

Series : F6EGH



SET ~ 3



रोल नं.

Roll No.



प्रश्न-पत्र कोड
Q.P. Code **430/6/3**

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.

नोट

- (I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 23 हैं।
- (II) कृपया जाँच कर लें कि इस प्रश्न-पत्र में 38 प्रश्न हैं।
- (III) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- (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।

NOTE

- (I) Please check that this question paper contains 23 printed pages.
- (II) Please check that this question paper contains 38 questions.
- (III) 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.
- (IV) Please write down the Serial Number of the question in the answer-book at the given place before attempting it.
- (V) 15 minutes 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 carefully and follow them :

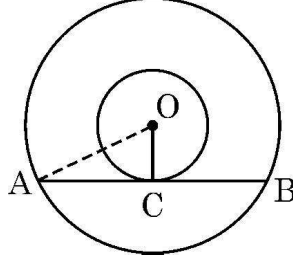
- (i) *This question paper contains 38 questions. All questions are compulsory.*
- (ii) *Question Paper is divided into FIVE Sections – SECTION A, B, C, D and E.*
- (iii) *In Section–A, question numbers 1 to 18 are Multiple Choice Questions (MCQs) and question numbers 19 & 20 are Assertion-Reason based questions of 1 mark each.*
- (iv) *In Section–B, question numbers 21 to 25 are Very Short Answer (VSA) type questions of 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-based integrated units of assessment 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 figures wherever required. Take $\pi = 22/7$ wherever required if not stated.*
- (x) *Use of calculators is NOT allowed.*



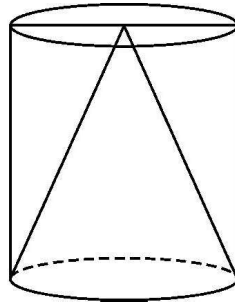
(बहुविकल्पीय प्रश्न)

इस खण्ड में 20 बहुविकल्पीय प्रश्न हैं, जिनमें प्रत्येक का 1 अंक है।

1. केन्द्र O पर संकेन्द्रित दो वृत्तों में से बड़े वृत्त की जीवा AB छोटे वृत्त को बिन्दु C पर स्पर्श करती है। यदि $OA = 3.5 \text{ cm}$, $OC = 2.1 \text{ cm}$ हो, तो AB का मान है



- (A) 5.6 cm (B) 2.8 cm
(C) 3.5 cm (D) 4.2 cm
2. तीन सिक्कों को एक साथ उछाला गया। कम से कम एक चित आने की प्रायिकता है
- (A) $\frac{3}{8}$ (B) $\frac{7}{8}$
(C) $\frac{1}{8}$ (D) $\frac{3}{4}$
3. एक खोखले लंबवृत्तीय बेलन में हवा का आयतन 450 cm^3 है। समान त्रिज्या तथा ऊँचाई वाला एक शंकु इस बेलन के अन्दर रखा गया है। बेलन में रिक्त स्थान का आयतन है



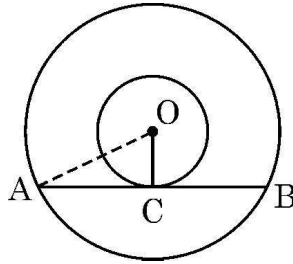
- (A) 225 cm^3 (B) 150 cm^3
(C) 250 cm^3 (D) 300 cm^3
4. किसी समय पर एक मीनार की छाया की लम्बाई उसकी ऊँचाई की $\sqrt{3}$ गुना है। सूर्य का उन्नयन कोण है
- (A) 45° (B) 30°
(C) 60° (D) 0°



(Multiple Choice Questions)

Section-A consists of **20** Multiple Choice Questions of **1** mark each.

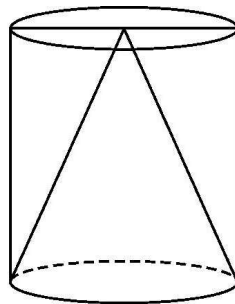
1. In two concentric circles centred at O, a chord AB of the larger circle touches the smaller circle at C. If $OA = 3.5$ cm, $OC = 2.1$ cm, then AB is equal to



- (A) 5.6 cm (B) 2.8 cm
(C) 3.5 cm (D) 4.2 cm
2. Three coins are tossed together. The probability that at least one head comes up, is

- (A) $\frac{3}{8}$ (B) $\frac{7}{8}$
(C) $\frac{1}{8}$ (D) $\frac{3}{4}$

3. The volume of air in a hollow cylinder is 450 cm^3 . A cone of same height and radius as that of cylinder is kept inside it. The volume of empty space in the cylinder is



- (A) 225 cm^3 (B) 150 cm^3
(C) 250 cm^3 (D) 300 cm^3
4. If the length of the shadow of a tower is $\sqrt{3}$ times its height, then the angle of elevation of the sun is
- (A) 45° (B) 30°
(C) 60° (D) 0°



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5. A.P. : $\frac{3}{2}, \frac{1}{2}, \frac{-1}{2}, \frac{-3}{2}, \dots$ का 22वाँ पद है :

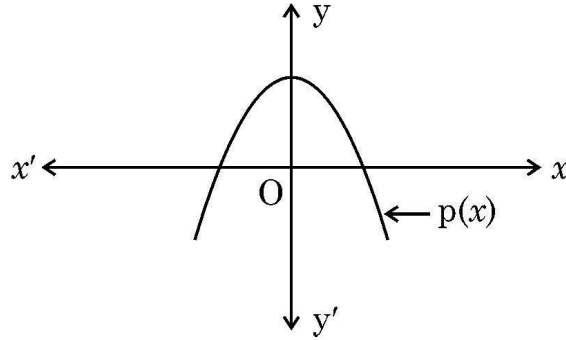
(A) $\frac{45}{2}$

(B) -9

(C) $\frac{-39}{2}$

(D) -21

6. दिये गये ग्राफ में, बहुपद $p(x)$ को दर्शाया गया है। $p(x)$ के शून्यकों की संख्या है



(A) 3

(B) 2

(C) 1

(D) 4

7. यदि किसी घटना के घटित होने की प्रायिकता 57% है, तो उस घटना के घटित ना होने की प्रायिकता है :

(A) 0.43

(B) 0.57

(C) 53%

(D) $\frac{1}{57}$

8. 7 cm त्रिज्या तथा केन्द्र O वाले वृत्त का त्रिज्यखंड (sector) OAB है। यदि चाप $\widehat{AB} = \frac{22}{3}$ cm है, तो $\angle AOB$ बराबर है

(A) $\left(\frac{120}{7}\right)^\circ$

(B) 45°

(C) 60°

(D) 30°

9. यदि एक A.P. के प्रथम n पदों का योग $S_n = \frac{n}{2} (3n + 1)$ है, तो A.P. का प्रथम पद है :

(A) 2

(B) $\frac{3}{2}$

(C) 4

(D) $\frac{5}{2}$

10. एक वर्गीकृत वितरण का माध्य ज्ञात करने के लिये राहुल ने कल्पित माध्य विधि का उपयोग किया। यदि $d = (x - A)$ है, जहाँ A कल्पित माध्य है, तो $\bar{x}$ का मान है

(A) $A + \bar{d}$

(B) $A + h\bar{d}$

(C) $h(A + \bar{d})$

(D) $A - h\bar{d}$

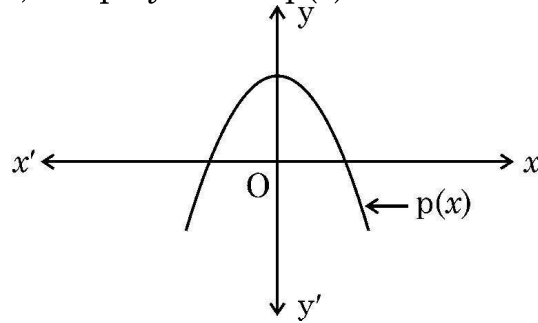


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5. 22nd term of the A.P. : $\frac{3}{2}, \frac{1}{2}, \frac{-1}{2}, \frac{-3}{2}, \dots$ is

- (A) $\frac{45}{2}$ (B) -9
(C) $\frac{-39}{2}$ (D) -21

6. In the given graph, the polynomial $p(x)$ is shown. Number of zeroes of $p(x)$ is



- (A) 3 (B) 2
(C) 1 (D) 4

7. If probability of happening of an event is 57%, then probability of non-happening of the event is

- (A) 0.43 (B) 0.57
(C) 53% (D) $\frac{1}{57}$

8. OAB is sector of a circle with centre O and radius 7 cm. If length of arc $\widehat{AB} = \frac{22}{3}$ cm, then $\angle AOB$ is equal to

- (A) $\left(\frac{120}{7}\right)^\circ$ (B) 45°
(C) 60° (D) 30°

9. If the sum of first n terms of an A.P. is given by $S_n = \frac{n}{2}(3n + 1)$, then the first term of the A.P. is

- (A) 2 (B) $\frac{3}{2}$
(C) 4 (D) $\frac{5}{2}$

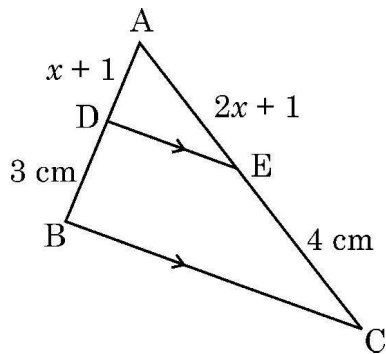
10. To calculate mean of a grouped data, Rahul used assumed mean method. He used $d = (x - A)$, where A is assumed mean. Then $\bar{x}$ is equal to

- (A) $A + \bar{d}$ (B) $A + h\bar{d}$
(C) $h(A + \bar{d})$ (D) $A - h\bar{d}$



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11. बिंदु $(3, -5)$, रेखा $mx - y = 11$ पर स्थित है। m का मान है
 (A) 3 (B) -2
 (C) 8 (D) 2
12. यदि $\sqrt{3} \sin \theta = \cos \theta$ है, तो θ का मान है
 (A) $\sqrt{3}$ (B) 60°
 (C) $\frac{1}{\sqrt{3}}$ (D) 30°
13. बिंदु $(2, -2)$, $(8, 4)$, $(4, 8)$ तथा $(-2, 2)$ इसी क्रम में लेने पर आयत ABCD के शीर्ष बिंदु हैं।
 इसके विकर्ण की लम्बाई है
 (A) $4\sqrt{2}$ (B) $6\sqrt{2}$
 (C) $4\sqrt{26}$ (D) $2\sqrt{26}$
14. दो पासों को एक साथ फेंका जाता है। प्राप्त संख्याओं का योग 9 से अधिक होने की प्रायिकता है
 (A) $\frac{5}{6}$ (B) $\frac{5}{18}$
 (C) $\frac{1}{6}$ (D) $\frac{1}{2}$
15. $\triangle ABC$ में, $DE \parallel BC$ है। यदि $AE = (2x + 1)$ cm, $EC = 4$ cm, $AD = (x + 1)$ cm तथा $DB = 3$ cm है, तो x का मान है

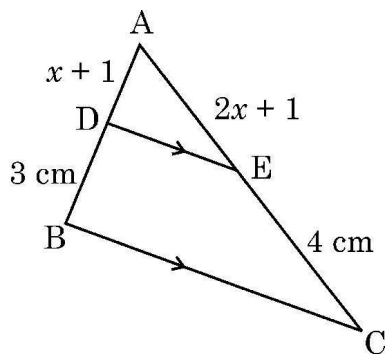


- (A) 1 (B) $\frac{1}{2}$
 (C) -1 (D) $\frac{1}{3}$



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11. The point $(3, -5)$ lies on the line $mx - y = 11$. The value of m is
(A) 3 (B) -2
(C) 8 (D) 2
12. If $\sqrt{3} \sin \theta = \cos \theta$, then value of θ is
(A) $\sqrt{3}$ (B) 60°
(C) $\frac{1}{\sqrt{3}}$ (D) 30°
13. ABCD is a rectangle with its vertices at $(2, -2)$, $(8, 4)$, $(4, 8)$ and $(-2, 2)$ taken in order. Length of its diagonal is
(A) $4\sqrt{2}$ (B) $6\sqrt{2}$
(C) $4\sqrt{26}$ (D) $2\sqrt{26}$
14. Two dice are rolled together. The probability of getting a sum more than 9 is
(A) $\frac{5}{6}$ (B) $\frac{5}{18}$
(C) $\frac{1}{6}$ (D) $\frac{1}{2}$
15. In $\triangle ABC$, $DE \parallel BC$. If $AE = (2x + 1)$ cm, $EC = 4$ cm, $AD = (x + 1)$ cm and $DB = 3$ cm, then value of x is



- (A) 1 (B) $\frac{1}{2}$
(C) -1 (D) $\frac{1}{3}$

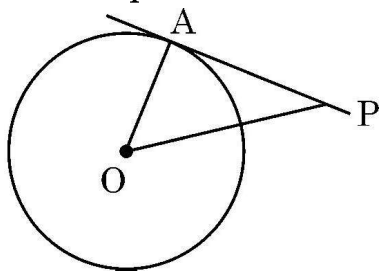


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16. The value of k for which the system of equations $3x - 7y = 1$ and $kx + 14y = 6$ is inconsistent, is

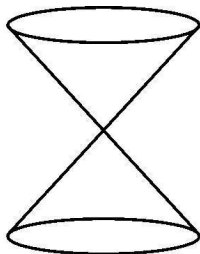
- (A) -6 (B) $\frac{2}{3}$
(C) 6 (D) $\frac{-3}{2}$

17. In the given figure, PA is tangent to a circle with centre O . If $\angle APO = 30^\circ$ and $OA = 2.5$ cm, then OP is equal to



- (A) 2.5 cm (B) 5 cm
(C) $\frac{5}{\sqrt{3}}$ cm (D) 2 cm

18. Two identical cones are joined as shown in the figure. If radius of base is 4 cm and slant height of the cone is 6 cm, then height of the solid is



- (A) 8 cm (B) $4\sqrt{5}$ cm
(C) $2\sqrt{5}$ cm (D) 12 cm

(Assertion – Reason based questions)

Directions : In question numbers **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 correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not correct explanation for Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false, but Reason (R) is true.



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19. **Assertion (A) :** $(a + \sqrt{b}) \cdot (a - \sqrt{b})$ is a rational number, where a and b are positive integers.

Reason (R) : Product of two irrationals is always rational.

20. **Assertion (A) :** $\triangle ABC \sim \triangle PQR$ such that $\angle A = 65^\circ$, $\angle C = 60^\circ$. Hence $\angle Q = 55^\circ$.

Reason (R) : Sum of all angles of a triangle is 180° .

Section – B

(Very Short Answer Type Questions)

$5 \times 2 = 10$

Q. Nos. **21** to **25** are Very Short Answer type questions of **2** marks each.

21. A box contains 120 discs, which are numbered from 1 to 120. If one disc is drawn at random from the box, find the probability that

- (i) it bears a 2– digit number
- (ii) the number is a perfect square.

22. (a) Evaluate : $\frac{\cos 45^\circ}{\tan 30^\circ + \sin 60^\circ}$

OR

- (b) Verify that $\sin 2A = \frac{2 \tan A}{1 + \tan^2 A}$, for $A = 30^\circ$.

23. (a) Solve the quadratic equation $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$ using quadratic formula.

OR

- (b) Find the nature of roots of the equation $4x^2 - 4a^2x + a^4 - b^4 = 0$, $b \neq 0$

24. Using prime factorisation, find the HCF of 180, 140 and 210.

25. The perimeters of two similar triangles are 22 cm and 33 cm respectively. If one side of first triangle is 9 cm, then find the length of corresponding side of the second triangle.



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Section – C

(Short Answer Type Questions)

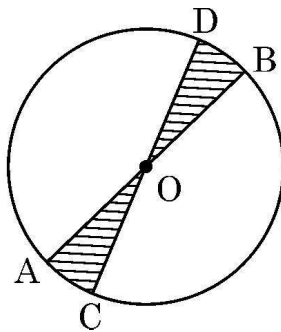
6 × 3 = 18

Q. Nos. 26 to 31 are Short Answer type questions of 3 marks each.

26. Given that $\sqrt{5}$ is an irrational number, prove that $2 + 3\sqrt{5}$ is an irrational number.
27. (a) Find the A.P. whose third term is 16 and seventh term exceeds the fifth term by 12. Also, find the sum of first 29 terms of the A.P.

OR

- (b) Find the sum of first 20 terms of an A.P. whose n^{th} term is given by $a_n = 5 + 2n$. Can 52 be a term of this A.P. ?
28. Prove that $\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$.
29. Find length and breadth of a rectangular park whose perimeter is 100 m and area is 600 m^2 .
30. AB and CD are diameters of a circle with centre O and radius 7 cm. If $\angle BOD = 30^\circ$, then find the area and perimeter of the shaded region.



31. (a) α, β are zeroes of the polynomial $3x^2 - 8x + k$. Find the value of k, if $\alpha^2 + \beta^2 = \frac{40}{9}$.

OR

- (b) Find the zeroes of the polynomial $2x^2 + 7x + 5$ and verify the relationship between its zeroes and co-efficients.



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Section – D

(Long Answer Type Questions)

$4 \times 5 = 20$

Q. Nos. 32 to 35 are Long Answer type questions of 5 marks each.

32. Find 'mean' and 'mode' marks of the following data :

Marks	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30
Number of students	2	3	8	15	14	8

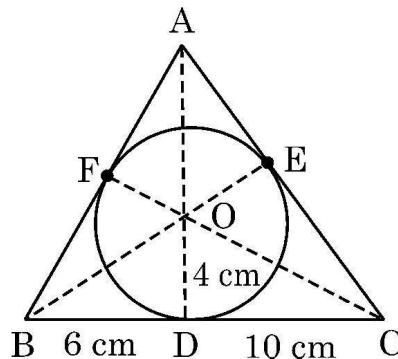
33. (a) Solve the following pair of linear equations by graphical method :

$$2x + y = 9 \text{ and } x - 2y = 2$$

OR

(b) Nidhi received simple interest of ₹ 1,200 when invested ₹ x at 6% p.a. and ₹ y at 5% p.a. for 1 year. Had she invested ₹ x at 3% p.a. and ₹ y at 8% p.a. for that year, she would have received simple interest of ₹ 1,260. Find the values of x and y .

34. (a) The given figure shows a circle with centre O and radius 4 cm circumscribed by $\triangle ABC$. BC touches the circle at D such that $BD = 6$ cm, $DC = 10$ cm. Find the length of AE .

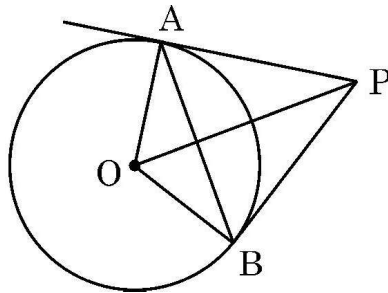


OR



(b) PA and PB are tangents drawn to a circle with centre O.

If $\angle AOB = 120^\circ$ and $OA = 10$ cm, then



(i) Find $\angle OPA$.

1

(ii) Find the perimeter of $\triangle OAP$.

3

(iii) Find the length of chord AB.

1

35. A drone is flying at a height of h metres. At an instant it observes the angle of elevation of top of an industrial turbine as 60° and angle of depression of foot of the turbine as 30° . If height of turbine is 200 metres, find the value of h and the distance of drone from the turbine.

(Use $\sqrt{3} = 1.73$)

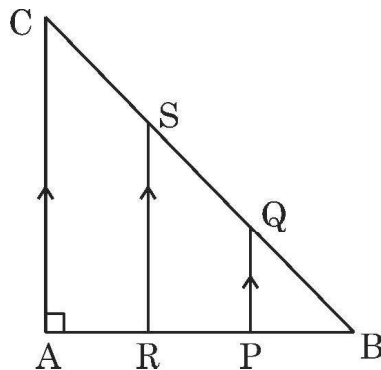
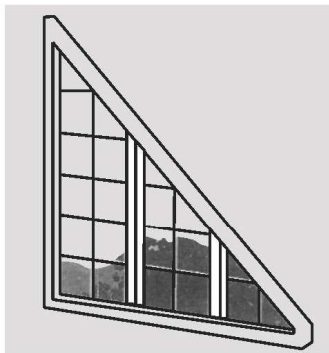
Section – E

(Case-study based Questions)

$3 \times 4 = 12$

Q. Nos. 36 to 38 are Case-study based Questions of 4 marks each.

36.



A triangular window of a building is shown above. Its diagram represents a $\triangle ABC$ with $\angle A = 90^\circ$ and $AB = AC$. Points P and R trisect AB and $PQ \parallel RS \parallel AC$.

Based on the above, answer the following questions :

(i) Show that $\triangle BPQ \sim \triangle BAC$.

1



(ii) Prove that $PQ = \frac{1}{3} AC$.

1

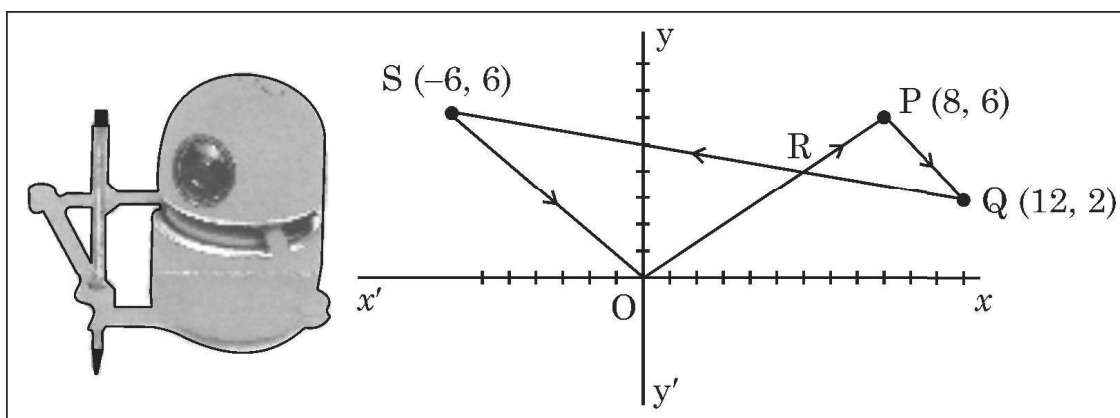
(iii) (a) If $AB = 3$ m, find length BQ and BS . Verify that $BQ = \frac{1}{2} BS$.

2

OR

(iii) (b) Prove that $BR^2 + RS^2 = \frac{4}{9} BC^2$.

37. Gurveer and Arushi built a robot that can paint a path as it moves on a graph paper. Some co-ordinate of points are marked on it. It starts from $(0, 0)$, moves to the points listed in order (in straight lines) and ends at $(0, 0)$.



Arushi entered the points $P(8, 6)$, $Q(12, 2)$ and $S(-6, 6)$ in order. The path drawn by robot is shown in the figure.

Based on the above, answer the following questions :

(i) Determine the distance OP .

1

(ii) QS is represented by equation $2x + 9y = 42$. Find the co-ordinates of the point where it intersects y - axis.

1

(iii) (a) Point $R(4.8, y)$ divides the line segment OP in a certain ratio, find the ratio. Hence, find the value of y .

2

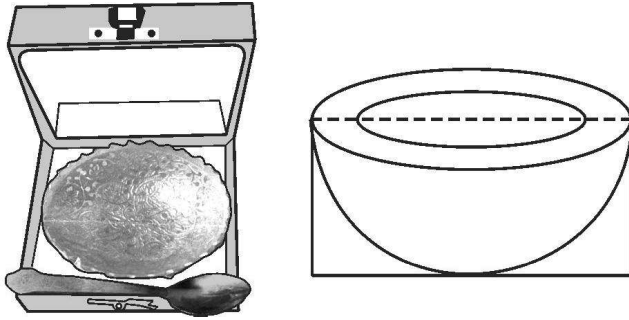
OR

(iii) (b) Using distance formula, show that $\frac{PQ}{OS} = \frac{2}{3}$.



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38.



A hemispherical bowl is packed in a cuboidal box. The bowl just fits in the box. Inner radius of the bowl is 10 cm. Outer radius of the bowl is 10.5 cm. Based on the above, answer the following questions :

- (i) Find the dimensions of the cuboidal box. 1
- (ii) Find the total outer surface area of the box. 1
- (iii) (a) Find the difference between the capacity of the bowl and the volume of the box. (use $\pi = 3.14$) 2

OR

- (iii) (b) The inner surface of the bowl and the thickness is to be painted. Find the area to be painted.



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