



रोल नं.
Roll No.



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नोट

- (I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 31 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 30/S/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.

NOTE

- (I) Please check that this question paper contains 31 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 (मानक)

MATHEMATICS (STANDARD)

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80



सामान्य निर्देश :

निम्नलिखित निर्देशों को बहुत सावधानी से पढ़िए और उनका सख्ती से पालन कीजिए :

- (i) इस प्रश्न-पत्र में 38 प्रश्न हैं। सभी प्रश्न अनिवार्य हैं।
- (ii) यह प्रश्न-पत्र पाँच खण्डों में विभाजित है – क, ख, ग, घ एवं ङ।
- (iii) खण्ड क में प्रश्न संख्या 1 से 18 तक बहुविकल्पीय (MCQ) तथा प्रश्न संख्या 19 एवं 20 अभिकथन एवं तर्क आधारित 1 अंक के प्रश्न हैं।
- (iv) खण्ड ख में प्रश्न संख्या 21 से 25 तक अति लघु-उत्तरीय (VSA) प्रकार के 2 अंकों के प्रश्न हैं।
- (v) खण्ड ग में प्रश्न संख्या 26 से 31 तक लघु-उत्तरीय (SA) प्रकार के 3 अंकों के प्रश्न हैं।
- (vi) खण्ड घ में प्रश्न संख्या 32 से 35 तक दीर्घ-उत्तरीय (LA) प्रकार के 5 अंकों के प्रश्न हैं।
- (vii) खण्ड ङ में प्रश्न संख्या 36 से 38 तक प्रकरण अध्ययन आधारित 4 अंकों के प्रश्न हैं। प्रत्येक प्रकरण अध्ययन में आंतरिक विकल्प 2 अंकों के प्रश्न में दिया गया है।
- (viii) प्रश्न-पत्र में समग्र विकल्प नहीं दिया गया है। यद्यपि, खण्ड ख के 2 प्रश्नों में, खण्ड ग के 2 प्रश्नों में, खण्ड घ के 2 प्रश्नों में तथा खण्ड ङ के 3 प्रश्नों में आंतरिक विकल्प का प्रावधान दिया गया है।
- (ix) जहाँ आवश्यक हो स्वच्छ आकृतियाँ बनाइए। जहाँ आवश्यक हो $\pi = \frac{22}{7}$ लीजिए, यदि अन्यथा न दिया गया हो।
- (x) कैल्कुलेटर का उपयोग वर्जित है।

खण्ड क

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

20×1=20

1. भूमि से 50 m की ऊँचाई पर एक पतंग उड़ रही है। भूमि के साथ डोरी का उन्नयन कोण 60° है। पतंग की डोरी की लंबाई है :

(A) $\frac{100}{\sqrt{3}}$ m

(B) $100\sqrt{3}$ m

(C) 150 m

(D) $\frac{50}{\sqrt{3}}$ m



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. The length of the string of a kite flying 50 m above the ground with an elevation of 60° is :

(A) $\frac{100}{\sqrt{3}}$ m

(B) $100\sqrt{3}$ m

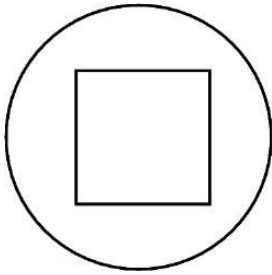
(C) 150 m

(D) $\frac{50}{\sqrt{3}}$ m



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2. 20 m त्रिज्या के एक वृत्ताकार पार्क के अंदर 8 m भुजा का एक वर्गाकार चबुतरा बना है। मि. जोसेफ इस पार्क के अंदर एक पौधा लगाना चाहते हैं।



इस पौधे को वर्गाकार चबुतरे के बाहर लगाने की प्रायिकता है :

- (A) $\frac{32}{400 \pi}$ (B) $\frac{64}{400 \pi}$
(C) $\frac{400 \pi - 32}{400 \pi}$ (D) $\frac{400 \pi - 64}{400 \pi}$

3. रैखिक समीकरण युग्म

$$9x - 15y + 19 = 0 \text{ और } 5y - 3x - 9 = 0$$

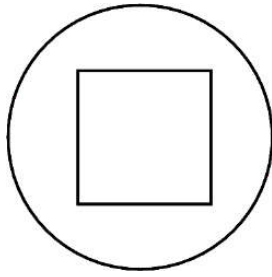
दो ऐसी रेखाओं का प्रतिनिधित्व करता है, जो :

- (A) केवल एक ही बिन्दु पर परस्पर काटती हैं।
(B) केवल दो ही बिन्दुओं पर काटती हैं।
(C) समांतर हैं।
(D) संपाती हैं।
4. एक समांतर चतुर्भुज ABCD के दो विपरीत शीर्ष $A(-4, 5)$ तथा $C(8, 2)$ हैं। इसके विकर्ण परस्पर बिंदु $P(a, b)$ पर काटते हैं। तो 'a' और 'b' में संबंध है :
- (A) $b = a - 1.5$ (B) $b = a + 1.5$
(C) $b = a - 4.5$ (D) $b = a + 4.5$



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2. There is a square lawn of side 8 m inside a circular park of radius 20 m. Mr. Joseph wants to plant a sapling in the park.



The probability that he can plant it outside the lawn is :

- (A) $\frac{32}{400 \pi}$ (B) $\frac{64}{400 \pi}$
(C) $\frac{400 \pi - 32}{400 \pi}$ (D) $\frac{400 \pi - 64}{400 \pi}$

3. The pair of linear equations

$$9x - 15y + 19 = 0 \text{ and } 5y - 3x - 9 = 0$$

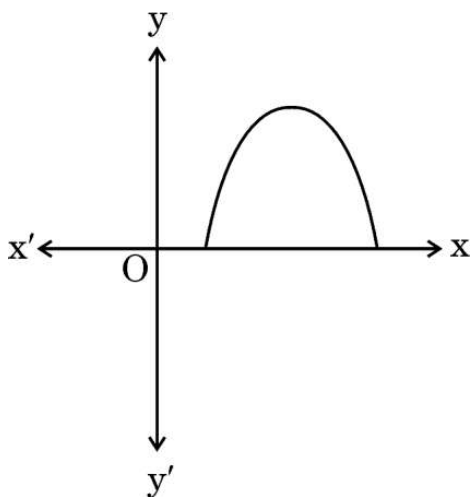
represents two lines which are :

- (A) intersecting exactly at one point.
(B) intersecting exactly at two points.
(C) parallel.
(D) coincident.
4. A(-4, 5) and C(8, 2) are the two opposite vertices of a parallelogram ABCD. Its diagonals intersect each other at P(a, b). The relation between 'a' and 'b' is :
- (A) $b = a - 1.5$ (B) $b = a + 1.5$
(C) $b = a - 4.5$ (D) $b = a + 4.5$

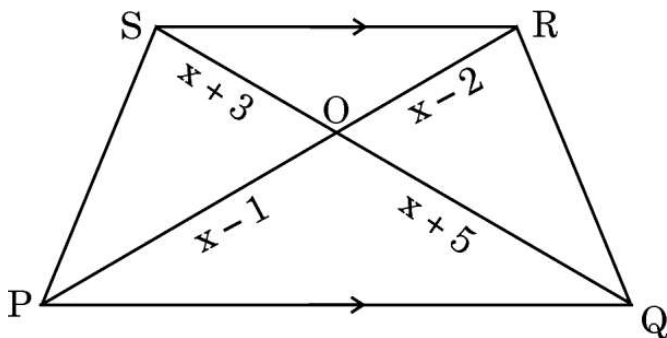


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5. यदि दी गई आकृति बहुपद $y = ax^2 + bx + c$ के ग्राफ को दर्शाती है, तो :



- (A) $a < 0$ (B) $b^2 < 4ac$
 (C) $c > 0$ (D) a और b एक ही चिह्न के हैं
6. दी गई आकृति में, $PQ \parallel SR$ है। x का मान है :

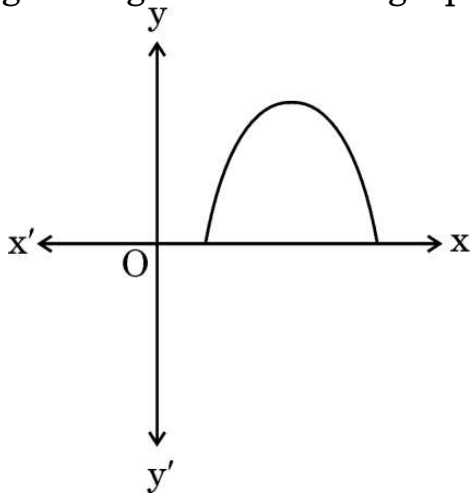


- (A) 3 (B) 5
 (C) 6 (D) 7
7. एक अभाज्य संख्या के वर्ग के गुणनखंडों की कुल संख्या है :
- (A) 1 (B) 2
 (C) 3 (D) 4
8. केन्द्र $P(4, 5)$ वाला एक वृत्त बिन्दु $A(0, 9)$ से गुजरता है। इस वृत्त में बने बड़े-से-बड़े वर्ग के विकर्ण की लम्बाई है :
- (A) $4\sqrt{2}$ इकाई (B) $8\sqrt{2}$ इकाई
 (C) $\sqrt{53}$ इकाई (D) $2\sqrt{53}$ इकाई
9. समान्तर श्रेणी $\sqrt{27}, \sqrt{75}, \sqrt{147}, \dots$ का छठा पद है :
- (A) $\sqrt{243}$ (B) $\sqrt{363}$
 (C) $\sqrt{300}$ (D) $\sqrt{507}$

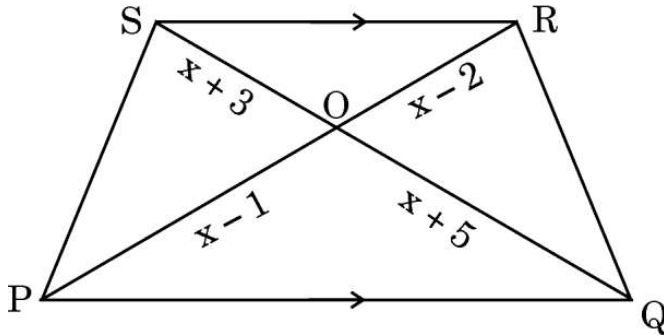


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5. If the given figure shows the graph of polynomial $y = ax^2 + bx + c$, then :



- (A) $a < 0$ (B) $b^2 < 4ac$
 (C) $c > 0$ (D) a and b are of same sign
6. In the given figure, $PQ \parallel SR$. The value of x is :



- (A) 3 (B) 5
 (C) 6 (D) 7
7. The total number of factors of the square of a prime number is :
- (A) 1 (B) 2
 (C) 3 (D) 4
8. A circle with centre $P(4, 5)$ passes through the point $A(0, 9)$. The length of the diagonal of the largest square inside this circle is :
- (A) $4\sqrt{2}$ units (B) $8\sqrt{2}$ units
 (C) $\sqrt{53}$ units (D) $2\sqrt{53}$ units
9. The 6th term of the AP $\sqrt{27}, \sqrt{75}, \sqrt{147}, \dots$ is :
- (A) $\sqrt{243}$ (B) $\sqrt{363}$
 (C) $\sqrt{300}$ (D) $\sqrt{507}$



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10. एक वृत्त के क्षेत्रफल का संख्यात्मक मान, एक अर्धवृत्ताकार डिस्क की परिधि के संख्यात्मक मान के बराबर है, जबकि दोनों की त्रिज्याएँ बराबर हैं। त्रिज्या है :

(A) 1 इकाई

(B) 2 इकाई

(C) $\frac{\pi + 2}{\pi}$ इकाई

(D) $\frac{2\pi + 2}{\pi}$ इकाई

11. यदि एक समांतर श्रेणी का 23वां पद इसके 16वें पद से 21 अधिक है, तो सार्व अन्तर है :

(A) 1

(B) 2

(C) 3

(D) 7

12. दो पासे एक साथ उछाले जाते हैं और उनकी ऊपर सतहों पर आई संख्याओं के गुणनफल को अंकित किया जाता है। इस गुणनफल के 6 से कम होने की प्रायिकता है :

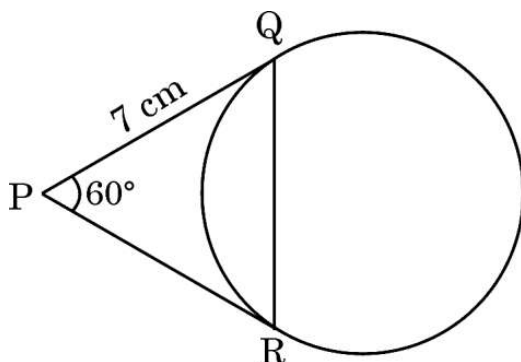
(A) $\frac{1}{6}$

(B) $\frac{1}{4}$

(C) $\frac{5}{18}$

(D) $\frac{7}{18}$

13. दी गई आकृति में, PQ और PR वृत्त की स्पर्श रेखाएँ हैं, जहाँ PQ = 7 cm और $\angle RPQ = 60^\circ$ है।



जीवा QR की लंबाई है :

(A) 5 cm

(B) 7 cm

(C) 9 cm

(D) 14 cm

14. यदि $\cot \theta = \frac{p}{q}$ ($q \neq 0$) है, तो $\sin \theta$ बराबर है :

(A) $\frac{p}{\sqrt{p^2 + q^2}}$

(B) $\frac{\sqrt{p^2 + q^2}}{p}$

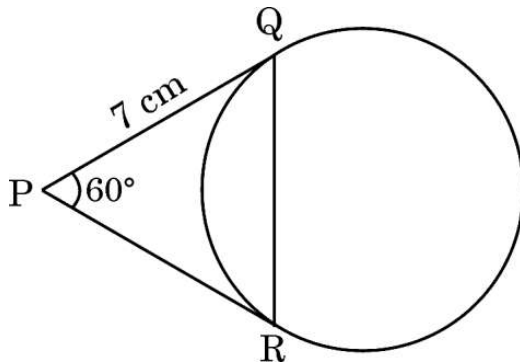
(C) $\frac{q}{\sqrt{p^2 + q^2}}$

(D) $\frac{q}{\sqrt{p^2 - q^2}}$



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10. The numerical value of the area of a circle is equal to that of the perimeter of a semicircular disc, both having equal radius. The radius is :
- (A) 1 unit (B) 2 units
(C) $\frac{\pi+2}{\pi}$ units (D) $\frac{2\pi+2}{\pi}$ units
11. If the 23rd term of an AP exceeds its 16th term by 21, then the common difference is :
- (A) 1 (B) 2
(C) 3 (D) 7
12. Two dice are thrown simultaneously and the product of the numbers appearing on the tops is noted. The probability of the product to be less than 6 is :
- (A) $\frac{1}{6}$ (B) $\frac{1}{4}$
(C) $\frac{5}{18}$ (D) $\frac{7}{18}$
13. In the given figure, PQ and PR are tangents to the circle such that PQ = 7 cm and $\angle RPQ = 60^\circ$.



The length of chord QR is :

- (A) 5 cm (B) 7 cm
(C) 9 cm (D) 14 cm
14. If $\cot \theta = \frac{p}{q}$ ($q \neq 0$), then $\sin \theta$ is equal to :
- (A) $\frac{p}{\sqrt{p^2 + q^2}}$ (B) $\frac{\sqrt{p^2 + q^2}}{p}$
(C) $\frac{q}{\sqrt{p^2 + q^2}}$ (D) $\frac{q}{\sqrt{p^2 - q^2}}$



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15. एक बॉक्स में कार्ड हैं, जिन पर संख्याएँ 10 से 30 तक अंकित हैं और इन कार्डों को अच्छी तरह से मिला दिया गया है। रोहित इस बॉक्स से एक कार्ड यादृच्छया निकालता है। इस कार्ड पर संख्या 4 या 5 का एक गुणज अंकित होने की प्रायिकता है :

- (A) $\frac{9}{20}$ (B) $\frac{9}{21}$
(C) $\frac{10}{20}$ (D) $\frac{10}{21}$

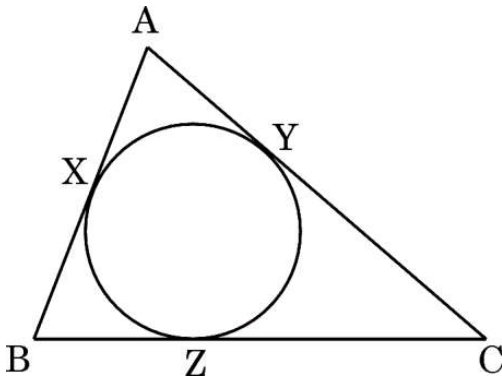
16. दो भिन्न वृत्तों के A और B त्रिज्यखंड हैं। त्रिज्यखंड A की त्रिज्या, त्रिज्यखंड B की त्रिज्या का 2 गुना है, जबकि त्रिज्यखंड B के केन्द्र पर बना कोण, त्रिज्यखंड A के केन्द्र पर बने कोण का 2 गुना है। त्रिज्यखंड A और त्रिज्यखंड B के क्षेत्रफलों का अनुपात है :

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

17. यदि $x = p \cos^3 \alpha$ तथा $y = q \sin^3 \alpha$ है, तो $\left(\frac{x}{p}\right)^{2/3} + \left(\frac{y}{q}\right)^{2/3}$ का मान है :

- (A) 1 (B) 2
(C) p (D) q

18. दी गई आकृति में, एक वृत्त के परिगत एक त्रिभुज ABC इस प्रकार बना है, कि त्रिभुज की भुजाएँ AB, BC और CA वृत्त को क्रमशः बिंदु X, Z तथा Y पर स्पर्श करती हैं।



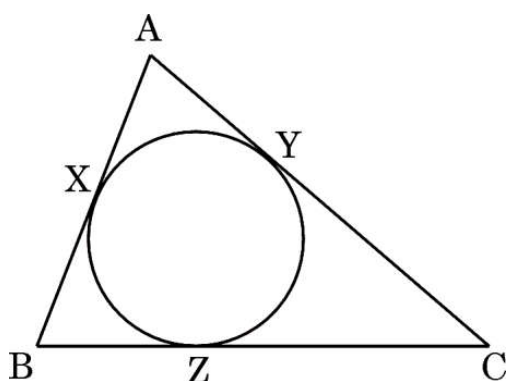
यदि $AB = 12 \text{ cm}$, $AY = 8 \text{ cm}$ तथा $CY = 6 \text{ cm}$ है, तो BC की लंबाई है :

- (A) 14 cm (B) 12 cm
(C) 10 cm (D) 8 cm



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15. Cards numbered 10, 11, 12, ..., 30 are kept in a box and shuffled thoroughly. Rohit draws a card at random from the box. The probability that the number on the card is a multiple of 4 or 5 is :
- (A) $\frac{9}{20}$ (B) $\frac{9}{21}$
(C) $\frac{10}{20}$ (D) $\frac{10}{21}$
16. A and B are sectors of two different circles. Radius of sector A is double of that of sector B whereas central angle of sector B is double the central angle of sector A. The ratio of the area of sector A to the area of sector B is :
- (A) 1 : 1 (B) 1 : 2
(C) 2 : 1 (D) 4 : 1
17. If $x = p \cos^3 \alpha$ and $y = q \sin^3 \alpha$, then the value of $\left(\frac{x}{p}\right)^{2/3} + \left(\frac{y}{q}\right)^{2/3}$ is :
- (A) 1 (B) 2
(C) p (D) q
18. In the given figure, a circle inscribed in $\triangle ABC$, touches AB, BC and CA at X, Z and Y, respectively.



If $AB = 12$ cm, $AY = 8$ cm and $CY = 6$ cm, then the length of BC is :

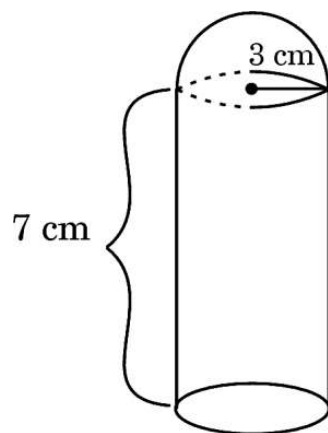
- (A) 14 cm (B) 12 cm
(C) 10 cm (D) 8 cm



प्रश्न संख्या 19 और 20 अभिकथन एवं तर्क आधारित प्रश्न हैं। दो कथन दिए गए हैं जिनमें एक को अभिकथन (A) तथा दूसरे को तर्क (R) द्वारा अंकित किया गया है। इन प्रश्नों के सही उत्तर नीचे दिए गए कोडों (A), (B), (C) और (D) में से चुनकर दीजिए।

- (A) अभिकथन (A) और तर्क (R) दोनों सही हैं और तर्क (R), अभिकथन (A) की सही व्याख्या करता है।
- (B) अभिकथन (A) और तर्क (R) दोनों सही हैं, परन्तु तर्क (R), अभिकथन (A) की सही व्याख्या नहीं करता है।
- (C) अभिकथन (A) सही है, परन्तु तर्क (R) गलत है।
- (D) अभिकथन (A) गलत है, परन्तु तर्क (R) सही है।

19. अभिकथन (A) : दी गई आकृति में एक खिलौना एक बेलन के आकार का है जिसके ऊपर एक अर्धगोला अध्यारोपित है। खिलौने का आयतन $81\pi \text{ cm}^3$ है, जबकि इसके बेलनाकार हिस्से की ऊँचाई 7 cm तथा इसकी त्रिज्या 3 cm है।



तर्क (R) : दिए गए ठोस का आयतन, बेलन और अर्धगोले के आयतनों का योग होता है।

20. अभिकथन (A) : द्विघात समीकरण $x^2 + 4x + 5 = 0$ के मूल वास्तविक हैं।

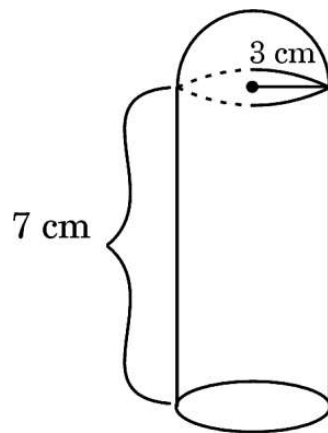
तर्क (R) : द्विघात समीकरण $ax^2 + bx + c = 0$, ($a \neq 0$) के मूल वास्तविक होंगे यदि $b^2 - 4ac \geq 0$.



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) : In the given figure, a toy is in the form of a cylinder surmounted by a hemisphere of the same radius. If the radius of the cylinder is 3 cm and its height is 7 cm, then the volume of toy is $81\pi \text{ cm}^3$.



Reason (R): Volume of the given solid is the sum of the volume of the cylinder and the volume of the hemisphere.

- 20.** Assertion (A) : The quadratic equation $x^2 + 4x + 5 = 0$ has real roots.

Reason (R): The quadratic equation $ax^2 + bx + c = 0$, $a \neq 0$ has real roots if $b^2 - 4ac \geq 0$.



खण्ड ख

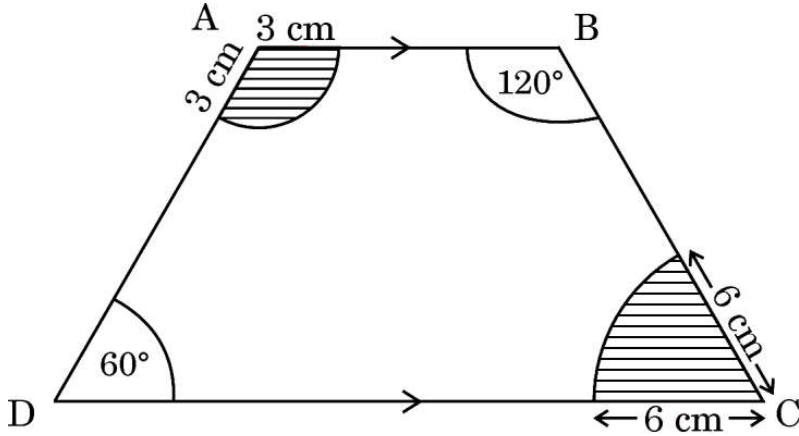
इस खण्ड में 5 अति लघु-उत्तरीय (VSA) प्रकार के प्रश्न हैं, जिनमें प्रत्येक के 2 अंक हैं।

5×2=10

21. (क) 15 cm त्रिज्या के एक वृत्त के एक त्रिज्यखंड का परिमाण 80 cm है। इस त्रिज्यखंड का क्षेत्रफल ज्ञात कीजिए।

अथवा

- (ख) दी गई आकृति में ABCD एक समलम्ब चतुर्भुज है, जिसमें $AB \parallel DC$ है। इसके छायांकित भाग का क्षेत्रफल ज्ञात कीजिए। (उत्तर को π के पदों में रखिए)

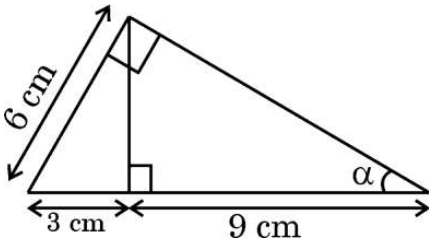


22. दर्शाइए कि 14^n , किसी भी प्राकृत संख्या n के लिए, अंक 0 या 5 पर समाप्त नहीं होती है।

23. (क) यदि $\sin(2A + 3B) = 1$ और $\cos(2A - 3B) = \frac{\sqrt{3}}{2}$ है, जहाँ $0^\circ < 2A + 3B \leq 90^\circ$ और $A > B$ है, तो A और B ज्ञात कीजिए।

अथवा

- (ख) दी गई आकृति से, $\sin \alpha$ का मान ज्ञात कीजिए।



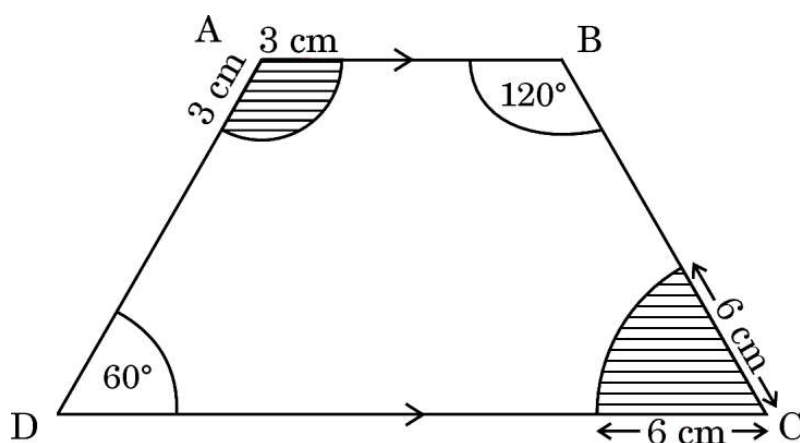
SECTION B

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

21. (a) The perimeter of a sector of a circle of radius 15 cm is 80 cm. Find the area of the sector.

OR

- (b) In the given figure, ABCD is a trapezium with $AB \parallel DC$. Find the area of the shaded region. (Keep the answer in terms of π).

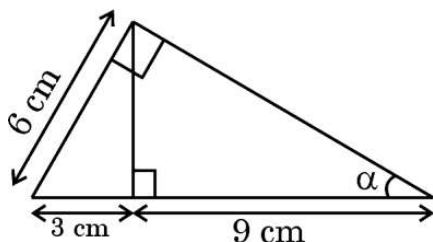


22. Show that 14^n cannot end with the digit 0 or 5 for any natural number n .

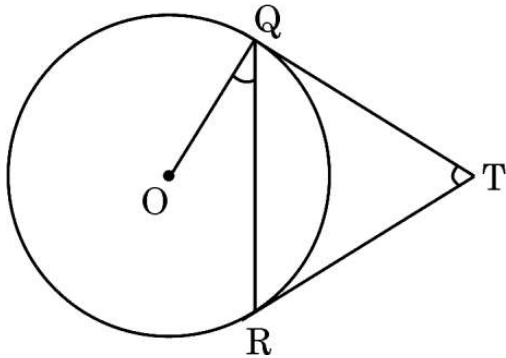
23. (a) If $\sin(2A + 3B) = 1$ and $\cos(2A - 3B) = \frac{\sqrt{3}}{2}$, $0^\circ < 2A + 3B \leq 90^\circ$, $A > B$, then find A and B .

OR

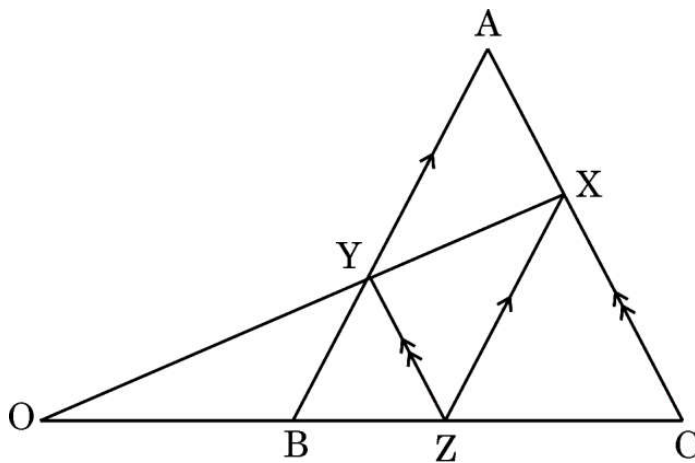
- (b) From the given figure, find the value of $\sin \alpha$.



24. दी गई आकृति में, केन्द्र O वाले एक वृत्त पर दो स्पर्श-रेखाएँ TQ तथा TR बनी हैं। सिद्ध कीजिए कि $\angle QTR = 2 \angle OQR$.



25. दी गई आकृति में, त्रिभुज ABC की भुजा BC पर एक बिंदु Z है, जिससे $XZ \parallel AB$ तथा $YZ \parallel AC$. यदि XY तथा CB बढ़ाने पर बिंदु O पर मिलें, तो सिद्ध कीजिए कि $ZO^2 = OB \times OC$.



खण्ड ग

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

6×3=18

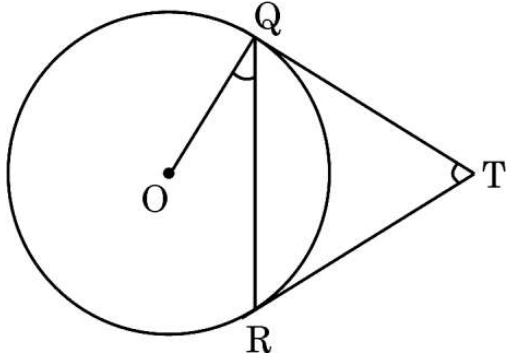
26. एक वृत्त के परिगत एक चतुर्भुज बना है। सिद्ध कीजिए कि चतुर्भुज की आमने-सामने की भुजाएँ वृत्त के केन्द्र पर संपूरक कोण अंतरित करती हैं।
27. सिद्ध कीजिए :

$$\frac{\tan^3 \theta}{1 + \tan^2 \theta} + \frac{\cot^3 \theta}{1 + \cot^2 \theta} = \sec \theta \operatorname{cosec} \theta - 2 \sin \theta \cos \theta$$

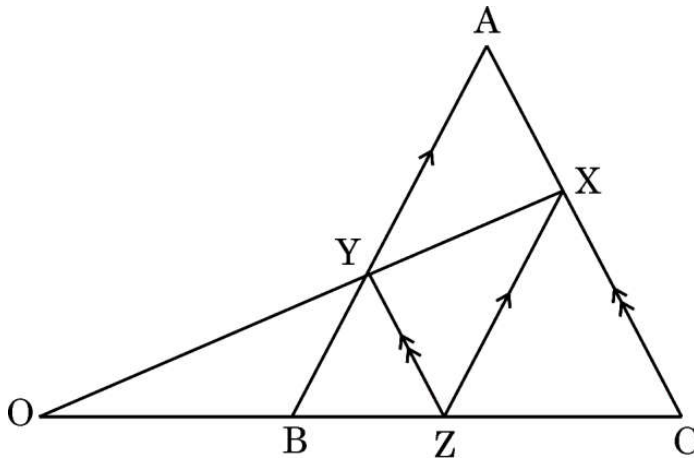


...

24. In the given figure, TQ and TR are tangents to the circle with centre O. Prove that $\angle QTR = 2 \angle OQR$.



25. In the given figure, Z is a point on the side BC of $\triangle ABC$ such that $XZ \parallel AB$ and $YZ \parallel AC$. If XY and CB produced meet at O, then prove that $ZO^2 = OB \times OC$.



SECTION C

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

26. A quadrilateral circumscribes a circle. Prove that the opposite sides of the quadrilateral subtend supplementary angles at the centre of the circle.

27. Prove that :

$$\frac{\tan^3 \theta}{1 + \tan^2 \theta} + \frac{\cot^3 \theta}{1 + \cot^2 \theta} = \sec \theta \operatorname{cosec} \theta - 2 \sin \theta \cos \theta$$



...

28. (क) 'डेंगू' से पीड़ित रोगियों के कल्याण के लिए काम करने वाले एक स्वास्थ्य केंद्र ने निम्नलिखित जानकारी दर्ज की :

रोगियों की आयु	रोगियों की संख्या
0 – 15	8
15 – 30	5
30 – 45	x
45 – 60	16
60 – 75	12
75 – 90	9

यदि रोगियों की बहुलक आयु 54 है, तो x का मान ज्ञात कीजिए।

अथवा

- (ख) एक इलाके के कुछ घरों का आयुर्वेदिक दवाओं पर साप्ताहिक खर्च नीचे दर्ज किया गया है।

साप्ताहिक खर्च (₹ में)	घरों की संख्या
100 – 150	4
150 – 200	5
200 – 250	y
250 – 300	2
300 – 350	2

यदि माध्य खर्च ₹ 211 है, तो लुप्त बारंबारता 'y' का मान ज्ञात कीजिए।

29. यदि बहुपद $p(x) = x^2 - 2x - 3$ के शून्यक α और β हैं, तो वह बहुपद ज्ञात कीजिए जिसके शून्यक $(2\alpha + 3\beta)$ और $(3\alpha + 2\beta)$ हैं।



28. (a) One healthcare center working for the welfare of the patients suffering from 'Dengue', recorded the following information :

<i>Age of Patients</i>	<i>Number of Patients</i>
0 – 15	8
15 – 30	5
30 – 45	x
45 – 60	16
60 – 75	12
75 – 90	9

If the modal age of the patients is 54, then find the value of x.

OR

- (b) Weekly expenditure on Ayurvedic medicines of few households in a locality is recorded below.

<i>Weekly Expenditure (in ₹)</i>	<i>Number of Households</i>
100 – 150	4
150 – 200	5
200 – 250	y
250 – 300	2
300 – 350	2

If the mean expenditure for this is ₹ 211, then find the value of the missing frequency 'y'.

29. If α , β are the zeroes of the polynomial $p(x) = x^2 - 2x - 3$, then find a polynomial where zeroes are $(2\alpha + 3\beta)$ and $(3\alpha + 2\beta)$.



30. रंजीता, नेहा और सलमा एक अनाथ आश्रम के बच्चों के लिए स्वेटरें बुनना एक साथ शुरू करती हैं। उन्हें एक स्वेटर बुनने के लिए क्रमशः 15, 18 और 20 दिन चाहिए। कितने दिनों के बाद वे सभी फिर से एक साथ नया स्वेटर बनाना शुरू करेंगी ? उस समय तक वे कितने स्वेटर बना चुकी होंगी ?

31. (क) ग्राफीय विधि से जाँच कीजिए, कि क्या रैखिक समीकरणों का निम्नलिखित युग्म संगत है :
 $2x + 3y = 12$; $5x - 3y = 9$. यदि हो, तो इस युग्म का हल ग्राफीय विधि से ज्ञात कीजिए।

अथवा

- (ख) एक 2-अंकीय संख्या या तो दोनों अंकों के योग को 7 से गुणा करके और गुणनफल में 3 जोड़कर बनाई जाती है, और या दोनों अंकों के अंतर को 19 से गुणा करके और गुणनफल में से 1 घटाकर बनाई जाती है। दिया गया है कि दहाई का अंक इकाई के अंक से बड़ा है। यह 2-अंकीय संख्या ज्ञात कीजिए।

खण्ड घ

इस खण्ड में 4 दीर्घ-उत्तरीय (LA) प्रकार के प्रश्न हैं, जिनमें प्रत्येक के 5 अंक हैं।

4×5=20

32. (क) एक भिन्न का हर उसके अंश से 2 बड़ा है। यदि इस भिन्न के हर और अंश दोनों में 2 जोड़ने पर प्राप्त नए भिन्न को पहले भिन्न में जोड़ा जाए तो भिन्न $\frac{46}{35}$ प्राप्त होता है। प्रारम्भिक भिन्न ज्ञात कीजिए।

अथवा

- (ख) वर्तमान में, सौरभ की आयु अपने पुत्र रवि की आयु के वर्ग से 3 वर्ष अधिक है। जब रवि अपने पिता सौरभ की वर्तमान आयु पर पहुँचता है, तब सौरभ की आयु रवि की वर्तमान आयु के 13 गुना से 6 वर्ष कम होती है। रवि और सौरभ की वर्तमान आयु ज्ञात कीजिए।



...

30. Ranjita, Neha and Salma start weaving sweaters at the same time for the children of an orphan home. They need 15, 18 and 20 days, respectively, to complete a sweater. After how many days will all of them start making a new sweater again ? By that time how many sweaters will have been completed by them ?
31. (a) Check graphically whether the pair of linear equations $2x + 3y = 12$; $5x - 3y = 9$ is consistent. If so, solve it graphically.

OR

- (b) A 2-digit number is obtained by either multiplying the sum of the digits by 7 and then adding 3 or by multiplying the difference of the digits by 19 and then subtracting 1. It is given that the digit at ten's place is greater than that of unit's place. Find the 2-digit number.

SECTION D

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

32. (a) The denominator of a fraction is 2 more than the numerator. If 2 is added to both its numerator and denominator, then the sum of the new fraction and the original fraction is $\frac{46}{35}$. Find the original fraction.

OR

- (b) At present, Sourav's age is 3 years more than the square of his son Ravi's age. When Ravi grows to his father's present age, Sourav's age would be 6 years less than 13 times the present age of Ravi. Find present ages of Ravi and Sourav.



33. 100 प्रेक्षणों वाले निम्न बंटन के लिए लुप्त बारंबारताओं p और q के मान ज्ञात कीजिए। दिया है कि बंटन का माध्यक 47 है।

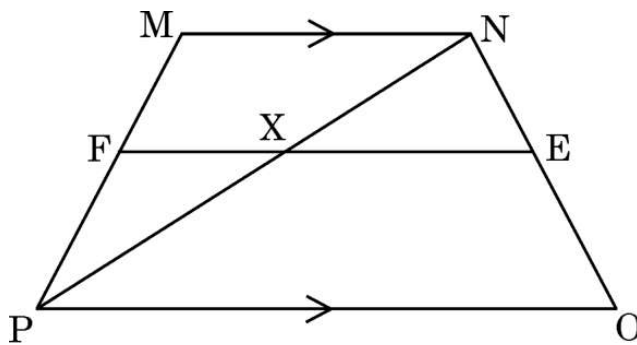
वर्ग	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65
बारंबारता	12	p	17	20	q	12	8

34. (क) त्रिज्या 0.7 cm और ऊँचाई 2.4 cm के एक ठोस बेलन में से इसी ऊँचाई और इसी त्रिज्या वाला एक शंकवाकार खोल काट लिया जाता है। शेष ठोस का आयतन और सम्पूर्ण पृष्ठीय क्षेत्रफल ज्ञात कीजिए।

अथवा

- (ख) एक बढ़ई लकड़ी का एक खिलौना (लट्टू) बना रहा है, जो शंकवाकार है और उसके ऊपर एक अर्धगोला अध्यारोपित है। अर्धगोले की ऊँचाई और शंकवाकार भाग की ऊँचाई का अनुपात $3 : 4$ है। यदि शंकु और अर्धगोले की त्रिज्या 2.1 cm है, तो ज्ञात कीजिए कि खिलौने को बनाने के लिए लगी लकड़ी का आयतन कितना होगा। खिलौने के बनने के पश्चात रंग करवाने के लिए इसका क्षेत्रफल कितना है ?

35. आकृति में समलम्ब चतुर्भुज $MNOP$ में, $MN \parallel PO$ तथा $PO = 2 MN$ है। एक रेखाखंड FE , MN के समांतर खींचा जाता है, जो MP को F पर और NO को E पर इस प्रकार काटता है कि $\frac{NE}{EO} = \frac{3}{4}$ है। विकर्ण PN , FE को X पर काटता है। सिद्ध कीजिए कि $7 FE = 10 MN$.



...

33. Find the values of the missing frequencies p and q in the following distribution of 100 observations. The median of the distribution is given as 47.

Class	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65
Frequency	12	p	17	20	q	12	8

34. (a) From a solid cylinder of height 2.4 cm and radius 0.7 cm, a conical cavity of the same height and same radius is hollowed out. Find the volume and total surface area of the remaining solid.

OR

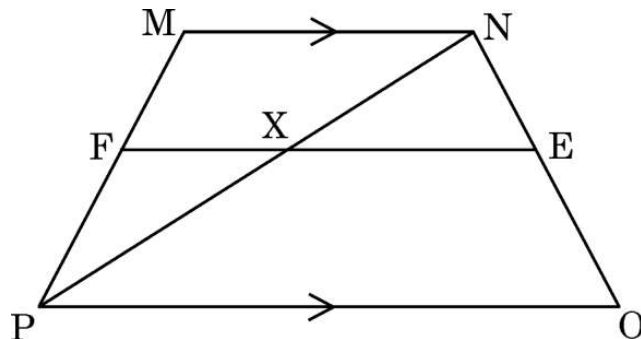
- (b) A carpenter is making a wooden toy (lattu) which is conical in shape and surmounted by a hemisphere. The ratio of the height of the hemisphere and the cone is 3 : 4. If the radius of the cone and the hemisphere is 2.1 cm, find the volume of wood required to make this toy. Also, find the area to be painted after making the toy.

35. In the figure, MNOP is a trapezium with, $MN \parallel PO$ and $PO = 2 MN$.

A line segment FE drawn parallel to MN intersects MP at F and NO at E

such that $\frac{NE}{EO} = \frac{3}{4}$. Diagonal PN intersects FE at X. Prove that

$$7 FE = 10 MN.$$



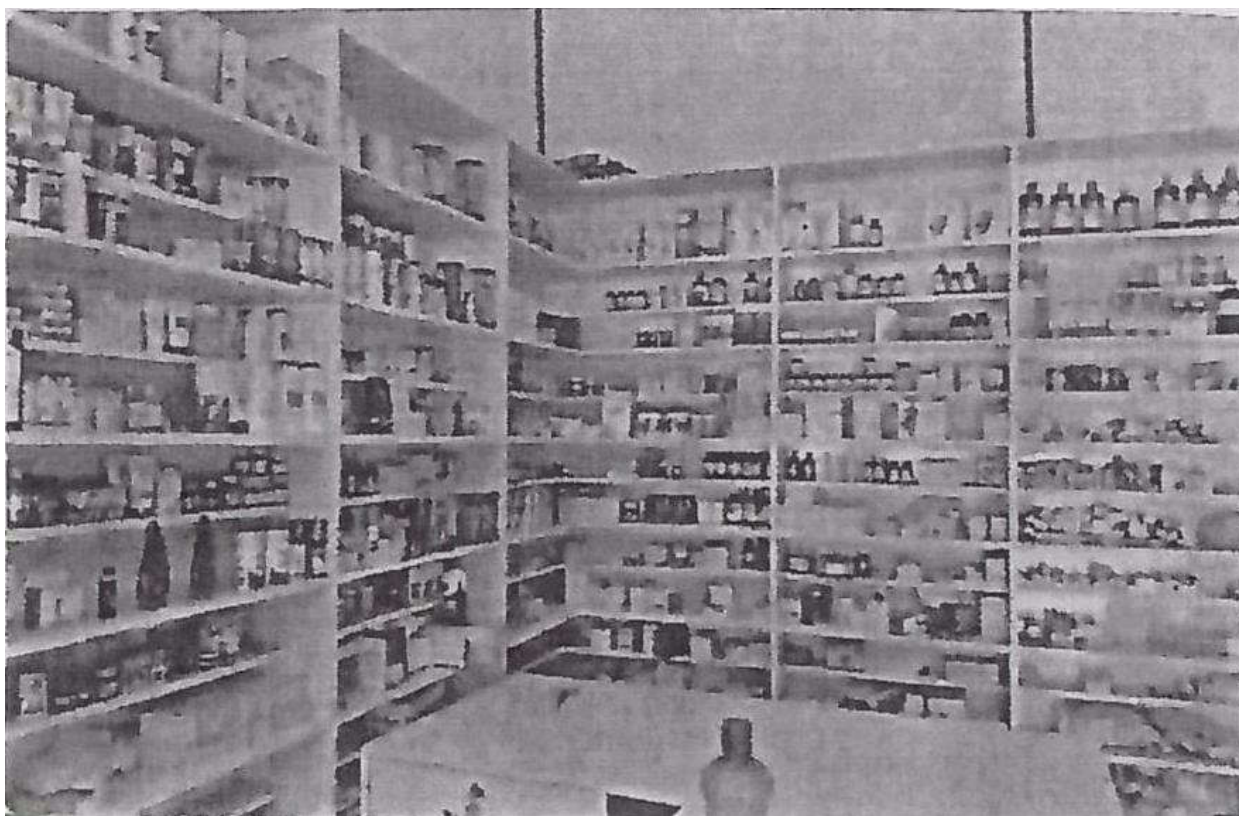
...
खण्ड ड

इस खण्ड में 3 प्रकरण अध्ययन आधारित प्रश्न हैं जिनमें प्रत्येक के 4 अंक हैं।

3×4=12

प्रकरण अध्ययन – 1

36. सितंबर के महीने में अंकुरहट के ग्रामीण तेज बुखार से बीमार पड़ रहे थे। उस दौर में पैरासिटामोल सबसे ज्यादा बिकने वाली दवाओं में से एक थी। पिछले 7 दिनों के दौरान प्रत्येक फार्मसी की पैरासिटामोल की समग्र बिक्री का अनुमान लगाने के लिए एक सर्वेक्षण किया गया। यह देखा गया कि विभिन्न दुकानों में बेची गई पैरासिटामोल की संख्या क्रमानुसार सभी 13 से विभाज्य 3-अंकीय संख्याएँ थीं।



उपर्युक्त दी गई जानकारी के आधार पर, निम्नलिखित प्रश्नों के उत्तर दीजिए :

- | | | |
|-------------|---|---|
| (i) | 7वीं फार्मसी द्वारा कितनी पैरासिटामोल बेची गई ? | 1 |
| (ii) | 14वीं और 9वीं फार्मसियों द्वारा बेची गई पैरासिटामोल की संख्या का अंतर क्या था ? | 1 |
| (iii) | (क) पीछे से (प्रथम की ओर) 9वीं फार्मसी द्वारा कितनी पैरासिटामोल बेची गई ? | 2 |
| अथवा | | |
| (iii) | (ख) उस सप्ताह में कुल कितनी पैरासिटामोल बेची गई ? | 2 |



...

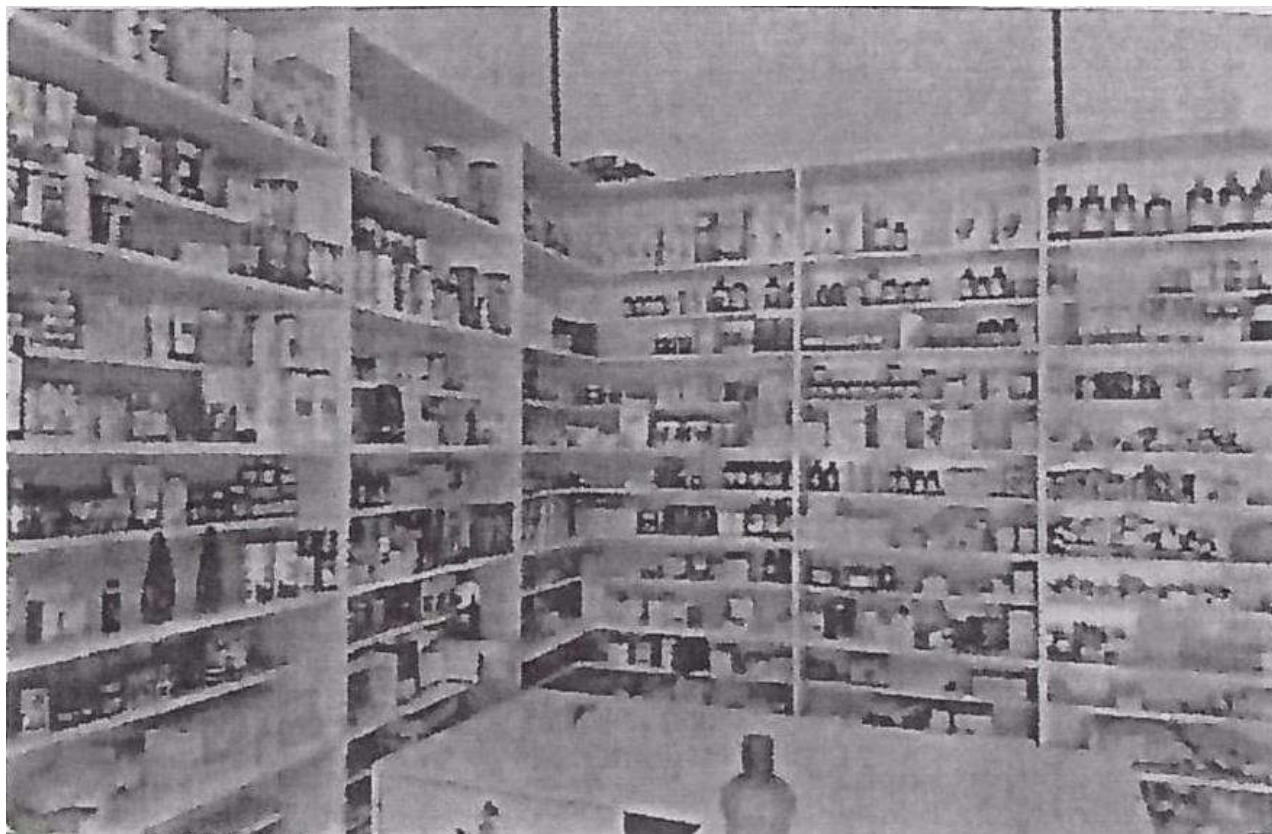
SECTION E

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

3×4=12

Case Study – 1

36. In the month of September, villagers of Ankurhut were falling ill with high temperature. Paracetamol was one of the highest sold medicines during that phase. A survey was conducted to estimate the overall sale of Paracetamol of each pharmacy during the last 7 days. It was observed that the number of Paracetamol sold in different shops were all 3-digit numbers, divisible by 13, taken in order.



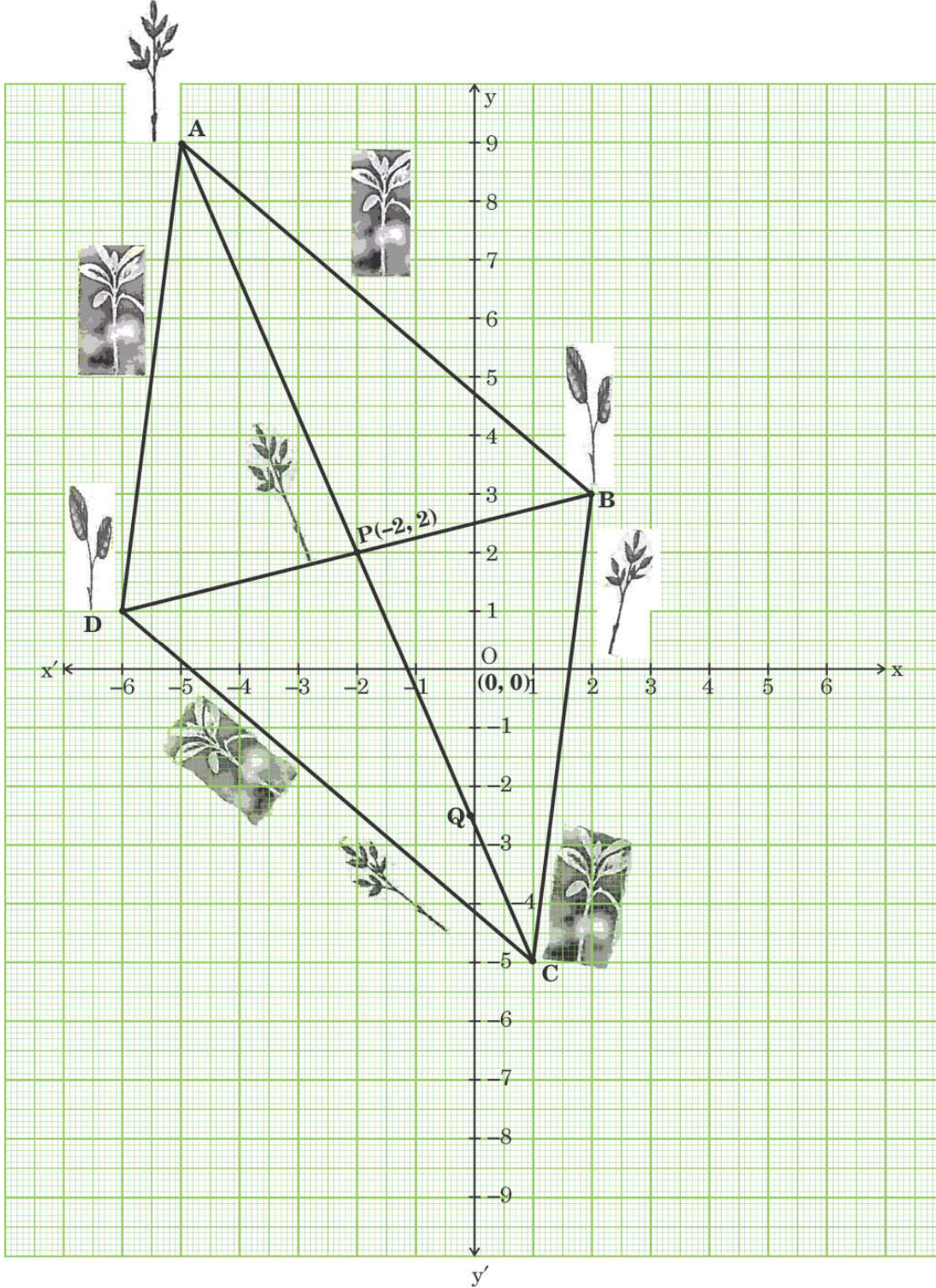
Based on the information given above, answer the following questions :

- (i) How many Paracetamols were sold by the 7th pharmacy ? 1
 - (ii) What was the difference between the number of Paracetamols sold by the 14th and the 9th pharmacy ? 1
 - (iii) (a) How many Paracetamols were sold by the 9th pharmacy from the last ? 2
- OR**
- (iii) (b) What was the total number of Paracetamols sold in that week ? 2



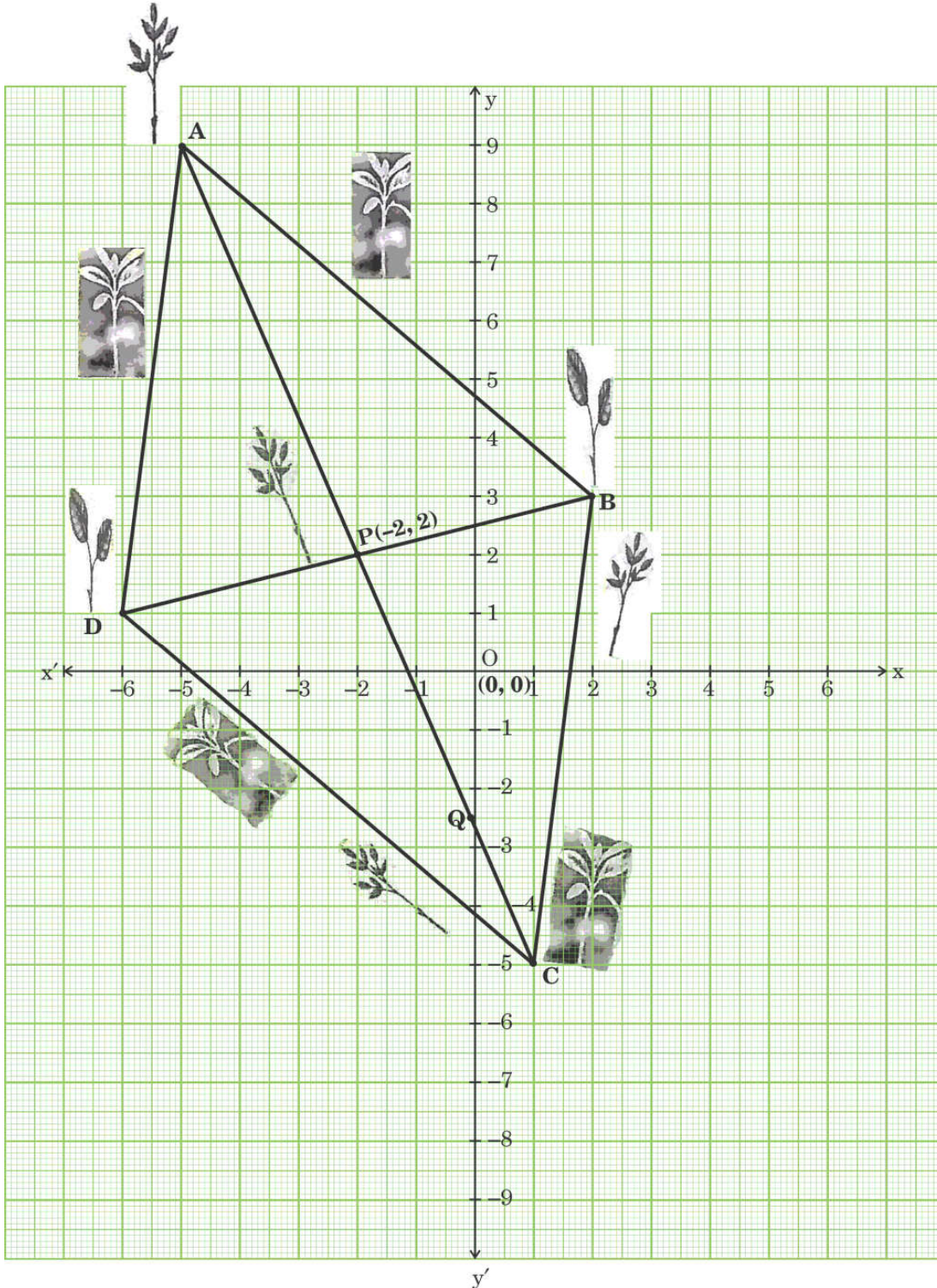
प्रकरण अध्ययन - 2

37. पेड़ प्राकृतिक फिल्टर का काम करते हैं। स्कूल परिसर में और उसके आस-पास पेड़ लगाकर, हम छात्रों और स्थानीय निवासियों के लिए स्वच्छ और स्वस्थ हवा बनाते हैं, जिससे श्वसन संबंधी समस्याएँ कम होती हैं। नोएडा के एक स्कूल ने “पृथ्वी बचाओ, पेड़ लगाओ” शीर्षक के अंतर्गत वृक्षारोपण पर एक सामुदायिक अभियान का प्रस्ताव और आयोजन किया है। उस स्कूल के छात्रों ने मैदान में पौधे इस प्रकार लगाए हैं कि इससे एक चतुर्भुज बना, जैसा कि चित्र ABCD में दिखाया गया है।



Case Study – 2

37. Trees act the natural filters. By planting trees in and around school premises, we create cleaner and healthier air for students and local residents, reducing respiratory problems. A school in Noida has proposed and organised a community drive on tree plantation under the title “Save Earth, Plant Trees”. Students of that school have planted saplings in the field such that it formed a quadrilateral as shown in the figure ABCD.



उपर्युक्त दी गई जानकारी के आधार पर, निम्नलिखित प्रश्नों के उत्तर दीजिए :

(i) दो पौधों A और D के बीच की दूरी ज्ञात कीजिए। 1

(ii) (क) एक छात्र AD के मध्य-बिंदु पर एक पौधा लगाता है और वह फिर DB के समानांतर एक सीधी रेखा में चलकर एक और पौधा AB पर लगाता है। इन दोनों नए पौधों की स्थिति के निर्देशांक क्या हैं ? 2

अथवा

(ii) (ख) DB के बिंदु M पर एक नया पौधा इस प्रकार लगाया जाता है कि $DM : MB = 3 : 1$ है। M के निर्देशांक ज्ञात कीजिए। 2

(iii) रेखाखंड AC और BD बिंदु $P(-2, 2)$ पर परस्पर समद्विभाजन करते हैं। बिंदु C के निर्देशांक ज्ञात कीजिए। 1

प्रकरण अध्ययन – 3

38. अंतर्राष्ट्रीय पतंग महोत्सव हर साल 14 जनवरी को होता है। महोत्सव के मुख्य आकर्षणों में राष्ट्रीय और अंतर्राष्ट्रीय पतंगबाजों की परेड, पतंगबाजी, पारंपरिक स्टॉल आदि शामिल हैं। इस दिन, कुछ पतंग उड़ाने वाले भूमि पर एक बिंदु 'O' पर इकट्ठे हुए थे। तीन पतंगों A, B, C की स्थिति इस प्रकार थी कि A और B भूमि से 40 m की समान ऊर्ध्वाधर ऊँचाई पर थीं। O से A, B और C के उन्नयन कोण क्रमशः 60° , 45° और 30° थे। एक ऊर्ध्वाधर टावर SD बिंदु S पर खड़ा है तथा फोटोग्राफी के लिए टावर के शीर्ष पर एक कैमरा लगाया गया है।



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

- (i) Find the distance between the two saplings at A and D. 1
- (ii) (a) One student plants one sapling at the mid-point of AD. Then he moves along a straight line parallel to DB and sows another sapling on AB. What are the coordinates of the positions of these two new saplings ? 2

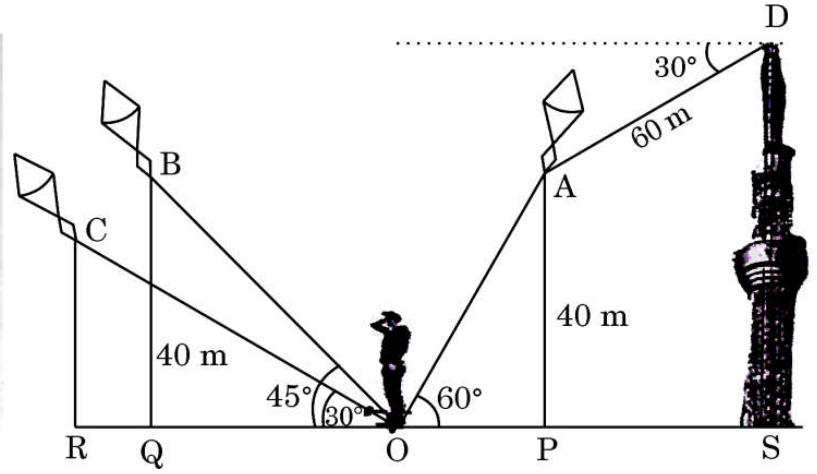
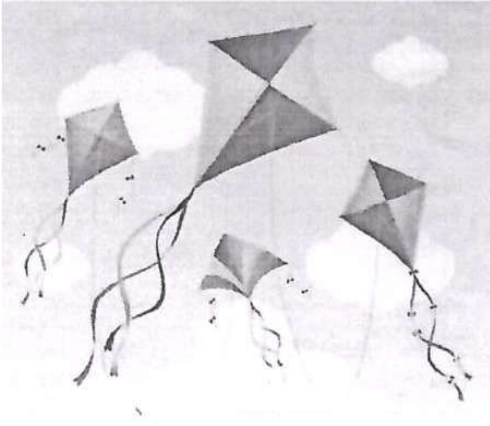
OR

- (ii) (b) A new sapling is kept at a point M on DB such that $DM : MB = 3 : 1$. Find the coordinates of M. 2
- (iii) The line segments AC and BD bisect each other at $P(-2, 2)$. Find the coordinates of C. 1

Case Study – 3

- 38.** The International Kite Festival takes place every year on 14th January. The main attractions of the festival include national and international Kite Flyers' Parade, kite flying, traditional stalls etc. On this day, few kite flyers, had assembled at a point 'O' on the ground. The position of 3 kites A, B, C was such that A and B were at the same vertical height of 40 m from the ground level. The angles of elevation of A, B and C from O were 60° , 45° and 30° respectively. A vertical tower, SD has been erected at point S and a camera is set at the top of the tower for photography.





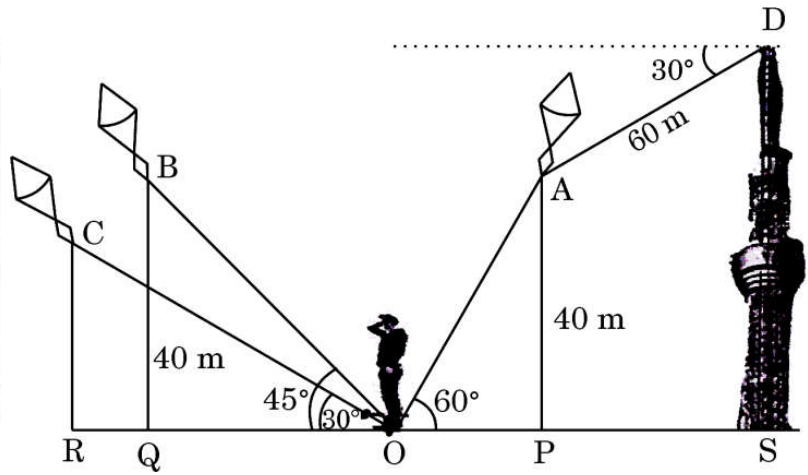
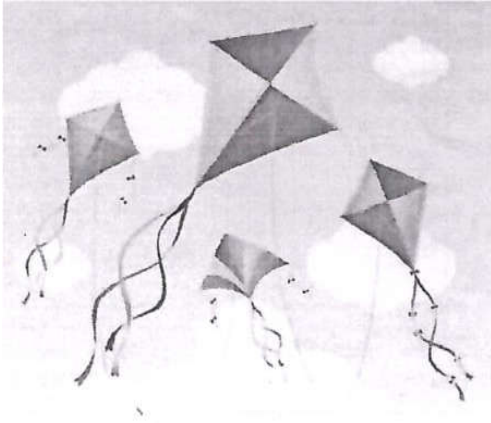
उपर्युक्त दी गई जानकारी के आधार पर, निम्नलिखित प्रश्नों के उत्तर दीजिए :

- (i) A पर पतंग की डोरी की लंबाई क्या है ? 1
- (ii) यदि C पर पतंग की डोरी की लम्बाई 40 m है, तो भूमि से पतंग C की ऊँचाई ज्ञात कीजिए। 1
- (iii) (क) A और B पर पतंगों की परस्पर क्षैतिज दूरी कितनी है ? 2

अथवा

- (iii) (ख) यदि A पर पतंग का अवनमन कोण, D पर कैमरे से 30° है तथा A और D के बीच की दूरी 60 m है, तो टावर की ऊँचाई ज्ञात कीजिए। 2





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

- (i) What is the length of the string of the kite at A ? 1
- (ii) If the length of the string of kite at C is 40 m, then find the height of that kite C from the ground. 1
- (iii) (a) What is the horizontal distance between the kites at A and B ? 2

OR

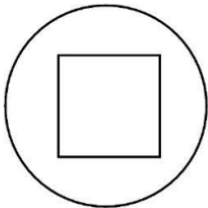
- (iii) (b) If the angle of depression of the kite at A is 30° from the camera at D and the distance between A and D is 60 m, then find the height of the tower. 2

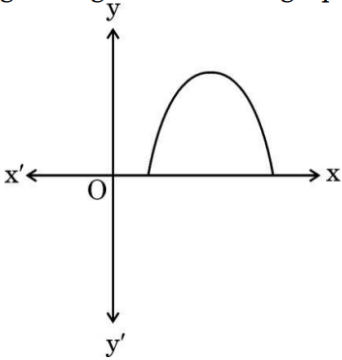
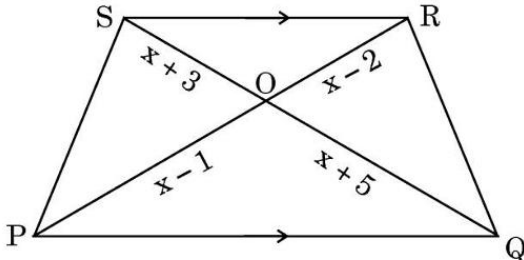


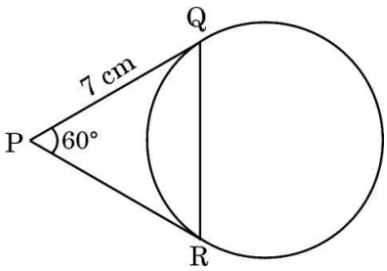
<p style="text-align: center;">Marking Scheme Strictly Confidential (For Internal and Restricted use only) Secondary School Supplementary Examination, 2025 MATHEMATICS (Standard) (Q.P. CODE 30/S/3)</p>	
<u>General Instructions: -</u>	
1.	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2.	“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. It’s leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc. may invite action under various rules of the Board and IPC.”
3.	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one’s own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In class-X, while evaluating the competency-based questions, please try to understand given answer and even if reply is not from Marking Scheme but correct competency is enumerated by the candidate, due marks should be awarded.
4.	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5.	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
6.	Evaluators will mark (✓) wherever answer is correct. For wrong answer CROSS ‘X’ be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. This is most common mistake which evaluators are committing.
7.	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totalled up and written on the left-hand margin and encircled. This may be followed strictly.
8.	If a question does not have any parts, marks must be awarded on the left-hand margin and encircled. This may also be followed strictly.

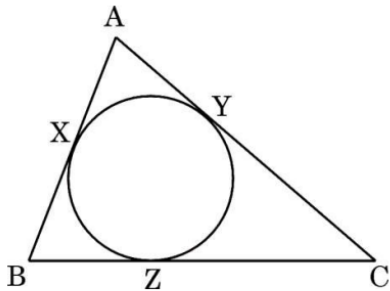
9.	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note “Extra Question”.
10.	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11.	A full scale of marks _____ (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12.	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
13.	<p>Ensure that you do not make the following common types of errors committed by the Examiner in the past:-</p> <ul style="list-style-type: none"> ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong totalling of marks awarded to an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. ● Wrong question wise totalling on the title page. ● Wrong totalling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to online award list. ● Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) <p>Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</p>
14.	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15.	Any un assessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16.	The Examiners should acquaint themselves with the guidelines given in the “ Guidelines for spot Evaluation ” before starting the actual evaluation.
17.	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
18.	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

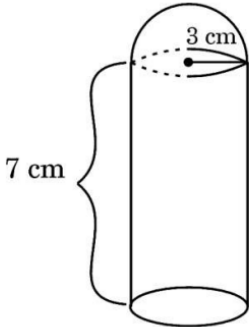
MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/S/3)

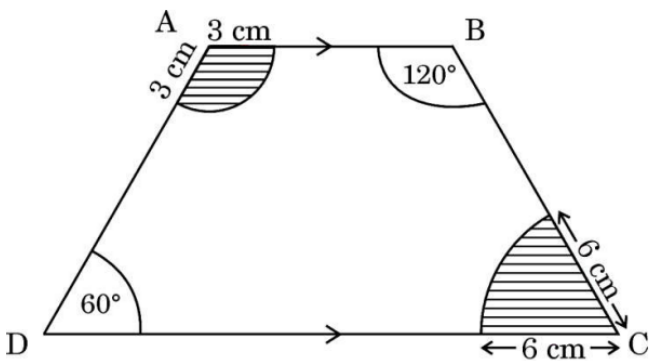
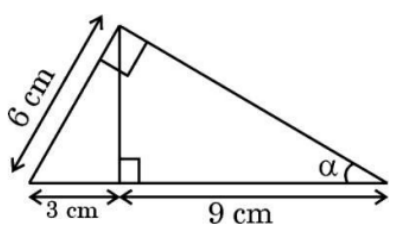
Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A	
	This section has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.	
1.	The length of the string of a kite flying 50 m above the ground with an elevation of 60° is : <div style="display: flex; justify-content: space-around;"> (A) $\frac{100}{\sqrt{3}}$ m (B) $100\sqrt{3}$ m </div> <div style="display: flex; justify-content: space-around;"> (C) 150 m (D) $\frac{50}{\sqrt{3}}$ m </div>	
Sol.	(A) $\frac{100}{\sqrt{3}}$ m	1
2.	There is a square lawn of side 8 m inside a circular park of radius 20 m. Mr. Joseph wants to plant a sapling in the park.  The probability that he can plant it outside the lawn is : <div style="display: flex; justify-content: space-around;"> (A) $\frac{32}{400 \pi}$ (B) $\frac{64}{400 \pi}$ </div> <div style="display: flex; justify-content: space-around;"> (C) $\frac{400 \pi - 32}{400 \pi}$ (D) $\frac{400 \pi - 64}{400 \pi}$ </div>	
Sol.	(D) $\frac{400\pi-64}{400\pi}$	1
3.	The pair of linear equations $9x - 15y + 19 = 0$ and $5y - 3x - 9 = 0$ represents two lines which are : <div style="display: flex; justify-content: space-between;"> (A) intersecting exactly at one point. (B) intersecting exactly at two points. </div> <div style="display: flex; justify-content: space-between;"> (C) parallel. (D) coincident. </div>	
Sol.	(C) parallel.	1

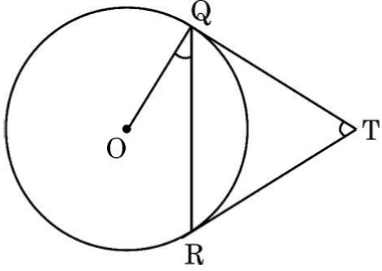
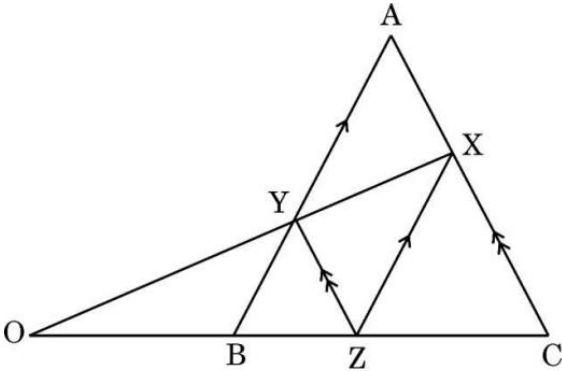
4.	<p>A(-4, 5) and C(8, 2) are the two opposite vertices of a parallelogram ABCD. Its diagonals intersect each other at P(a, b). The relation between 'a' and 'b' is :</p> <p>(A) $b = a - 1.5$ (B) $b = a + 1.5$ (C) $b = a - 4.5$ (D) $b = a + 4.5$</p>	
Sol.	(B) $b = a + 1.5$	1
5.	<p>If the given figure shows the graph of polynomial $y = ax^2 + bx + c$, then :</p>  <p>(A) $a < 0$ (B) $b^2 < 4ac$ (C) $c > 0$ (D) a and b are of same sign</p>	
Sol.	(A) $a < 0$	1
6.	<p>In the given figure, $PQ \parallel SR$. The value of x is :</p>  <p>(A) 3 (B) 5 (C) 6 (D) 7</p>	
Sol.	(D) 7	1
7.	<p>The total number of factors of the square of a prime number is :</p> <p>(A) 1 (B) 2 (C) 3 (D) 4</p>	
Sol.	(C) 3	1
8.	<p>A circle with centre P(4, 5) passes through the point A(0, 9). The length of the diagonal of the largest square inside this circle is :</p> <p>(A) $4\sqrt{2}$ units (B) $8\sqrt{2}$ units (C) $\sqrt{53}$ units (D) $2\sqrt{53}$ units</p>	
Sol.	(B) $8\sqrt{2}$ units	1

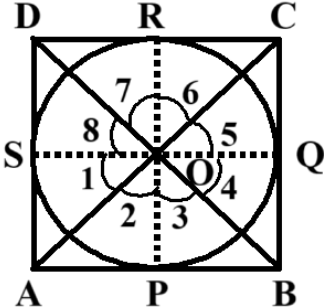
9.	<p>The 6th term of the AP $\sqrt{27}$, $\sqrt{75}$, $\sqrt{147}$, ... is :</p> <p>(A) $\sqrt{243}$ (B) $\sqrt{363}$ (C) $\sqrt{300}$ (D) $\sqrt{507}$</p>	
Sol.	(D) $\sqrt{507}$	1
10.	<p>The numerical value of the area of a circle is equal to that of the perimeter of a semicircular disc, both having equal radius. The radius is :</p> <p>(A) 1 unit (B) 2 units (C) $\frac{\pi+2}{\pi}$ units (D) $\frac{2\pi+2}{\pi}$ units</p>	
Sol.	(C) $\frac{\pi+2}{\pi}$ units	1
11.	<p>If the 23rd term of an AP exceeds its 16th term by 21, then the common difference is :</p> <p>(A) 1 (B) 2 (C) 3 (D) 7</p>	
Sol.	(C) 3	1
12.	<p>Two dice are thrown simultaneously and the product of the numbers appearing on the tops is noted. The probability of the product to be less than 6 is :</p> <p>(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{5}{18}$ (D) $\frac{7}{18}$</p>	
Sol.	(C) $\frac{5}{18}$	1
13.	<p>In the given figure, PQ and PR are tangents to the circle such that PQ = 7 cm and $\angle RPQ = 60^\circ$.</p>  <p>The length of chord QR is :</p> <p>(A) 5 cm (B) 7 cm (C) 9 cm (D) 14 cm</p>	
Sol.	(B) 7 cm	1

14.	<p>If $\cot \theta = \frac{p}{q}$ ($q \neq 0$), then $\sin \theta$ is equal to :</p> <p>(A) $\frac{p}{\sqrt{p^2 + q^2}}$ (B) $\frac{\sqrt{p^2 + q^2}}{p}$</p> <p>(C) $\frac{q}{\sqrt{p^2 + q^2}}$ (D) $\frac{q}{\sqrt{p^2 - q^2}}$</p>	
Sol.	(C) $\frac{q}{\sqrt{p^2 + q^2}}$	1
15.	<p>Cards numbered 10, 11, 12, ..., 30 are kept in a box and shuffled thoroughly. Rohit draws a card at random from the box. The probability that the number on the card is a multiple of 4 or 5 is :</p> <p>(A) $\frac{9}{20}$ (B) $\frac{9}{21}$</p> <p>(C) $\frac{10}{20}$ (D) $\frac{10}{21}$</p>	
Sol.	(B) $\frac{9}{21}$	1
16.	<p>A and B are sectors of two different circles. Radius of sector A is double of that of sector B whereas central angle of sector B is double the central angle of sector A. The ratio of the area of sector A to the area of sector B is :</p> <p>(A) 1 : 1 (B) 1 : 2</p> <p>(C) 2 : 1 (D) 4 : 1</p>	
Sol.	(C) 2 : 1	1
17.	<p>If $x = p \cos^3 \alpha$ and $y = q \sin^3 \alpha$, then the value of $\left(\frac{x}{p}\right)^{2/3} + \left(\frac{y}{q}\right)^{2/3}$ is :</p> <p>(A) 1 (B) 2</p> <p>(C) p (D) q</p>	
Sol.	(A) 1	1
18.	<p>In the given figure, a circle inscribed in ΔABC, touches AB, BC and CA at X, Z and Y, respectively.</p>  <p>If $AB = 12$ cm, $AY = 8$ cm and $CY = 6$ cm, then the length of BC is :</p> <p>(A) 14 cm (B) 12 cm</p> <p>(C) 10 cm (D) 8 cm</p>	
Sol.	(C) 10 cm	1

	<p>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.</p> <p>(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).</p> <p>(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).</p> <p>(C) Assertion (A) is true, but Reason (R) is false.</p> <p>(D) Assertion (A) is false, but Reason (R) is true.</p>	
19.	<p>Assertion (A) : In the given figure, a toy is in the form of a cylinder surmounted by a hemisphere of the same radius. If the radius of the cylinder is 3 cm and its height is 7 cm, then the volume of toy is $81\pi\text{ cm}^3$.</p>  <p>Reason (R): Volume of the given solid is the sum of the volume of the cylinder and the volume of the hemisphere.</p>	
Sol.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1
20.	<p>Assertion (A) : The quadratic equation $x^2 + 4x + 5 = 0$ has real roots.</p> <p>Reason (R): The quadratic equation $ax^2 + bx + c = 0$, $a \neq 0$ has real roots if $b^2 - 4ac \geq 0$.</p>	
Sol.	(D) Assertion (A) is false, but Reason (R) is true.	1
	<p style="text-align: center;">SECTION B</p> <p>This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each.</p>	
21 (a)	The perimeter of a sector of a circle of radius 15 cm is 80 cm. Find the area of the sector.	
Sol.	<p>Perimeter of sector $= 30 + l = 80$ $\Rightarrow l = 50\text{ cm}$ \therefore Area of the sector $= \frac{1}{2} \times 15 \times 50$ $= 375\text{ cm}^2$</p>	<p>1</p> <p>1</p>
	OR	

21 (b)	<p>In the given figure, ABCD is a trapezium with $AB \parallel DC$. Find the area of the shaded region. (Keep the answer in terms of π).</p> 	
Sol.	<p>ABCD is a trapezium. $\therefore \angle A = 120^\circ$ and $\angle C = 60^\circ$ Area of shaded region = $\frac{120}{360} \times \pi \times (3)^2 + \frac{60}{360} \times \pi \times (6)^2$ $= 9\pi \text{ cm}^2$</p>	$\frac{1}{2}$ 1 $\frac{1}{2}$
22.	Show that 14^n cannot end with the digit 0 or 5 for any natural number n.	
Sol.	<p>$14^n = 2^n \times 7^n$ To end with a digit 0 or 5, 14^n must have at least one prime factor 5, which is not there. $\therefore 14^n$ can not end with digit 0 or 5.</p>	1 $\frac{1}{2}$ $\frac{1}{2}$
23 (a)	<p>If $\sin(2A + 3B) = 1$ and $\cos(2A - 3B) = \frac{\sqrt{3}}{2}$, $0^\circ < 2A + 3B \leq 90^\circ$, $A > B$, then find A and B.</p>	
Sol.	<p>$\sin(2A + 3B) = 1 \Rightarrow 2A + 3B = 90^\circ$ --- (1) $\cos(2A - 3B) = \frac{\sqrt{3}}{2} \Rightarrow 2A - 3B = 30^\circ$ --- (2) Solving (1) and (2), we get $A = 30^\circ$ and $B = 10^\circ$</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$
OR		
23 (b)	<p>From the given figure, find the value of $\sin \alpha$.</p> 	
Sol.	<p>$\sin \alpha = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$ $\sin \alpha = \frac{6}{3+9} = \frac{1}{2}$</p>	2

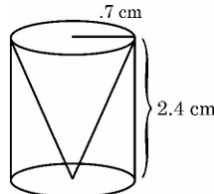
24.	<p>In the given figure, TQ and TR are tangents to the circle with centre O. Prove that $\angle QTR = 2 \angle OQR$.</p> 	
Sol.	<p>Since $TQ = TR$ $\therefore \angle TQR = \angle TRQ$ Also, $\angle QTR = 180^\circ - (\angle TQR + \angle TRQ)$ $\Rightarrow \angle QTR = 180^\circ - 2 \angle TQR$ --- (1) Now $TQ \perp OQ$ $\therefore \angle OQR = 90^\circ - \angle TQR$ Using (1), we get $2 \angle OQR = 180^\circ - 2 \angle TQR = \angle QTR$</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
25.	<p>In the given figure, Z is a point on the side BC of $\triangle ABC$ such that $XZ \parallel AB$ and $YZ \parallel AC$. If XY and CB produced meet at O, then prove that $ZO^2 = OB \times OC$.</p> 	
Sol.	<p>In $\triangle OZX$, $ZX \parallel BY$ (As $XZ \parallel AB$) $\therefore \frac{OB}{OZ} = \frac{OY}{OX}$ --- (1) In $\triangle OCX$, $ZY \parallel CX$ (As $YZ \parallel AC$) $\therefore \frac{OZ}{OC} = \frac{OY}{OX}$ --- (2) Using (1) and (2), we get $\frac{OB}{OZ} = \frac{OZ}{OC}$ $\Rightarrow OZ^2 = OB \times OC$</p>	1 $\frac{1}{2}$ $\frac{1}{2}$

	<p style="text-align: center;">SECTION C</p> <p>This section has 6 Short Answer (SA) type questions carrying 3 marks each.</p>	
26.	A quadrilateral circumscribes a circle. Prove that the opposite sides of the quadrilateral subtend supplementary angles at the centre of the circle.	
Sol.	<div style="text-align: right;">Correct figure</div>  <p> $\Delta OPA \cong \Delta OSA$ $\Rightarrow \angle 1 = \angle 2$ Similarly, $\angle 3 = \angle 4, \angle 5 = \angle 6, \angle 7 = \angle 8$ Now, $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360^\circ$ $\Rightarrow 2(\angle 1 + \angle 4 + \angle 5 + \angle 8) = 360^\circ$ $\Rightarrow (\angle 1 + \angle 8) + (\angle 4 + \angle 5) = 180^\circ$ $\Rightarrow \angle AOD + \angle BOC = 180^\circ$ </p>	<p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p>
27.	<p>Prove that :</p> $\frac{\tan^3 \theta}{1 + \tan^2 \theta} + \frac{\cot^3 \theta}{1 + \cot^2 \theta} = \sec \theta \operatorname{cosec} \theta - 2 \sin \theta \cos \theta$	
Sol.	$\begin{aligned} \text{LHS} &= \frac{\tan^3 \theta}{\sec^2 \theta} + \frac{\cot^3 \theta}{\operatorname{cosec}^2 \theta} \\ &= \frac{\sin^3 \theta}{\cos \theta} + \frac{\cos^3 \theta}{\sin \theta} \\ &= \frac{\sin^4 \theta + \cos^4 \theta}{\sin \theta \cos \theta} \\ &= \frac{(\sin^2 \theta + \cos^2 \theta)^2 - 2\sin^2 \theta \cos^2 \theta}{\sin \theta \cos \theta} \\ &= \frac{1 - 2\sin^2 \theta \cos^2 \theta}{\sin \theta \cos \theta} = \frac{1}{\sin \theta \cos \theta} - \frac{2\sin^2 \theta \cos^2 \theta}{\sin \theta \cos \theta} \\ &= \operatorname{cosec} \theta \sec \theta - 2 \sin \theta \cos \theta = \text{RHS} \end{aligned}$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>


28 (a)	<p>One healthcare center working for the welfare of the patients suffering from ‘Dengue’, recorded the following information :</p> <table><tr><th>Age of Patients</th><th>Number of Patients</th></tr><tr><td>0 – 15</td><td>8</td></tr><tr><td>15 – 30</td><td>5</td></tr><tr><td>30 – 45</td><td>x</td></tr><tr><td>45 – 60</td><td>16</td></tr><tr><td>60 – 75</td><td>12</td></tr><tr><td>75 – 90</td><td>9</td></tr></table> <p>If the modal age of the patients is 54, then find the value of x.</p>	Age of Patients	Number of Patients	0 – 15	8	15 – 30	5	30 – 45	x	45 – 60	16	60 – 75	12	75 – 90	9																						
Age of Patients	Number of Patients																																				
0 – 15	8																																				
15 – 30	5																																				
30 – 45	x																																				
45 – 60	16																																				
60 – 75	12																																				
75 – 90	9																																				
Sol.	<p>Modal class is 45 – 60 Mode = 54 $\therefore 45 + \left(\frac{16-x}{2 \times 16-x-12}\right) \times 15 = 54$ $\Rightarrow x = 10$</p>	<p>$\frac{1}{2}$ $1\frac{1}{2}$ 1</p>																																			
OR																																					
28 (b)	<p>Weekly expenditure on Ayurvedic medicines of few households in a locality is recorded below.</p> <table><tr><th>Weekly Expenditure (in ₹)</th><th>Number of Households</th></tr><tr><td>100 – 150</td><td>4</td></tr><tr><td>150 – 200</td><td>5</td></tr><tr><td>200 – 250</td><td>y</td></tr><tr><td>250 – 300</td><td>2</td></tr><tr><td>300 – 350</td><td>2</td></tr></table> <p>If the mean expenditure for this is ₹ 211, then find the value of the missing frequency ‘y’.</p>	Weekly Expenditure (in ₹)	Number of Households	100 – 150	4	150 – 200	5	200 – 250	y	250 – 300	2	300 – 350	2																								
Weekly Expenditure (in ₹)	Number of Households																																				
100 – 150	4																																				
150 – 200	5																																				
200 – 250	y																																				
250 – 300	2																																				
300 – 350	2																																				
Sol.	<table><tr><th>Class Interval</th><th>x_i</th><th>f_i</th><th>$u_i = \frac{x_i - 225}{50}$</th><th>$f_i u_i$</th></tr><tr><td>100 – 150</td><td>125</td><td>4</td><td>– 2</td><td>– 8</td></tr><tr><td>150 – 200</td><td>175</td><td>5</td><td>– 1</td><td>– 5</td></tr><tr><td>200 – 250</td><td>225</td><td>y</td><td>0</td><td>0</td></tr><tr><td>250 – 300</td><td>275</td><td>2</td><td>1</td><td>2</td></tr><tr><td>300 – 350</td><td>325</td><td>2</td><td>2</td><td>4</td></tr><tr><td></td><td></td><td>13 + y</td><td></td><td>– 7</td></tr></table> <p style="text-align: right;">Correct table</p> <p>Mean = 211 $\Rightarrow 225 + \frac{(-7)}{13+y} \times 50 = 211$ $\Rightarrow y = 12$</p>	Class Interval	x_i	f_i	$u_i = \frac{x_i - 225}{50}$	$f_i u_i$	100 – 150	125	4	– 2	– 8	150 – 200	175	5	– 1	– 5	200 – 250	225	y	0	0	250 – 300	275	2	1	2	300 – 350	325	2	2	4			13 + y		– 7	<p>$\frac{1}{2}$ 1 $\frac{1}{2}$</p>
Class Interval	x_i	f_i	$u_i = \frac{x_i - 225}{50}$	$f_i u_i$																																	
100 – 150	125	4	– 2	– 8																																	
150 – 200	175	5	– 1	– 5																																	
200 – 250	225	y	0	0																																	
250 – 300	275	2	1	2																																	
300 – 350	325	2	2	4																																	
		13 + y		– 7																																	

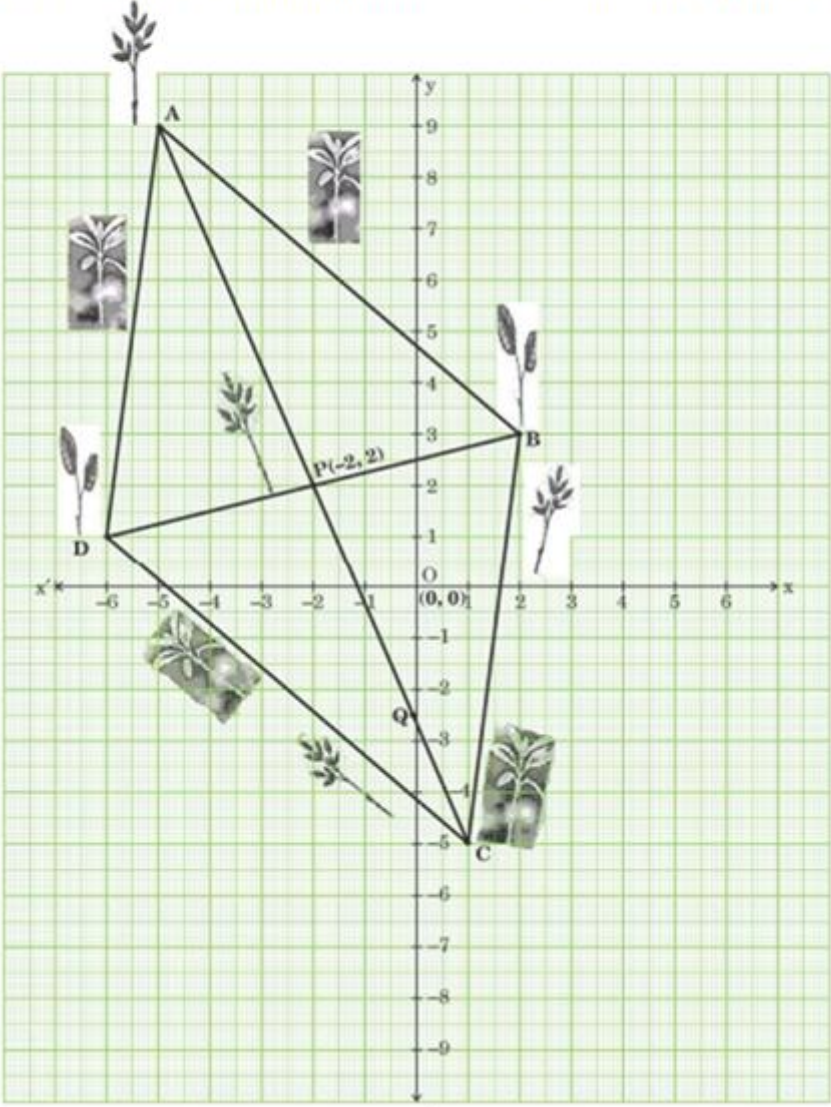
31 (a)	Check graphically whether the pair of linear equations $2x + 3y = 12$; $5x - 3y = 9$ is consistent. If so, solve it graphically.	
Sol.	<p>Correct graph of $2x + 3y = 12$ Correct graph of $5x - 3y = 9$</p> <p>As lines are intersecting, therefore given system of linear equations is consistent. Solution is $x = 3$, $y = 2$</p>	<p>1 1</p> <p>$\frac{1}{2}$ $\frac{1}{2}$</p>
	OR	
31 (b)	A 2-digit number is obtained by either multiplying the sum of the digits by 7 and then adding 3 or by multiplying the difference of the digits by 19 and then subtracting 1. It is given that the digit at ten's place is greater than that of unit's place. Find the 2-digit number.	
Sol.	<p>Let the unit's place digit be y and ten's digit be x. So, number be $10x + y$ Therefore, $10x + y = 7(x + y) + 3$ $\Rightarrow x - 2y = 1$ --- ① Also, $10x + y = 19(x - y) - 1$ $\Rightarrow -9x + 20y = -1$ --- ② Solving ① and ②, we get $x = 9$, $y = 4$ \therefore the required number is 94.</p>	<p>1 1 $\frac{1}{2}$ $\frac{1}{2}$</p>

	SECTION D This section has 4 Long Answer (LA) type questions carrying 5 marks each.	
32 (a)	The denominator of a fraction is 2 more than the numerator. If 2 is added to both its numerator and denominator, then the sum of the new fraction and the original fraction is $\frac{46}{35}$. Find the original fraction.	
Sol.	<p>Let the fraction be $\frac{x}{x+2}$</p> <p>Therefore, $\frac{x}{x+2} + \frac{x+2}{x+4} = \frac{46}{35}$</p> $\Rightarrow 24x^2 + 4x - 228 = 0 \text{ or } 6x^2 + x - 57 = 0$ $\Rightarrow (6x + 19)(x - 3) = 0$ $x \neq -\frac{19}{6}$ $\therefore x = 3$ <p>So, the required fraction is $\frac{3}{5}$</p>	$\frac{1}{2}$ 2 1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	OR	
32 (b)	At present, Sourav's age is 3 years more than the square of his son Ravi's age. When Ravi grows to his father's present age, Sourav's age would be 6 years less than 13 times the present age of Ravi. Find present ages of Ravi and Sourav.	
Sol.	<p>Let the present age of Ravi be 'r' years and the present age of Sourav be 's' years</p> <p>Therefore, $s = 3 + r^2$ --- (1)</p> <p>Ravi grows to father's present age in (s - r) years.</p> <p>\therefore father's age after (s - r) years = (2s - r) years and Ravi's age after (s - r) years = 's' years</p> <p>Therefore, $2s - r = 13r - 6$ or $s = 7r - 3$ --- (2)</p> <p>Using (1) and (2),</p> $r^2 - 7r + 6 = 0$ $\Rightarrow (r - 6)(r - 1) = 0$ $\Rightarrow r = 6, 1$ <p>Ignoring $r = 1$ as $s \neq 4$</p> <p>$r = 6$</p> <p>Hence $s = 39$</p>	1 1 1 1 $\frac{1}{2}$ $\frac{1}{2}$

33.	<p>Find the values of the missing frequencies p and q in the following distribution of 100 observations. The median of the distribution is given as 47.</p> <table><tr><td>Class</td><td>30 – 35</td><td>35 – 40</td><td>40 – 45</td><td>45 – 50</td><td>50 – 55</td><td>55 – 60</td><td>60 – 65</td></tr><tr><td>Frequency</td><td>12</td><td>p</td><td>17</td><td>20</td><td>q</td><td>12</td><td>8</td></tr></table>	Class	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	Frequency	12	p	17	20	q	12	8									
Class	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65																			
Frequency	12	p	17	20	q	12	8																			
Sol.	<table><tr><td>C.I.</td><td>f_i</td><td>u_i</td></tr><tr><td>30 – 35</td><td>12</td><td>12</td></tr><tr><td>35 – 40</td><td>p</td><td>12 + p</td></tr><tr><td>40 – 45</td><td>17</td><td>29 + p</td></tr><tr><td>45 – 50</td><td>20</td><td>49 + p</td></tr><tr><td>50 – 55</td><td>q</td><td>49 + p + q</td></tr><tr><td>55 – 60</td><td>12</td><td>61 + p + q</td></tr><tr><td>60 – 65</td><td>8</td><td>69 + p + q</td></tr></table> <p>$\therefore 69 + p + q = 100$ $\Rightarrow p + q = 31$ Median class is 45 – 50 Median = 47 $\therefore 45 + \left(\frac{\frac{100}{2} - (29+p)}{20} \right) \times 5 = 47$ $\Rightarrow p = 13$ and q = 18</p>	C.I.	f_i	u_i	30 – 35	12	12	35 – 40	p	12 + p	40 – 45	17	29 + p	45 – 50	20	49 + p	50 – 55	q	49 + p + q	55 – 60	12	61 + p + q	60 – 65	8	69 + p + q	<p>Correct table</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p>
C.I.	f_i	u_i																								
30 – 35	12	12																								
35 – 40	p	12 + p																								
40 – 45	17	29 + p																								
45 – 50	20	49 + p																								
50 – 55	q	49 + p + q																								
55 – 60	12	61 + p + q																								
60 – 65	8	69 + p + q																								
34 (a)	<p>From a solid cylinder of height 2.4 cm and radius 0.7 cm, a conical cavity of the same height and same radius is hollowed out. Find the volume and total surface area of the remaining solid.</p>																									
Sol.	<div></div> <p>Volume of the remaining solid = Volume of cylinder – volume of cone $= \frac{22}{7} \times (0.7)^2 \times 2.4 - \frac{1}{3} \times \frac{22}{7} \times (0.7)^2 \times 2.4$ $= 2.464 \text{ cm}^3$</p> <p>Slant height of cone = $\sqrt{(0.7)^2 + (2.4)^2} = 2.5 \text{ cm}$ Total Surface area = CSA of cylinder + CSA of cone + Area of base $= 2 \times \frac{22}{7} \times 0.7 \times 2.4 + \frac{22}{7} \times 0.7 \times 2.5 + \frac{22}{7} \times (0.7)^2$ $= 17.6 \text{ cm}^2$</p>	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$</p> <p>1</p>																								
	OR																									

34 (b)	<p>A carpenter is making a wooden toy (lattu) which is conical in shape and surmounted by a hemisphere. The ratio of the height of the hemisphere and the cone is 3 : 4. If the radius of the cone and the hemisphere is 2.1 cm, find the volume of wood required to make this toy. Also, find the area to be painted after making the toy.</p>	
Sol.	<div data-bbox="708 465 863 712" data-label="Image"> </div> <p>Given $r : h = 3 : 4$ Let $r = 3x$, $h = 4x$ $\therefore r = 3x = 2.1 \Rightarrow x = 0.7$ Hence $h = 2.8$ cm Volume of wood required to make the toy = Volume of cone + Volume of hemisphere $= \frac{1}{3} \times \frac{22}{7} \times (2.1)^2 \times 2.8 + \frac{2}{3} \times \frac{22}{7} \times (2.1)^3$ $= 32.34 \text{ cm}^3$ Slant height of cone = $\sqrt{(2.1)^2 + (2.8)^2} = 3.5$ cm Total Surface Area = CSA of cone + CSA of hemisphere $= \frac{22}{7} \times 2.1 \times 3.5 + 2 \times \frac{22}{7} \times (2.1)^2$ $= 50.82 \text{ cm}^2$</p>	<p>$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$</p>
35.	<p>In the figure, MNOP is a trapezium with, $MN \parallel PO$ and $PO = 2 MN$. A line segment FE drawn parallel to MN intersects MP at F and NO at E such that $\frac{NE}{EO} = \frac{3}{4}$. Diagonal PN intersects FE at X. Prove that $7 FE = 10 MN$.</p> <div data-bbox="459 1525 951 1783" data-label="Image"> </div>	
Sol.	<p>$\frac{NE}{EO} = \frac{3}{4} \Rightarrow \frac{NE}{NO} = \frac{3}{7}$ $XE \parallel PO$ Therefore, $\frac{NX}{NP} = \frac{NE}{NO} = \frac{XE}{PO} = \frac{3}{7}$ $\therefore PO = 2 MN$ $\therefore \frac{XE}{MN} = \frac{6}{7} \text{ --- (1)}$</p>	<p>$\frac{1}{2}$ 1 $\frac{1}{2}$</p>

	<p>Also, $\frac{NX}{NP} = \frac{3}{7} \Rightarrow \frac{XP}{NP} = \frac{4}{7}$</p> <p>Now, $FX \parallel MN$</p> <p>$\therefore \frac{XP}{NP} = \frac{FX}{MN} = \frac{4}{7}$ --- (2)</p> <p>Using (1) and (2),</p> <p>$\frac{XE}{MN} + \frac{XF}{MN} = \frac{6}{7} + \frac{4}{7} = \frac{10}{7}$</p> <p>$\Rightarrow \frac{EF}{MN} = \frac{10}{7}$ or $7\ EF = 10\ MN$</p>	<p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p>
	<p style="text-align: center;">SECTION E</p> <p>This section has 3 case study based questions carrying 4 marks each.</p>	
36.	<p style="text-align: center;">Case Study - 1</p> <p>In the month of September, villagers of Ankurhut were falling ill with high temperature. Paracetamol was one of the highest sold medicines during that phase. A survey was conducted to estimate the overall sale of Paracetamol of each pharmacy during the last 7 days. It was observed that the number of Paracetamol sold in different shops were all 3-digit numbers, divisible by 13, taken in order.</p>  <p>Based on the information given above, answer the following questions :</p> <p>(i) How many Paracetamols were sold by the 7th pharmacy ?</p> <p>(ii) What was the difference between the number of Paracetamols sold by the 14th and the 9th pharmacy ?</p> <p>(iii) (a) How many Paracetamols were sold by the 9th pharmacy from the last ?</p> <p style="text-align: center;">OR</p> <p>(iii) (b) What was the total number of Paracetamols sold in that week ?</p>	
Sol.	<p>(i) A.P. formed is 104, 117, 130, ... with $a = 104$ and $d = 13$ $a_7 = 104 + 6 \times 13 = 182$</p> <p>(ii) $a_{14} - a_9 = 5 \times 13 = 65$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>

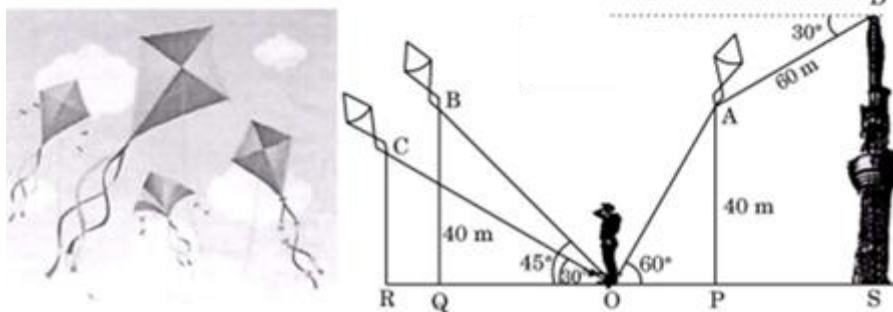
	<p>(iii) (a) Last term of A.P. is 988 and $d = -13$ $a_9 = 988 + 8 \times (-13) = 884$</p> <p style="text-align: center;">OR</p> <p>(b) Last term of A.P. is 988 and $d = -13$ $988 = 104 + (n - 1) \times 13$ $\Rightarrow n = 69$ $S_{69} = \frac{69}{2} \times (104 + 988)$ $= 37674$</p>	<p>1 1</p> <p>1</p> <p>1</p>
37.	<p style="text-align: center;">Case Study - 2</p> <p>Trees act the natural filters. By planting trees in and around school premises, we create cleaner and healthier air for students and local residents, reducing respiratory problems. A school in Noida has proposed and organised a community drive on tree plantation under the title "Save Earth, Plant Trees". Students of that school have planted saplings in the field such that it formed a quadrilateral as shown in the figure ABCD.</p> 	

	<p>Based on the information given above, answer the following questions :</p> <p>(i) Find the distance between the two saplings at A and D.</p> <p>(ii) (a) One student plants one sapling at the mid-point of AD. Then he moves along a straight line parallel to DB and sows another sapling on AB. What are the coordinates of the positions of these two new saplings ?</p> <p style="text-align: center;">OR</p> <p>(ii) (b) A new sapling is kept at a point M on DB such that $DM : MB = 3 : 1$. Find the coordinates of M.</p> <p>(iii) The line segments AC and BD bisect each other at $P(-2, 2)$. Find the coordinates of C.</p>	
Sol.	<p>(i) Observing the graph, coordinators of points are A $(-5, 9)$ and D $(-6, 1)$ $AD = \sqrt{(-6 + 5)^2 + (1 - 9)^2} = \sqrt{65}$</p> <p>(ii) (a) Mid point of AD $= \left(\frac{-6-5}{2}, \frac{1+9}{2}\right)$ i.e. $\left(\frac{-11}{2}, 5\right)$ Student will sow another sapling at mid point of AB. Point B is $(2, 3)$ Mid point of AB $= \left(\frac{2-5}{2}, \frac{3+9}{2}\right)$ i.e. $\left(\frac{-3}{2}, 6\right)$</p> <p style="text-align: center;">OR</p> <p>(b)</p> <p style="text-align: center;">Coordinates of M $= \left(\frac{6-6}{4}, \frac{9+1}{4}\right)$ i.e. $\left(0, \frac{5}{2}\right)$</p> <p>(iii) Coordinates of C are $(1, -5)$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>

38.

Case Study – 3

The International Kite Festival takes place every year on 14th January. The main attractions of the festival include national and international Kite Flyers' Parade, kite flying, traditional stalls etc. On this day, few kite flyers, had assembled at a point 'O' on the ground. The position of 3 kites A, B, C was such that A and B were at the same vertical height of 40 m from the ground level. The angles of elevation of A, B and C from O were 60°, 45° and 30° respectively. A vertical tower, SD has been erected at point S and a camera is set at the top of the tower for photography.



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

- (i) What is the length of the string of the kite at A ?
- (ii) If the length of the string of kite at C is 40 m, then find the height of that kite C from the ground.
- (iii) (a) What is the horizontal distance between the kites at A and B ?

OR

- (iii) (b) If the angle of depression of the kite at A is 30° from the camera at D and the distance between A and D is 60 m, then find the height of the tower.

Sol.

$$(i) \quad \sin 60^\circ = \frac{\sqrt{3}}{2} = \frac{40}{OA}$$

$$\Rightarrow OA = \frac{80}{\sqrt{3}} \text{ m or } \frac{80\sqrt{3}}{3} \text{ m}$$

$$(ii) \quad \sin 30^\circ = \frac{1}{2} = \frac{RC}{40}$$

$$\Rightarrow RC = 20 \text{ m}$$

$$(iii) \quad (a) \quad \tan 45^\circ = 1 = \frac{40}{OQ}$$

$$\Rightarrow OQ = 40 \text{ m}$$

$$\text{Also, } \tan 60^\circ = \sqrt{3} = \frac{40}{OP}$$

$$\Rightarrow OP = \frac{40}{\sqrt{3}} \text{ m or } \frac{40\sqrt{3}}{3} \text{ m}$$

$$AB = PQ = \left(40 + \frac{40}{\sqrt{3}}\right) \text{ m or } \left(40 + \frac{40\sqrt{3}}{3}\right) \text{ m}$$

OR

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

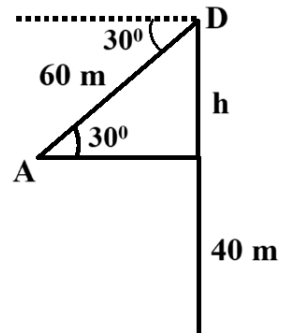
$\frac{1}{2}$

$\frac{1}{2}$

1

$\frac{1}{2}$

(b)



$$\sin 30^\circ = \frac{1}{2} = \frac{h}{60}$$

$$\Rightarrow h = 30 \text{ m}$$

$$\text{Height of the tower} = 40 + 30 = 70 \text{ m}$$

1

$\frac{1}{2}$

$\frac{1}{2}$