seconds ? 2



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Case Study – 3

38. There is a semicircular park in Aman's society. He wishes to plant saplings along the boundary of the park. There is a borewell at the centre O of the park along the diameter AB as shown in the figure below.



Based on the above information, answer the following questions :

- (i) Find the coordinates of point O. 1
- (ii) Find the radius of the semicircular park. 1
- (iii) (a) One sapling is kept at point C(12, y). Find the coordinates of C. 2

OR

- (b) One sapling is kept at point P along AB so that $PA = \frac{1}{3} PB$.
Find the coordinates of P. 2

