

Series : F6EGH



SET ~ 2



रोल नं.

Roll No.



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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।

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प्रश्न-पत्र कोड
Q.P. Code 430/6/2

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 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.*

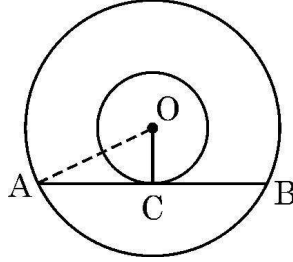


खण्ड – क
(बहुविकल्पीय प्रश्न)

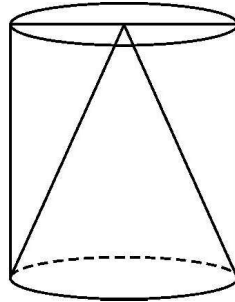
20 × 1 = 20

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 जाता है। केवल एक सिक्के पर चित आने की प्रायिकता है :
- (A) $\frac{1}{8}$ (B) $\frac{1}{4}$
(C) 1 (D) $\frac{3}{8}$
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



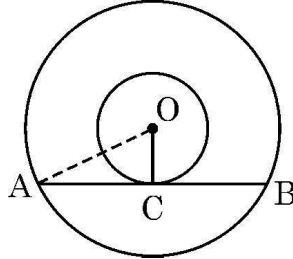
- (A) 225 cm^3 (B) 150 cm^3
(C) 250 cm^3 (D) 300 cm^3
4. ΔABC में, $\angle B = 90^\circ$ है। यदि $\frac{AB}{AC} = \frac{1}{2}$ है, तो $\cos C$ का मान है
- (A) $\frac{3}{2}$ (B) $\frac{1}{2}$
(C) $\frac{\sqrt{3}}{2}$ (D) $\frac{1}{\sqrt{3}}$



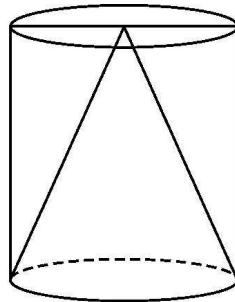
(Multiple Choice Questions)

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 exactly one coin shows head, is
- (A) $\frac{1}{8}$ (B) $\frac{1}{4}$
(C) 1 (D) $\frac{3}{8}$
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. In $\triangle ABC$, $\angle B = 90^\circ$. If $\frac{AB}{AC} = \frac{1}{2}$, then $\cos C$ is equal to
- (A) $\frac{3}{2}$ (B) $\frac{1}{2}$
(C) $\frac{\sqrt{3}}{2}$ (D) $\frac{1}{\sqrt{3}}$



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5. A.P. $\frac{13}{3}, \frac{9}{3}, \frac{5}{3}, \dots$ का 15वाँ पद है

(A) 23

(B) $\frac{-53}{3}$

(C) -11

(D) $\frac{-43}{3}$

6. 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) $\frac{1}{57}$

7. एक द्विघात बहुपद जिसके शून्यक 0 तथा -2 हैं, है

(A) $x(x-2)$

(B) $4x(x+2)$

(C) x^2+2

(D) $2x^2+2x$

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. 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) $A - h\bar{d}$

10. 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) $\frac{5}{2}$



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5. 15th term of the A.P. $\frac{13}{3}, \frac{9}{3}, \frac{5}{3}, \dots$ is
- (A) 23 (B) $\frac{-53}{3}$
(C) -11 (D) $\frac{-43}{3}$
6. 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) $\frac{1}{57}$
7. A quadratic polynomial having zeroes 0 and -2, is
- (A) $x(x-2)$ (B) $4x(x+2)$
(C) x^2+2 (D) $2x^2+2x$
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. 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) $A - h\bar{d}$
10. 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) $\frac{5}{2}$

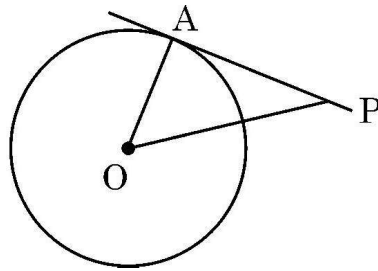


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11. ABCD is a rectangle with its vertices at (2, -2), (8, 4), (4, 8) and (-2, 2) taken in order. Length of its diagonal is

(A) $4\sqrt{2}$ (B) $6\sqrt{2}$
(C) $4\sqrt{26}$ (D) $2\sqrt{26}$

12. 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

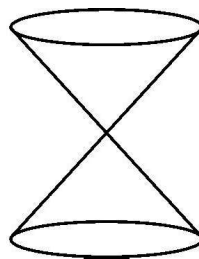


(A) 2.5 cm (B) 5 cm
(C) $\frac{5}{\sqrt{3}}$ cm (D) 2 cm

13. Two dice are rolled together. The probability of getting an outcome (a, b) such that $b = 2a$, is

(A) $\frac{1}{6}$ (B) $\frac{1}{12}$
(C) $\frac{1}{36}$ (D) $\frac{1}{9}$

14. 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



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15. यदि $\sin \theta = \frac{1}{9}$ है, तो $\tan \theta$ का मान है

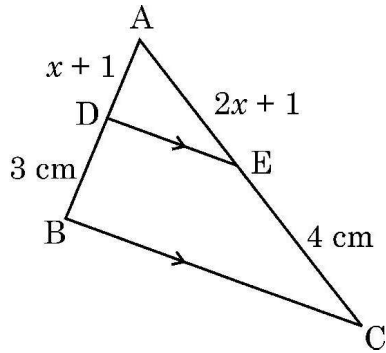
(A) $\frac{1}{4\sqrt{5}}$

(B) $\frac{4\sqrt{5}}{9}$

(C) $\frac{1}{8}$

(D) $4\sqrt{5}$

16. $\triangle ABC$ 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) $\frac{1}{3}$

17. k का वह मान जिसके लिये समीकरण युग्म $3x - 7y = 1$ तथा $kx + 14y = 6$ असंगत है, है :

(A) -6

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

(C) 6

(D) $\frac{-3}{2}$

18. रेखा $2x - 3y = 6$, x -अक्ष को निम्न बिंदु पर काटती है :

(A) $(0, -2)$

(B) $(0, 3)$

(C) $(-2, 0)$

(D) $(3, 0)$



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15. If $\sin \theta = \frac{1}{9}$, then $\tan \theta$ is equal to

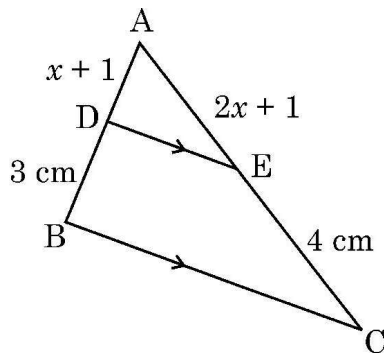
(A) $\frac{1}{4\sqrt{5}}$

(B) $\frac{4\sqrt{5}}{9}$

(C) $\frac{1}{8}$

(D) $4\sqrt{5}$

16. 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) $\frac{1}{3}$

17. 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) $\frac{-3}{2}$

18. The line $2x - 3y = 6$ intersects x -axis at

(A) $(0, -2)$

(B) $(0, 3)$

(C) $(-2, 0)$

(D) $(3, 0)$



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(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.

19. **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° .

20. **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.

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) 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 $A = 30^\circ$.



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22. 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.

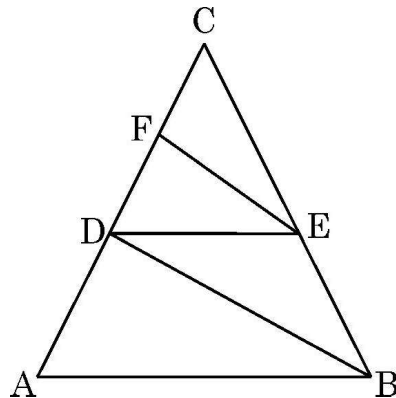
23. Using prime factorisation, find the HCF of 144, 180 and 192.

24. (a) Solve the equation $4x^2 - 9x + 3 = 0$, using quadratic formula.

OR

(b) Find the nature of roots of the equation $3x^2 - 4\sqrt{3}x + 4 = 0$.

25. In the given figure, $AB \parallel DE$ and $BD \parallel EF$. Prove that $DC^2 = CF \times AC$.



Section – C

(Short Answer Type Questions)

$6 \times 3 = 18$

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

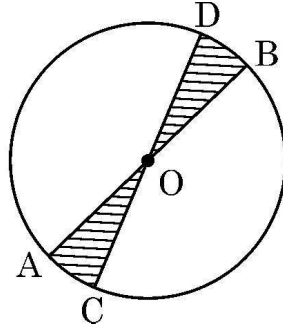
26. Three friends plan to go for a morning walk. They step off together and their steps measures 48 cm, 52 cm and 56 cm respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps ten times ?

27. Prove that $\left(1 + \frac{1}{\tan^2 \theta}\right) \left(1 + \frac{1}{\cot^2 \theta}\right) = \frac{1}{\sin^2 \theta - \sin^4 \theta}$



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28. 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.



29. (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. ?

30. (a) If α, β are zeroes of the polynomial $8x^2 - 5x - 1$, then form a quadratic polynomial in x whose zeroes are $\frac{2}{\alpha}$ and $\frac{2}{\beta}$.

OR

- (b) Find the zeroes of the polynomial $p(x) = 3x^2 + x - 10$ and verify the relationship between zeroes and its coefficients.

31. The sum of a number and its reciprocal is $\frac{13}{6}$. Find the number.

Section – D

(Long Answer Type Questions)

4 × 5 = 20

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

32. Two poles of equal heights are standing opposite each other on either side of the road which is 85 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles. (Use $\sqrt{3} = 1.73$)

33. (a) Solve the following pair of linear equations by graphical method :
 $2x + y = 9$ and $x - 2y = 2$

OR



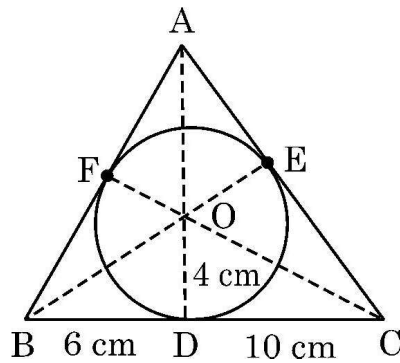
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- (b) Nidhi received simple interest of ₹ 1,200 when invested ₹ x at 6% p.a. and ₹ y at 5% p.a. for 1 year. Had she invested ₹ x at 3% p.a. and ₹ y at 8% p.a. for that year, she would have received simple interest of ₹ 1,260. Find the values of x and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

34. Find 'mean' and 'mode' of the following data :

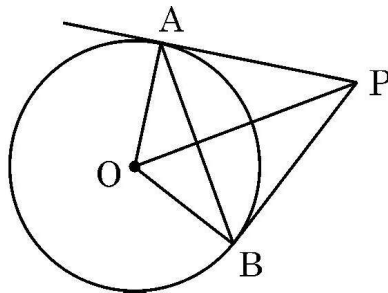
Class	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75	75 – 90
Frequency	11	8	15	7	10	9

35. (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 |



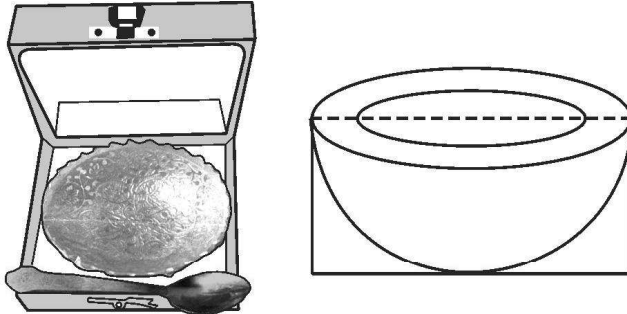
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Section – E
(Case-study based Questions)

$3 \times 4 = 12$

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

36.



A 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.

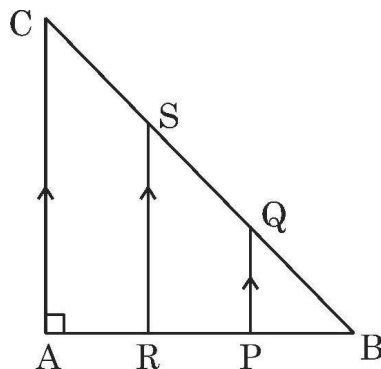
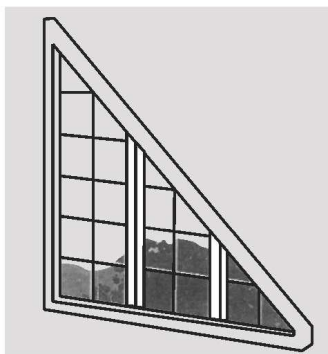
Based on the above, answer the following questions :

- | | |
|---|---|
| (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.

37.



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 |

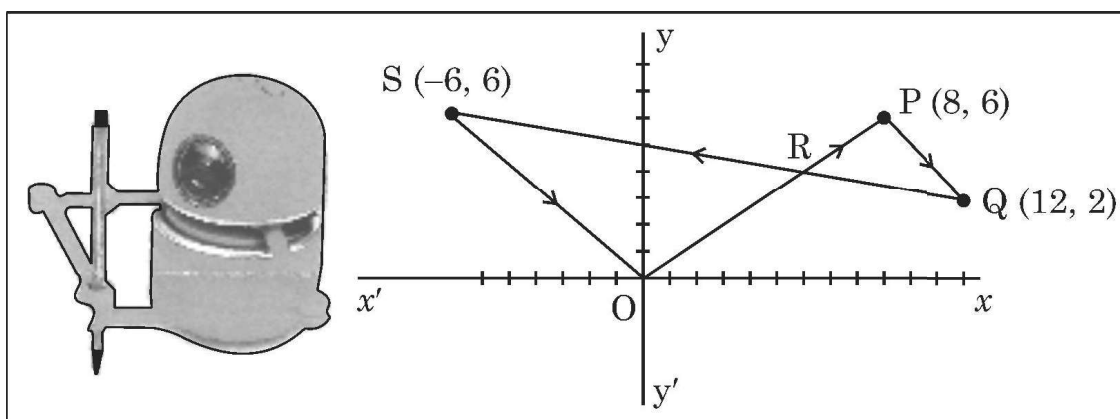


- • •
- (iii) (a) If $AB = 3$ m, find length BQ and BS . Verify that $BQ = \frac{1}{2} BS$. 2

OR

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

38. 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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