Series : 4MNKL

SET ~ 2

रोल नं.

Roll No.

प्रश्न–पत्र कोड
Q.P. Code **430/4/2**

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.

नोट/ NOTE :

(I) कृपया जाँच कर लें कि इस प्रश्न–पत्र में मुद्रित पृष्ठ **23** हैं ।

Please check that this question paper contains **23** printed pages.

(II) प्रश्न–पत्र में दाहिने हाथ की ओर दिए गए प्रश्न–पत्र कोड को परीक्षार्थी उत्तर–पुस्तिका के मुख–पृष्ठ पर लिखें ।

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) कृपया जाँच कर लें कि इस प्रश्न–पत्र में **38** प्रश्न हैं ।

Please check that this question paper contains **38** questions.

(IV) **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर–पुस्तिका में यथा स्थान पर प्रश्न का क्रमांक अवश्य लिखें ।**

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

(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 ।

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

गणित (बुनियादी)

MATHEMATICS (BASIC)

*निर्धारित समय : **3** घण्टे* | *अधिकतम अंक : **80***

*Time allowed : **3** hours* | *Maximum Marks : **80***

सामान्य निर्देश :

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

(i) *इस प्रश्न-पत्र में कुल **38** प्रश्न हैं। **सभी** प्रश्न **अनिवार्य** हैं।*

(ii) *प्रश्न-पत्र **पाँच** खण्डों में विभाजित है – **क, ख, ग, घ** तथा **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 बनाएँ। जहाँ आवश्यक हो $\pi = \frac{22}{7}$ लीजिए, यदि अन्यथा न दिया गया है।*

(x) *कैल्कुलेटर का उपयोग **वर्जित** है।*

General Instructions :

Read the following instructions very carefully and strictly follow them :

(i) *This question paper contains total **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 number **1** to **18** are Multiple Choice Questions (MCQs) and questions number **19** & **20** are Assertion-Reason based questions of **1** mark each.*

(iv) *In **Section–B**, questions number **21** to **25** are Very Short Answer (VSA) type questions of **2** marks each.*

(v) *In **Section–C**, questions number **26** to **31** are Short Answer (SA) type questions carrying **3** marks each.*

(vi) *In **Section–D**, questions number **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.*

(vii) *In **Section–E**, questions number **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.*

खण्ड – क $20 \times 1 = 20$

(बहुविकल्पीय प्रश्न)

प्रश्न संख्या **1** से **20** तक बहुविकल्पीय प्रश्न हैं । प्रत्येक प्रश्न **1** अंक का है ।

1. 52 पत्तों की अच्छी प्रकार से फेंटी गयी एक गड्डी में से एक पत्ता निकाला जाता है । इस पत्ते के इक्का या दस होने की प्रायिकता है :

   (A) $\frac{1}{13}$ (B) $\frac{2}{13}$

   (C) $\frac{1}{26}$ (D) $\frac{4}{13}$

2. बिंदुओं (–5, 1) तथा (2, 2) के बीच की दूरी है :

   (A) $2\sqrt{5}$ इकाइयाँ (B) $\sqrt{10}$ इकाइयाँ

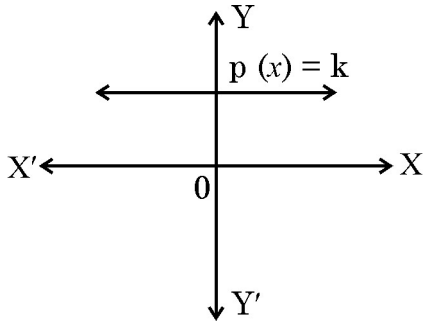
   (C) $5\sqrt{2}$ इकाइयाँ (D) $3\sqrt{2}$ इकाइयाँ

3. संख्याओं $\sqrt{3}, \sqrt{4}, 3\sqrt{9}, 3\sqrt{8}, \sqrt{5}, 0, 4^{\frac{3}{2}}$ में से यादृच्छया एक अपरिमेय संख्या चुने जाने की प्रायिकता है :

   (A) 0 (B) $\frac{4}{7}$

   (C) $\frac{3}{7}$ (D) 1

4. यहाँ बहुपद $p(x) = k$ का ग्राफ दिखाया गया है । बहुपद $p(x)$ के शून्यकों की संख्या है :



   (A) 0 (B) 1

   (C) 2 (D) अनंत रूप से अनेक

5. 9 cm त्रिज्या वाले वृत्त की एक जीवा AB केन्द्र पर 40° का कोण अंतरित करती है । चाप AB की लंबाई है :

   (A) $\frac{22}{7}$ cm (B) $\frac{198}{7}$ cm

   (C) $\frac{44}{7}$ cm (D) $\frac{54}{7}$ cm

Section – A

20 × 1 = 20

(Multiple Choice Questions)

Q. No. **1** to **20** are multiple choice questions of **1** mark each.

1. A card is drawn from a well shuffled deck of 52 cards. The probability of getting an ace or a ten is :

   (A) $\frac{1}{13}$ (B) $\frac{2}{13}$

   (C) $\frac{1}{26}$ (D) $\frac{4}{13}$

2. The distance between the points (– 5, 1) and (2, 2) is :

   (A) $2\sqrt{5}$ units (B) $\sqrt{10}$ units

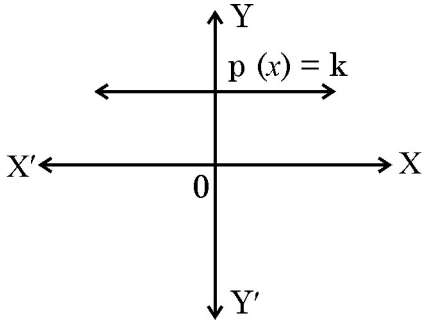
   (C) $5\sqrt{2}$ units (D) $3\sqrt{2}$ units

3. Probability of getting an irrational number at random from the numbers $\sqrt{3}, \sqrt{4}, 3\sqrt{9}, 3\sqrt{8}, \sqrt{5}, 0, 4^{\frac{3}{2}}$ is :

   (A) 0 (B) $\frac{4}{7}$

   (C) $\frac{3}{7}$ (D) 1

4. The graph of polynomial p(x) = k is shown here. Number of zeroes of polynomial p(x) is :



   (A) 0 (B) 1

   (C) 2 (D) infinitely many

5. Chord AB subtends an angle of 40° at the centre of the circle of radius 9 cm. The length of arc AB is :

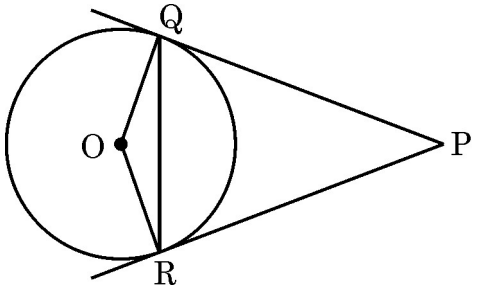
   (A) $\frac{22}{7}$ cm (B) $\frac{198}{7}$ cm

   (C) $\frac{44}{7}$ cm (D) $\frac{54}{7}$ cm

6. $7 \times 29 \times 23 + 1$

(A) एक अभाज्य संख्या है ।
(B) 23 से विभाजित होती है ।
(C) एक विषम संख्या है ।
(D) एक भाज्य संख्या है ।

7. दी गयी आकृति में, PQ तथा PR केन्द्र O वाले वृत्त पर खींची गयी दो स्पर्श-रेखाएँ हैं । यदि $\angle ORQ = 25°$ हो, तो $\angle PQR$ का माप है :



(A) 65°
(B) 25°
(C) 50°
(D) 75°

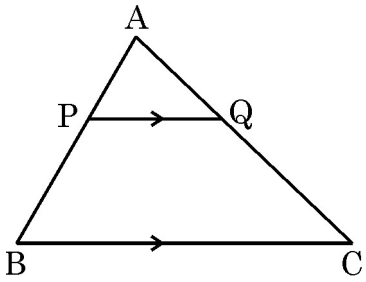
8. $\tan 30° \tan 60° - \sin 90° \cos 90°$ का मान है :

(A) 1
(B) 0
(C) 2
(D) परिभाषित नहीं

9. दो क्रमागत प्राकृत संख्याओं का HCF है :

(A) 2
(B) 1
(C) 0
(D) छोटी वाली संख्या

10. दी गयी आकृति में, PQ || BC है । यदि AP : AB = 3 : 7 है, तो AQ : QC बराबर है :

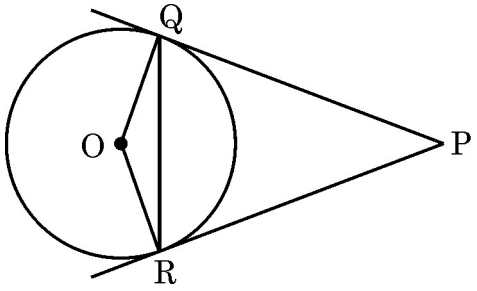


(A) 3 : 7
(B) 3 : 10
(C) 7 : 3
(D) 3 : 4

6. $7 \times 29 \times 23 + 1$ is :

(A) a prime number.
(B) divisible by 23.
(C) an odd number.
(D) a composite number.

7. In the given figure, PQ and PR are two tangents drawn to a circle with centre O. If $\angle ORQ = 25°$, then the measure of $\angle PQR$ is :



(A) 65°
(B) 25°
(C) 50°
(D) 75°

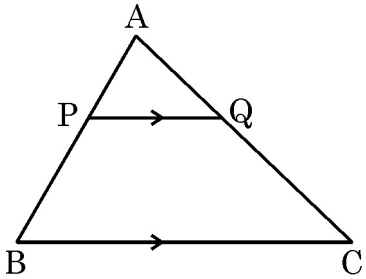
8. The value of $\tan 30° \tan 60° - \sin 90° \cos 90°$ is :

(A) 1
(B) 0
(C) 2
(D) not defined

9. HCF of two consecutive natural numbers is :

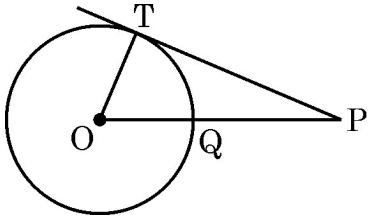
(A) 2
(B) 1
(C) 0
(D) smaller number

10. In the given figure, PQ || BC. If AP : AB = 3 : 7 then, AQ : QC equals :



(A) 3 : 7
(B) 3 : 10
(C) 7 : 3
(D) 3 : 4

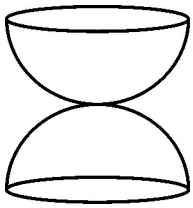
11. PT एक वृत्त जिसका केन्द्र O तथा त्रिज्या 5 cm है, पर खींची गयी एक स्पर्शरेखा है । OP वृत्त को बिंदु Q पर काटती है । यदि PQ = x है, तो PT^2 बराबर है :



(A) $x^2 + 5x$ (B) $x^2 + 10x + 50$

(C) $x^2 + 10x$ (D) $x^2 - 25$

12. समान त्रिज्या r वाले लकड़ी के दो ठोस अर्धगोले चित्र में दर्शाये अनुसार एक बिंदु से जोड़े गये हैं । इस वस्तु का कुल पृष्ठीय क्षेत्रफल है :



(A) $4\pi r^2$ (B) $6\pi r^2$

(C) $3\pi r^2$ (D) $5\pi r^2$

13. एक वर्गीकृत बारंबारता बंटन का माध्य ज्ञात करने के लिये पद विचलन विधि $\left(u = \frac{x - a}{h}\right)$ का उपयोग करते हुये पाया गया कि $\overline{x} = 62$, $a = 47.5$ तथा $h = 5$ है । $\overline{u}$ का मान है :

(A) 3 (B) 14.5

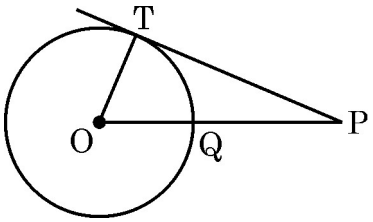
(C) 2.9 (D) 3.1

14. एक A.P. का nवाँ पद $5n - 15$ है । इस A.P. का सार्व अन्तर है :

(A) 5n (B) 5

(C) – 5 (D) 10

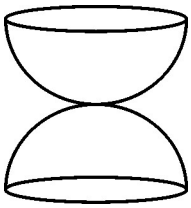
11. PT is tangent to the circle with centre O and radius 5 cm. OP intersects the circle at Q. If PQ = x, then PT^2 equals :



(A) $x^2 + 5x$ (B) $x^2 + 10x + 50$

(C) $x^2 + 10x$ (D) $x^2 - 25$

12. Two wooden solid hemispheres of same radii r, are joined at a point, as shown in the figure. The total surface area of the object is :



(A) $4\pi r^2$ (B) $6\pi r^2$

(C) $3\pi r^2$ (D) $5\pi r^2$

13. While calculating mean of a grouped frequency distribution using step deviation method $\left(u = \frac{x - a}{h}\right)$ it was found that $\overline{x} = 62$, a = 47.5, h = 5. The value of $\overline{u}$ is :

(A) 3 (B) 14.5

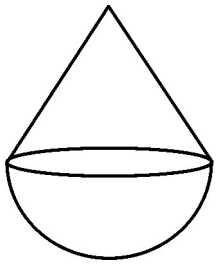
(C) 2.9 (D) 3.1

14. n^{th} term of an A.P. is 5n – 15. The common difference of the A.P. is :

(A) 5n (B) 5

(C) – 5 (D) 10

15. त्रिज्या 6 cm तथा तिर्यक ऊँचाई 10 cm वाला शंकु, समान त्रिज्या वाले अर्धगोले पर अध्यारोपित है । खिलौने की ऊँचाई है :



(A) 12 cm (B) 16 cm
(C) 14 cm (D) 10 cm

16. समांतर श्रेणी $\frac{-3}{2}, \frac{3}{2}, \frac{9}{2}, \ldots$ का nवाँ पद है :

(A) $\frac{3n}{2} - 3$ (B) $3n - \frac{9}{2}$
(C) $\frac{3n - 9}{2}$ (D) $3n + \frac{3}{2}$

17. यदि $\sec \theta = \sqrt{3}$ है, तो $\tan \theta$ का मान है :

(A) $\sqrt{3} - 1$ (B) $60°$
(C) 2 (D) $\sqrt{2}$

18. समीकरण $5x^2 - 2x + k = 0$ के मूल वास्तविक और बराबर हैं । k का मान है :

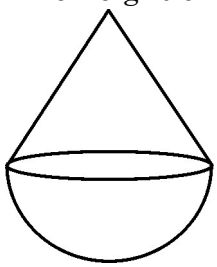
(A) 5 (B) $-\frac{1}{5}$
(C) $\frac{1}{5}$ (D) 0

(अभिकथन – तर्क आधारित प्रश्न)

निर्देश : प्रश्न संख्या **19** तथा **20** में एक अभिकथन (A) के बाद एक तर्क (R), कथन दिया गया है । सही विकल्प चुनिये :

(A) दोनों, अभिकथन (A) तथा तर्क (R) सही हैं । तर्क (R), अभिकथन (A) की सही व्याख्या करता है ।
(B) दोनों, अभिकथन (A) तथा तर्क (R) 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 ।

15. A cone with slant height 10 cm and radius 6 cm is surmounted on a hemisphere of same radius. The height of the toy is :



(A) 12 cm
(B) 16 cm
(C) 14 cm
(D) 10 cm

16. n^{th} term of the A.P. $-\frac{3}{2}, \frac{3}{2}, \frac{9}{2}, \ldots$ is :

(A) $\frac{3n}{2} - 3$
(B) $3n - \frac{9}{2}$
(C) $\frac{3n - 9}{2}$
(D) $3n + \frac{3}{2}$

17. If $\sec\theta = \sqrt{3}$, then the value of $\tan\theta$ is :

(A) $\sqrt{3} - 1$
(B) $60°$
(C) 2
(D) $\sqrt{2}$

18. The value of k for which the equation $5x^2 - 2x + k = 0$ has equal real roots, is :

(A) 5
(B) $-\frac{1}{5}$
(C) $\frac{1}{5}$
(D) 0

(Assertion – Reason based questions)

Directions : In questions number **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. **अभिकथन (A) :** 4^n, अंक शून्य (0) पर समाप्त नहीं हो सकता है ।

तर्क (R) : 4^n का अभाज्य गुणनखंडन अद्वितीय है ।

20. **अभिकथन (A) :** किसी घटना के घटित होने की प्रायिकता $\frac{1}{0.9}$ नहीं हो सकती है ।

तर्क (R) : किसी भी घटना (E) के लिये $0 \leq P(E) \leq 1$ होता है ।

खण्ड – ख

(अति लघु–उत्तरीय प्रश्न) **5 × 2 = 10**

प्रश्न संख्या **21** से **25** तक अति लघु–उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न के **2** अंक हैं ।

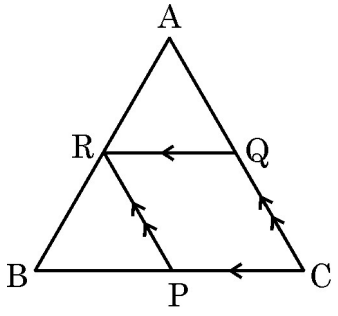
21. यदि $\sin 2A = \frac{\sqrt{3}}{2}$ तथा $2 \tan B + 1 = 3$ है, तो $(A + B)$ का मान ज्ञात कीजिए ।

22. (a) α तथा β बहुपद $p(x) = -9x^2 - 6x + 1$ के शून्यक हैं । $\alpha^2 + \beta^2$ का मान ज्ञात कीजिए ।

अथवा

(b) एक ऐसा द्विघात बहुपद बनाइये जिसके शून्यक बहुपद $p(x) = x^2 - 3x - 5$ के शून्यकों के दुगुने हों ।

23. दी गयी आकृति में, QR || CB है तथा RP || AC है । यदि BR = 10 cm, QA = 12 cm, BP = 12 cm तथा PC = 18 cm है, तो AR तथा QC की लम्बाइयाँ ज्ञात कीजिए ।



24. A(– 2, 3) तथा B(4, 1) एक अर्धवृत्त के व्यास के अंतिम बिंदु हैं । अर्धवृत्त y-अक्ष को बिंदु P पर प्रतिच्छेद करता है । बिंदु P के निर्देशांक ज्ञात कीजिए ।

19. **Assertion (A) :** 4^n can not end with the digit zero.

Reason (R) : Prime factorisation of 4^n is unique.

20. **Assertion (A) :** The probability of an event can not be $\frac{1}{0.9}$.

Reason (R) : $0 \leq P(E) \leq 1$ for an event E.

Section – B

(Very Short Answer Type Questions) **5 × 2 = 10**

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

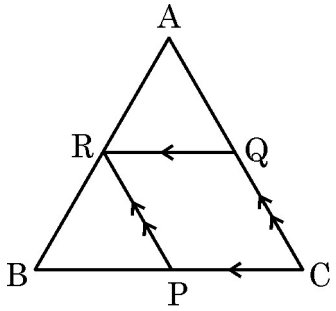
21. If $\sin 2A = \frac{\sqrt{3}}{2}$ and $2 \tan B + 1 = 3$, then find the value of $(A + B)$.

22. (a) If α, β are the zeroes of polynomial $p(x) = -9x^2 - 6x + 1$. Find the value of $\alpha^2 + \beta^2$.

OR

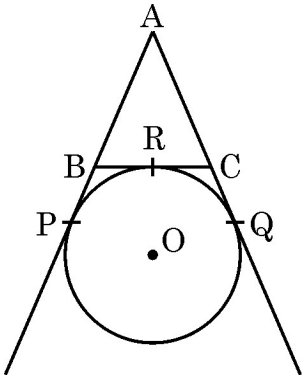
(b) Form a quadratic polynomial whose zeroes are twice the zeroes of polynomial $p(x) = x^2 - 3x - 5$.

23. In the given figure, QR || CB and RP || AC. If BR = 10 cm, QA = 12 cm, BP = 12 cm and PC = 18 cm, then find the lengths of AR and QC.



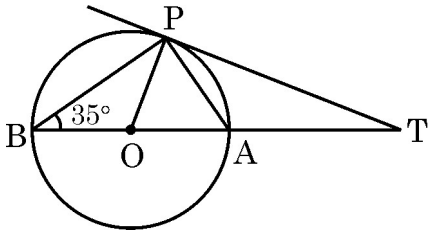
24. A (– 2, 3) and B (4, 1) are end points of the diameter of a semi-circle. The semi-circle intersects y-axis at point P. Find the co-ordinates of the point P.

25. (a) दी गयी आकृति में, AP, AQ तथा BC केन्द्र O वाले वृत्त पर खींची गयी स्पर्श–रेखाएँ हैं । यदि AB = 6 cm, AC = 7 cm तथा BC = 5 cm है, तो AP की लम्बाई ज्ञात कीजिए ।



अथवा

(b) दी गयी आकृति में, TP केन्द्र O वाले वृत्त की स्पर्श-रेखा है । व्यास BA, बढ़ाने पर स्पर्श–रेखा को बिंदु T पर काटता है । यदि $\angle$ ABP = 35° है, तो $\angle$ PTA का माप ज्ञात कीजिए ।

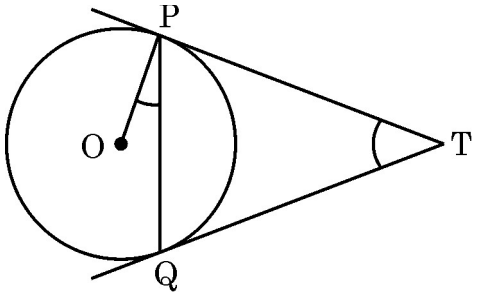


खण्ड – ग

(लघु–उत्तरीय प्रश्न) **6 × 3 = 18**

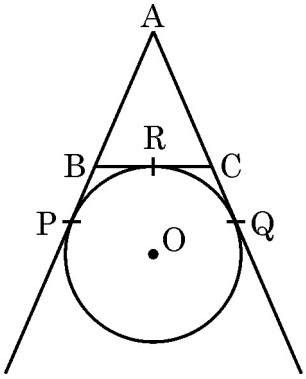
प्रश्न संख्या **26** से **31** तक लघु–उत्तरीय प्रकार के प्रश्न हैं तथा प्रत्येक प्रश्न के **3** अंक हैं ।

26. केन्द्र O वाले वृत्त पर बाह्य बिन्दु T से दो स्पर्श–रेखाएँ TP तथा TQ खींची गयी हैं । सिद्ध कीजिये कि $\angle$PTQ = 2$\angle$OPQ है ।



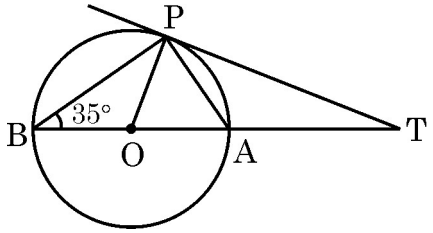
27. सिद्ध कीजिए कि $\sqrt{5}$ एक अपरिमेय संख्या है ।

25. (a) In the given figure, AP, AQ and BC are tangents to the circle with centre O. If AB = 6 cm, AC = 7 cm and BC = 5 cm, then what is the length of AP ?



OR

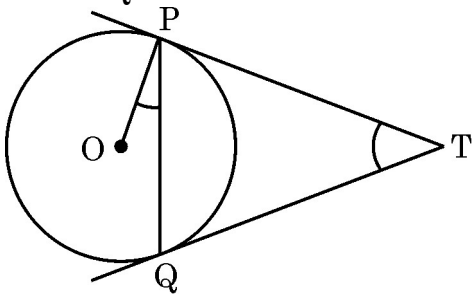
(b) In the given figure, TP is tangent to a circle with centre O. Diameter BA when produced meets the tangent at T. If $\angle$ ABP = 35°, then find the measure of $\angle$ PTA.



Section – C
(Short Answer Type Questions) 6 × 3 = 18

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

26. Two tangents TP and TQ are drawn to a circle with centre O, from an external point T.
Prove that $\angle$PTQ = 2$\angle$OPQ.



27. Prove that $\sqrt{5}$ is an irrational number.

28. (a) A(–3, –4), B(5, –3), C(1, 4) तथा D(–7, 3) एक समचतुर्भुज ABCD के शीर्ष बिंदु हैं । इसके दोनों विकर्णों की लम्बाई ज्ञात कीजिए । अतः समचतुर्भुज ABCD का क्षेत्रफल ज्ञात कीजिए ।

अथवा

(b) बिंदुओं A(–5, 1) तथा B(7, 6) को जोड़ने वाले रेखाखंड को बिंदु P तथा Q इस प्रकार समत्रिभाजित करते हैं कि बिंदु P, बिंदु A के समीप है । यदि बिंदु P रेखा $x + y = k$ पर स्थित हो तो k का मान ज्ञात कीजिए ।

29. (a) सिद्ध कीजिए : $\frac{(\sec\theta + \tan\theta)^2 - 1}{(\sec\theta + \tan\theta)^2 + 1} = \sin\theta$

अथवा

(b) सिद्ध कीजिए : $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = 1 + \sec A \operatorname{cosec} A.$

30. त्रिज्या 14 cm वाले वृत्त की एक जीवा केन्द्र पर एक समकोण अंतरित करती है । संगत (i) लघु वृत्तखंड तथा (ii) दीर्घ वृत्तखंड का क्षेत्रफल ज्ञात कीजिए ।

31. दो पासे एक साथ फेंके जाते हैं । प्रायिकता ज्ञात कीजिए कि प्राप्त अंकों में कम से कम एक अंक 3 का गुणज हो ।

खण्ड – घ

(दीर्घ–उत्तरीय प्रश्न) **4 × 5 = 20**

प्रश्न संख्या **32** से **35** तक प्रत्येक प्रश्न दीर्घ–उत्तरीय प्रकार के हैं । प्रत्येक प्रश्न के **5** अंक हैं ।

32. (a) दो संख्याओं का अंतर 12 है । बड़ी संख्या, छोटी संख्या के दोगुने से 6 कम है ।
   (i) उपरोक्त परिस्थिति को दर्शाती हुई दो चर वाली, दो रैखिक समीकरण बनाइए ।
   (ii) दर्शाइये कि समीकरणों का हल अद्वितीय है ।
   (iii) समीकरणों को हल करते हुये दोनों संख्याएँ ज्ञात कीजिए ।

अथवा

(b) निम्न समीकरणों को ग्राफीय विधि से हल कीजिए :

$x + y = 7$ तथा $2x - 5y = 7$

33. एक समांतर श्रेणी का तीसरा तथा नौवाँ पद क्रमशः 4 तथा –8 हैं ।
   (i) इस A.P. का कौन सा पद शून्य है ?
   (ii) यदि $S_n = -36$ है, तो n का मान ज्ञात कीजिए ।

28. (a) The vertices of a rhombus ABCD are A(– 3, – 4), B(5, – 3), C(1, 4) and D(– 7, 3). Find the length of both the diagonals. Hence, find area of the rhombus ABCD.

OR

(b) The line segment joining the points A (– 5, 1) and B (7, 6) is trisected at the points P and Q such that P is nearer to A. If P lies on the line $x + y = k$, then find the value of k.

29. (a) Prove that $\frac{(\sec \theta + \tan \theta)^2 - 1}{(\sec \theta + \tan \theta)^2 + 1} = \sin \theta$.

OR

(b) Prove that $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = 1 + \sec A \operatorname{cosec} A$.

30. A chord of a circle of radius 14 cm subtends a right angle at the centre. Find the area of the corresponding (i) minor segment (ii) major segment.

31. Two dice are rolled together. Find the probability that at least one of the numbers obtained is a multiple of 3.

Section – D

(Long Answer Type Questions) **4 × 5 = 20**

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

32. (a) The difference between two numbers is 12. The greater number is 6 less than twice the smaller one.
    (i) Representing the above situation, frame two linear equations in two variables.
    (ii) Show that the equations have unique solution.
    (iii) Solve the equations and hence find the numbers.

OR

(b) Solve the following equations graphically :

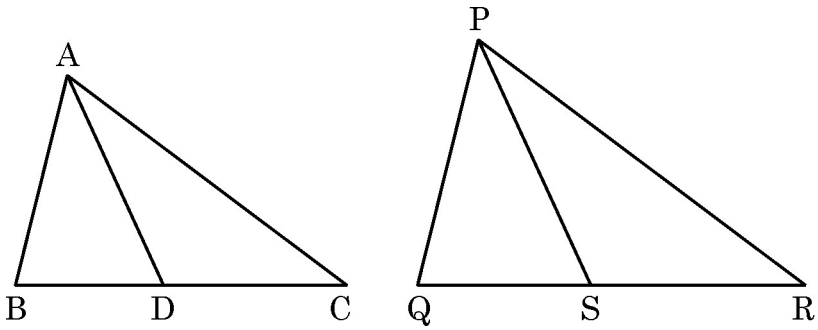
$x + y = 7$ and $2x - 5y = 7$

33. The third and ninth term of an A.P. are 4 and – 8 respectively.
    (i) Which term of the A.P. is zero ?
    (ii) Find the value of n if $S_n = -36$.

34. (a) यदि किसी त्रिभुज की एक भुजा के समांतर अन्य दो भुजाओं को भिन्न भिन्न बिंदुओं पर प्रतिच्छेद करने के लिये एक रेखा खींची जाए तो सिद्ध कीजिए कि अन्य दो भुजायें एक ही अनुपात में विभाजित हो जाती हैं ।

अथवा

(b)



AD और PS त्रिभुजों ABC तथा PQR की क्रमशः माध्यिकाएँ हैं । यदि $\Delta ABC \sim \Delta PQR$ है, तो सिद्ध कीजिए कि (i) $\Delta ADC \sim \Delta PSR$ है । (ii) $\frac{AD}{PS} = \frac{BC}{QR}$ है ।

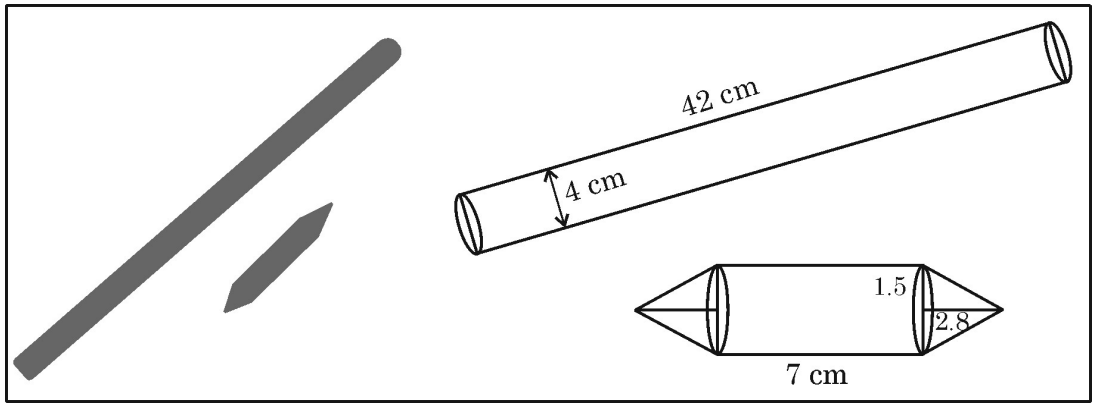
35. एक पेडस्टल के शिखर पर 2 m ऊँची मूर्ति लगी है । भूमि के एक बिंदु से मूर्ति के शिखर का उन्नयन कोण $60°$ है और उसी बिंदु से पेडस्टल के पाद का उन्नयन कोण $45°$ है । पेडस्टल की ऊँचाई तथा भूमि पर स्थित प्रेक्षक बिंदु से इसकी दूरी ज्ञात कीजिए । ($\sqrt{3} = 1.73$ लीजिये)

खण्ड – ङ

(प्रकरण अध्ययन आधारित प्रश्न) **3 × 4 = 12**

प्रश्न संख्या **36** से **38** तक प्रकरण अध्ययन आधारित प्रश्न हैं । प्रत्येक प्रश्न के **4** अंक हैं ।

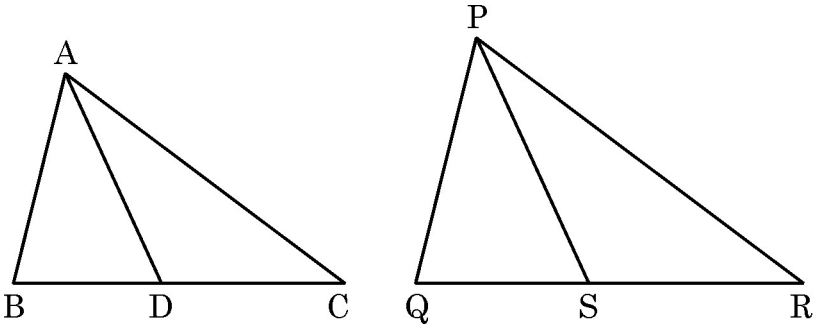
36. 'गुल्ली डंडा' भारत का प्राचीन व लोकप्रिय खेल है । यह लकड़ी की दो छड़ियों की सहायता से खेला जाता है । बड़ी छड़ी को 'डंडा' तथा छोटी छड़ी को 'गुल्ली' कहते हैं ।



34. (a) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

OR

(b)



AD and PS are respectively, the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$, then prove that

(i) $\Delta ADC \sim \Delta PSR$

(ii) $\frac{AD}{PS} = \frac{BC}{QR}$

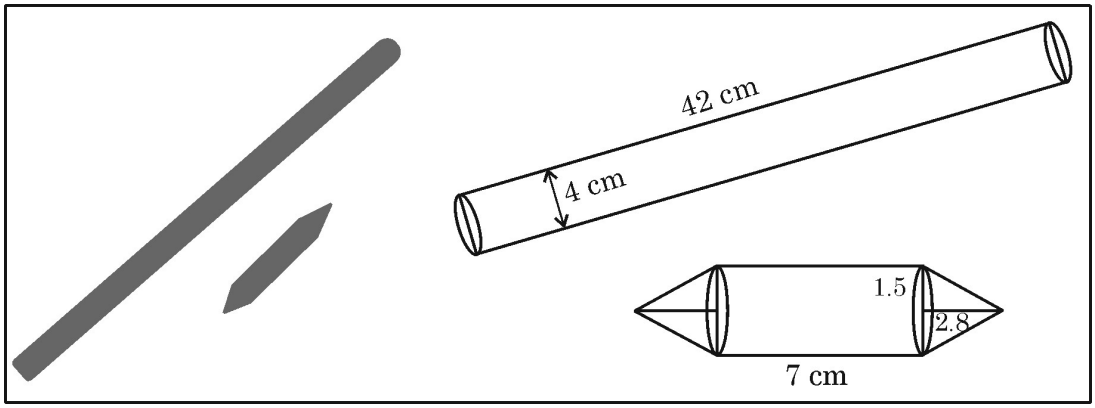
35. A statue, 2 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the bottom of the statue is 45°. Find the height of the pedestal and its distance from the point of observation on the ground. (use $\sqrt{3} = 1.73$)

Section – E

(Case-study based Questions) **3 × 4 = 12**

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

36. 'Gilli Danda' is a very popular traditional game of India which is played with two wooden sticks – the larger one is called 'Danda' and smaller one 'Gilli'.



डंडा – यह 4 cm व्यास तथा 42 cm लम्बाई की बेलनाकार छड़ी है ।

गुल्ली–गुल्ली का बीच का हिस्सा बेलनाकार तथा दोनों सिरे समान शंकु के आकार के होते हैं । बेलनाकार हिस्से की लम्बाई 7 cm है । शंक्वाकार हिस्से की त्रिज्या 1.5 cm तथा लम्बाई 2.8 cm है ।

उपरोक्त के आधार पर, निम्न प्रश्नों के उत्तर दीजिए :

(i) गुल्ली के दोनों शंक्वाकार हिस्सों को बनाने में प्रयुक्त लकड़ी का आयतन ज्ञात कीजिए । **1**

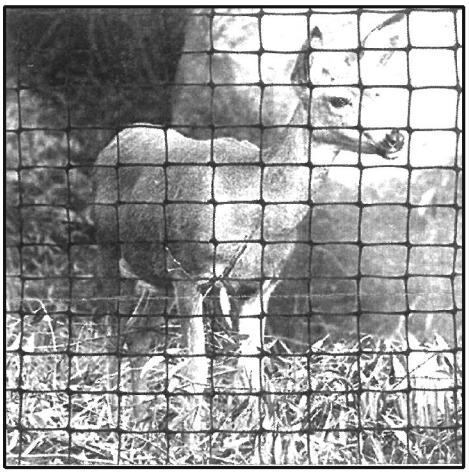
(ii) गुल्ली के बेलनाकार हिस्से को बनाने में प्रयुक्त लकड़ी का आयतन ज्ञात कीजिए । **1**

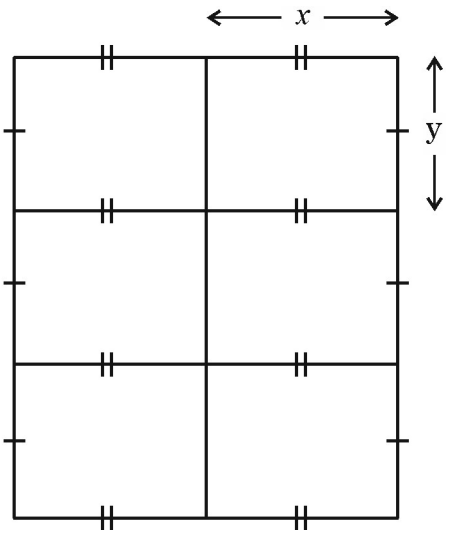
(iii) (a) 1.5 cm त्रिज्या तथा 14 cm लम्बाई के बेलनाकार लकड़ी के टुकड़े से गुल्ली बनाई जाती है । लकड़ी की छीलन का आयतन ज्ञात कीजिए । **2**

अथवा

(b) 'डंडे' का सम्पूर्ण पृष्ठीय क्षेत्रफल ज्ञात कीजिए । **2**

37.





ऊपर दी गयी आकृति को ध्यानपूर्वक देखिये । आकृति में बाड़ की तार से बने जाल द्वारा बनाये गये छः एकसमान आयताकार बाड़े दिखाये गए हैं । यह बाड़े चिड़ियाघर में जानवरों के बच्चों की सुरक्षा हेतु बनाये गये हैं । प्रत्येक बाड़े की विमायें x फुट × y फुट है ।

बाड़ बनाने के लिये आवश्यक जाल की कुल लम्बाई 152 फुट है तथा प्रत्येक बाड़े का क्षेत्रफल 80 वर्गफुट है ।

उपरोक्त के आधार पर, निम्न प्रश्नों के उत्तर दीजिए :

(i) बाड़ के जाल की लम्बाई की आवश्यकता को x तथा y के पदों वाले व्यंजक के रूप में लिखिये । **1**

(ii) प्रत्येक बाड़े का क्षेत्रफल x के संदर्भ में लिखें । **1**

(iii) (a) उपरोक्त समीकरण को द्विघाती समीकरण के रूप में लिखिए । गुणनखंडन विधि द्वारा समीकरण को हल करते हुए प्रत्येक बाड़े की विमायें ज्ञात कीजिए । **2**

अथवा

'Danda' – It is cylindrical in shape with diameter 4 cm and length 42 cm.

Gilli – It is cylindrical in middle with identical conical ends of same radius 1.5 cm and length 2.8 cm. The length of cylindrical part is 7 cm.

Based on the above, answer the following questions :

(i) Find the volume of wood used in making both the conical parts of Gilli. **1**

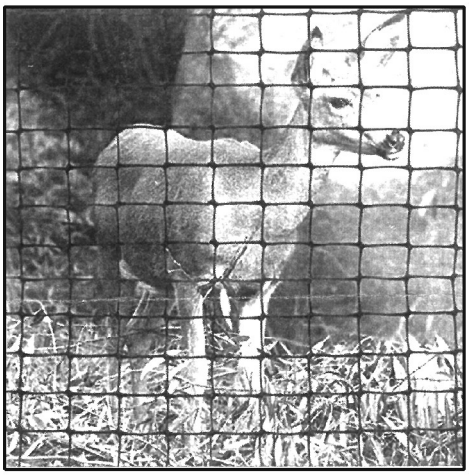
(ii) Find the volume of wood used in making cylindrical part of Gilli. **1**

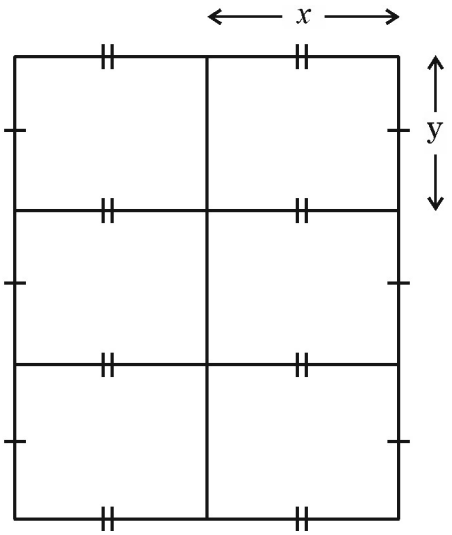
(iii) (a) A cylindrical log of wood of radius 1.5 cm and length 14 cm is used to make Gilli. Find the volume of the wood scrapped. **2**

OR

(b) Find the total surface area of 'Danda'. **2**

37.





Observe the figure given above. It shows six identical rectangular enclosures made by using fencing wire mesh. These enclosures are used to protect baby animals in a zoo. Dimensions of each enclosure is x feet × y feet. The total length of fencing required is 152 feet and area of each enclosure is 80 square feet.

Based on the above, answer the following questions :

(i) Write an expression for length of fencing required in terms of x and y. **1**

(ii) Write the area of each enclosure in terms of x. **1**

(iii) (a) Write the above equation in quadratic equation form and thus find the dimensions of each enclosure using factorisation method. **2**

OR

(b) उपरोक्त समीकरण को द्विघाती समीकरण के रूप में लिखिये । द्विघाती सूत्र का प्रयोग करते हुए समीकरण को हल कीजिए तथा प्रत्येक बाड़े की विमायें ज्ञात कीजिए । **2**

38. **CENTRAL POLLUTION CONTROL BOARD'S AIR QUALITY STANDARDS**

AIR QUALITY INDEX (AQI)	CATEGORY
0-50	Good
51-100	Satisfactory
101-200	Moderate
201-300	Poor
301-400	Very Poor
401-500	Severe

Air Quality Index (AQI) वायु में प्रदूषण के स्तर को जाँचने का एक सूचकांक है जिसमें 0 से 500 के बीच आंका जाता है । AQI का मान जितना अधिक होगा, वायु प्रदूषण का स्तर भी उतना ही ज्यादा होगा और स्वास्थ्य संबंधी समस्याएँ भी अधिक होंगी ।

मानसी ने अपने शहर में एक महीने तक प्रत्येक दिन AQI सूचकांक का मान रिकॉर्ड किया तथा उसे नीचे दिए गए के अनुसार लिखा :

AQI श्रेणी :	1 – 100	101 – 200	201 – 300	301 – 400	401 – 500
दिनों की संख्या :	3	9	12	4	2

(i) दिये गए आँकड़ों को सतत आवृत्ति-वितरण (continuous frequency distribution) में लिखिए । **1**

(ii) महीने के ज्यादातर दिनों में शहर में वायु की गुणवत्ता कैसी रही ? **1**

(iii) (a) पार्ट (i) में बनायी गयी सारणी का बहुलक ज्ञात कीजिए । **2**

अथवा

(b) पार्ट (i) में बनायी गयी सारणी का माध्यक ज्ञात कीजिए । **2**

(b) Using above equation in quadratic form, solve the equation and find the dimensions of each enclosure using quadratic formula. **2**

38.

CENTRAL POLLUTION CONTROL BOARD'S AIR QUALITY STANDARDS

AIR QUALITY INDEX (AQI)	CATEGORY
0-50	Good
51-100	Satisfactory
101-200	Moderate
201-300	Poor
301-400	Very Poor
401-500	Severe

The Air Quality Index (AQI) is a scale from 0 to 500 that indicates air quality, with higher numbers signifying more pollution and greater health concerns.

Mansi collected the daily data of AQI of her city for a month and presented it as given below :

AQI Range :	1 – 100	101 – 200	201 – 300	301 – 400	401 – 500
Number of Days :	3	9	12	4	2

(i) Convert the data to continuous frequency distribution. **1**

(ii) What is the quality of air in most of the days of the month ? **1**

(iii) (a) Using table formed in part (i), find mode of the data. **2**

OR

(b) Using table formed in part (i), find median of the data. **2**

Marking Scheme Strictly Confidential
(For Internal and Restricted use only) Secondary School Examination, 2026
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/4/2)

General Instructions: -

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 two 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 totaled up and written in the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded in 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	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- Leaving answer or part thereof unassessed in an answer book. Giving more marks for an answer than assigned to it. Wrong totaling of marks awarded on an answer. Wrong transfer of marks from the inside pages of the answer book to the title page. Wrong question wise totaling on the title page. Wrong totaling 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.) Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
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 unassessed 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 totaled 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 BASIC (Subject Code 241)

Section – A **20 × 1 = 20**

(Multiple Choice Questions)

Q. No. **1** to **20** are multiple choice questions of **1** mark each.

1. A card is drawn from a well shuffled deck of 52 cards. The probability of getting an ace or a ten is :

(A) $\frac{1}{13}$ (B) $\frac{2}{13}$

(C) $\frac{1}{26}$ (D) $\frac{4}{13}$

Answer : (B) $\frac{2}{13}$ — 1

2. The distance between the points (– 5, 1) and (2, 2) is :

(A) $2\sqrt{5}$ units (B) $\sqrt{10}$ units

(C) $5\sqrt{2}$ units (D) $3\sqrt{2}$ units

Answer : (C) $5\sqrt{2}$ units — 1

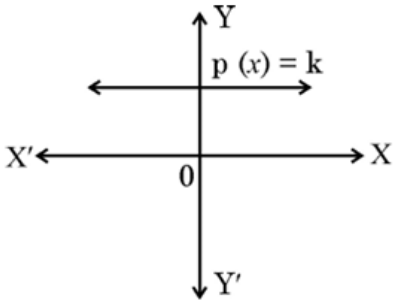
3. Probability of getting an irrational number at random from the numbers $\sqrt{3}, \sqrt{4}, 3\sqrt{9}, 3\sqrt{8}, \sqrt{5}, 0, 4^{\frac{3}{2}}$ is :

(A) 0 (B) $\frac{4}{7}$

(C) $\frac{3}{7}$ (D) 1

Answer : (C) $\frac{3}{7}$ — 1

4. The graph of polynomial p(x) = k is shown here. Number of zeroes of polynomial p(x) is :



(A) 0 (B) 1

(C) 2 (D) infinitely many

Answer : (A) 0 — 1

5. Chord AB subtends an angle of 40° at the centre of the circle of radius 9 cm. The length of arc AB is :

(A) $\frac{22}{7}$ cm (B) $\frac{198}{7}$ cm

(C) $\frac{44}{7}$ cm (D) $\frac{54}{7}$ cm

Answer : (C) $\frac{44}{7}$ cm — 1

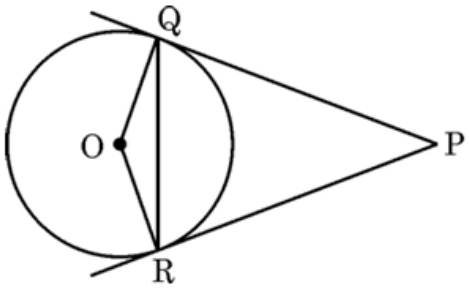
6. $7 \times 29 \times 23 + 1$ is :

(A) a prime number. (B) divisible by 23.

(C) an odd number. (D) a composite number.

Answer : (D) a composite number — 1

7. In the given figure, PQ and PR are two tangents drawn to a circle with centre O. If $\angle ORQ = 25°$, then the measure of $\angle PQR$ is :



(A) 65° (B) 25°

(C) 50° (D) 75°

Answer: (A) 65° — 1

8. The value of $\tan 30° \tan 60° - \sin 90° \cos 90°$ is :

(A) 1 (B) 0

(C) 2 (D) not defined

Answer : (A) 1 — 1

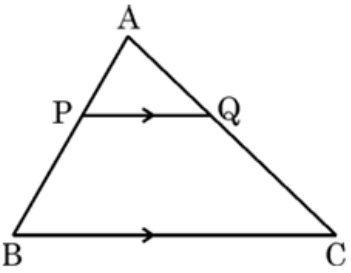
9. HCF of two consecutive natural numbers is :

(A) 2 (B) 1

(C) 0 (D) smaller number

Answer : (B) 1 — 1

10. In the given figure, PQ || BC. If AP : AB = 3 : 7 then, AQ : QC equals :

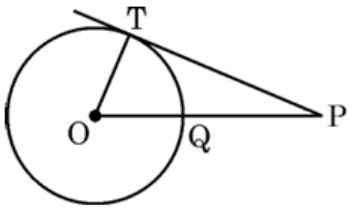


(A) 3 : 7 (B) 3 : 10

(C) 7 : 3 (D) 3 : 4

Answer : (D) 3 : 4 — 1

11. PT is tangent to the circle with centre O and radius 5 cm. OP intersects the circle at Q. If PQ = x, then PT^2 equals :

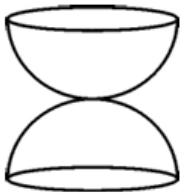


(A) $x^2 + 5x$ (B) $x^2 + 10x + 50$

(C) $x^2 + 10x$ (D) $x^2 - 25$

Answer : (C) $x^2 + 10x$ — 1

12. Two wooden solid hemispheres of same radii r, are joined at a point, as shown in the figure. The total surface area of the object is :



(A) $4\pi r^2$ (B) $6\pi r^2$

(C) $3\pi r^2$ (D) $5\pi r^2$

Answer : (B) $6\pi r^2$ — 1

13. While calculating mean of a grouped frequency distribution using step deviation method $\left(u = \frac{x - a}{h}\right)$ it was found that $\overline{x} = 62$, a = 47.5, h = 5. The value of $\overline{u}$ is :

(A) 3 (B) 14.5

(C) 2.9 (D) 3.1

Answer : (C) 2.9	1

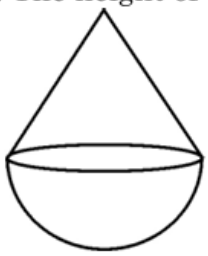
14. n^{th} term of an A.P. is $5n - 15$. The common difference of the A.P. is :

(A) $5n$ (B) 5

(C) -5 (D) 10

Answer : (B) 5	1

15. A cone with slant height 10 cm and radius 6 cm is surmounted on a hemisphere of same radius. The height of the toy is :



(A) 12 cm (B) 16 cm

(C) 14 cm (D) 10 cm

Answer : (C) 14 cm	1

16. n^{th} term of the A.P. $-\frac{3}{2}, \frac{3}{2}, \frac{9}{2}, \ldots$ is :

(A) $\frac{3n}{2} - 3$ (B) $3n - \frac{9}{2}$

(C) $\frac{3n - 9}{2}$ (D) $3n + \frac{3}{2}$

Answer : (B) $3n - \frac{9}{2}$	1

17. If $\sec\theta = \sqrt{3}$, then the value of $\tan\theta$ is :

(A) $\sqrt{3} - 1$ (B) $60°$

(C) 2 (D) $\sqrt{2}$

Answer : (D) $\sqrt{2}$	1

18. The value of k for which the equation $5x^2 - 2x + k = 0$ has equal real roots, is :

(A) 5 (B) $-\frac{1}{5}$

(C) $\frac{1}{5}$ (D) 0

Answer : (C) $\frac{1}{5}$	1

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

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

19. **Assertion (A) :** 4^n can not end with the digit zero.

Reason (R) : Prime factorisation of 4^n is unique.

Answer : (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A)	1

20. **Assertion (A) :** The probability of an event can not be $\frac{1}{0.9}$.

Reason (R) : $0 \le P(E) \le 1$ for an event E.

Answer :(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)	1

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. If $\sin 2A = \frac{\sqrt{3}}{2}$ and $2 \tan B + 1 = 3$, then find the value of $(A + B)$.

Solution : Getting $A = 30°$ and $B = 45°$ $A + B = 75°$	1½ ½

22. (a) If α, β are the zeroes of polynomial $p(x) = -9x^2 - 6x + 1$. Find the value of $\alpha^2 + \beta^2$.

OR

(b) Form a quadratic polynomial whose zeroes are twice the zeroes of polynomial $p(x) = x^2 - 3x - 5$.

Solution: (a) $\alpha + \beta = \frac{-6}{9}$, $\alpha\beta = \frac{-1}{9}$ — 1

$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$

$= \frac{2}{3}$ — 1

OR

(b) Let α and β be zeroes of p(x)

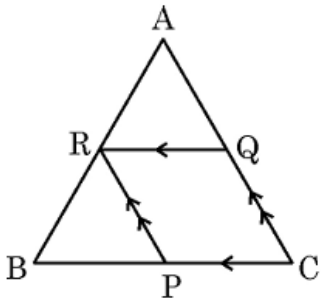
then $\alpha + \beta = 3$ and $\alpha\beta = -5$ — 1

Zeroes of required polynomial are 2α and 2β

$2\alpha + 2\beta = 6$ and $4\alpha\beta = -20$ — ½

$\therefore$ Required polynomial is $x^2 - 6x - 20$ or $k(x^2 - 6x - 20)$ — ½

23. In the given figure, QR || CB and RP || AC. If BR = 10 cm, QA = 12 cm, BP = 12 cm and PC = 18 cm, then find the lengths of AR and QC.

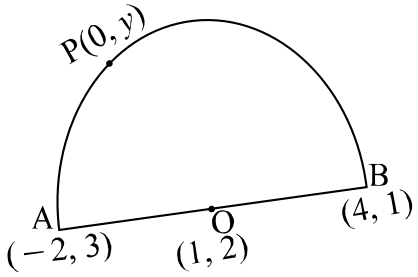


Solution: PR || CA $\therefore \frac{BP}{PC} = \frac{BR}{RA} \Rightarrow \frac{12}{18} = \frac{10}{AR} \Rightarrow$ AR = 15 cm — 1

QR || CB $\therefore \frac{AR}{RB} = \frac{AQ}{QC} \Rightarrow \frac{15}{10} = \frac{12}{QC} \Rightarrow$ QC = 8 cm — 1

24. A (– 2, 3) and B (4, 1) are end points of the diameter of a semi-circle. The semi-circle intersects y-axis at point P. Find the co-ordinates of the point P.

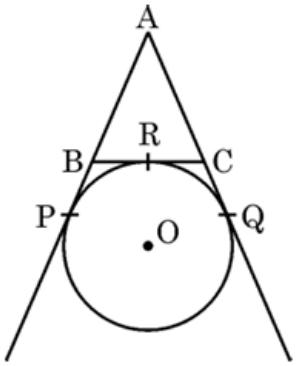
Solution:



Coordinates of centre O are $(\frac{-2+4}{2}, \frac{3+1}{2})$ i.e.(1, 2) — ½

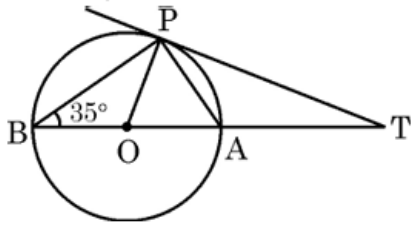
Let the coordinates of point P be (0, y) Now $OP^2 = OB^2 \Rightarrow 1^2 + (2 - y)^2 = 3^2 + 1^2$ $\Rightarrow y = 5$ or $y = -1$ Coordinates of P are (0, 5) or (0, –1).	1 ½

25. (a) In the given figure, AP, AQ and BC are tangents to the circle with centre O. If AB = 6 cm, AC = 7 cm and BC = 5 cm, then what is the length of AP ?



OR

(b) In the given figure, TP is tangent to a circle with centre O. Diameter BA when produced meets the tangent at T. If ∠ ABP = 35°, then find the measure of ∠ PTA.

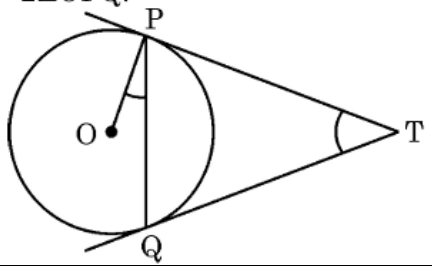


Solution: (a) AP = AB + BP = AB + BR, AQ = AC + CQ = AC + CR	½
Adding corresponding sides, AP + AQ = AB + (BR + CR) + AC	½
Since AP =AQ,	
∴ 2AP = AB + BC + AC = 18	½
⇒ AP = 9 cm	½
OR	
(b) ∠BPO = ∠OBP = 35°, ∴ ∠BOP = 110°	1
∠OPT = 90° ∴ ∠PTA = 20°	1

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. Two tangents TP and TQ are drawn to a circle with centre O, from an external point T.
Prove that $\angle PTQ = 2\angle OPQ$.



Solution: In ΔTPQ, $TP = TQ \Rightarrow \angle TPQ = \angle TQP$	½
$\therefore \angle PTQ = 180° - 2\angle TPQ$ ……(i)	1
$OP \perp PT \Rightarrow \angle OPQ = 90° - \angle TPQ$ …… (ii)	1
Using (i) and (ii) , $\angle PTQ = 2\angle OPQ$.	½

27. Prove that $\sqrt{5}$ is an irrational number.

Solution: Let $\sqrt{5}$ be a rational number such that $\sqrt{5} = \frac{p}{q}$ where p and q are co-prime integers and $q \neq 0$	½
$\sqrt{5}q = p \Rightarrow 5q^2 = p^2$	
5 divides p^2 $\Rightarrow$ 5 divides p as well	1
Let $p = 5m$ (for some integer m)	
$5q^2 = 25m^2$ $\Rightarrow q^2 = 5m^2$	
5 divides q^2 $\Rightarrow$ 5 divides q as well	1
p and q have a common factor 5, which is a contradiction as p and q are co-prime integers.	
$\therefore$ our assumption is wrong	½
Hence, $\sqrt{5}$ is an irrational number.	

28. (a) The vertices of a rhombus ABCD are A(– 3, – 4), B(5, – 3), C(1, 4) and D(– 7, 3). Find the length of both the diagonals. Hence, find area of the rhombus ABCD.

OR

(b) The line segment joining the points A (– 5, 1) and B (7, 6) is trisected at the points P and Q such that P is nearer to A. If P lies on the line $x + y = k$, then find the value of k.

Solution: (a) $AC = \sqrt{(1+3)^2 + (4+4)^2} = 4\sqrt{5}$	1

BD = $\sqrt{(-7-5)^2+(3+3)^2} = 6\sqrt{5}$ 1

Area of rhombus ABCD = $\frac{1}{2} \times 4\sqrt{5} \times 6\sqrt{5}$

$= 60$ 1

OR

(b) AP : PB = 1 : 2 ½

Coordinates of P are $\left(\frac{1\times 7+2\times(-5)}{1+2}, \frac{1\times 6+2\times 1}{1+2}\right)$ i.e. $\left(-1, \frac{8}{3}\right)$ 1½

$\because$ P lies on x + y = k therefore k = $-1+\frac{8}{3} = \frac{5}{3}$ 1

29. (a) Prove that $\frac{(\sec\theta + \tan\theta)^2 - 1}{(\sec\theta + \tan\theta)^2 + 1} = \sin\theta$.

OR

(b) Prove that $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A} = 1 + \sec A \operatorname{cosec} A$.

Solution: (a) LHS = $\frac{\sec^2\theta + \tan^2\theta + 2\sec\theta\tan\theta - 1}{\sec^2\theta + \tan^2\theta + 2\sec\theta\tan\theta + 1}$ 1

$= \frac{2\tan^2\theta + 2\sec\theta\tan\theta}{2\sec^2\theta + 2\sec\theta\tan\theta}$ 1

$= \frac{2\tan\theta(\tan\theta + \sec\theta)}{2\sec\theta(\sec\theta + \tan\theta)}$ ½

$= \sin\theta$ = RHS. ½

OR

(b) LHS = $\frac{\frac{\sin A}{\cos A}}{1-\frac{\cos A}{\sin A}} + \frac{\frac{\cos A}{\sin A}}{1-\frac{\sin A}{\cos A}}$ ½

$= \frac{\sin^2 A}{\cos A(\sin A - \cos A)} + \frac{\cos^2 A}{\sin A(\cos A - \sin A)}$ ½

$= \frac{1}{\sin A - \cos A} \times \frac{\sin^3 A - \cos^3 A}{\sin A \cos A}$ 1

$= \frac{\sin^2 A + \cos^2 A + \sin A \cos A}{\sin A \cos A}$ ½

= sec A cosec A + 1 = RHS ½

30. A chord of a circle of radius 14 cm subtends a right angle at the centre. Find the area of the corresponding (i) minor segment (ii) major segment.

Solution: (i) Area of minor segment $= \frac{90}{360} \times \frac{22}{7} \times 14 \times 14 - \frac{1}{2} \times 14 \times 14$ — 1

$= 56 \text{ cm}^2$ — 1

(ii) Area of major segment $= \frac{22}{7} \times 14 \times 14 - 56$ — ½

$= 560 \text{ cm}^2$ — ½

31. Two dice are rolled together. Find the probability that at least one of the numbers obtained is a multiple of 3.

Solution: Total number of outcomes = 36 — 1

Number of favourable outcomes = 20 — 1

P(at least one of the numbers obtained is multiple of 3) $= \frac{20}{36}$ or $\frac{5}{9}$ — 1

Section – D

(Long Answer Type Questions) **4 × 5 = 20**

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

32. (a) The difference between two numbers is 12. The greater number is 6 less than twice the smaller one.
   (i) Representing the above situation, frame two linear equations in two variables.
   (ii) Show that the equations have unique solution.
   (iii) Solve the equations and hence find the numbers.

OR

(b) Solve the following equations graphically :
$x + y = 7$ and $2x - 5y = 7$

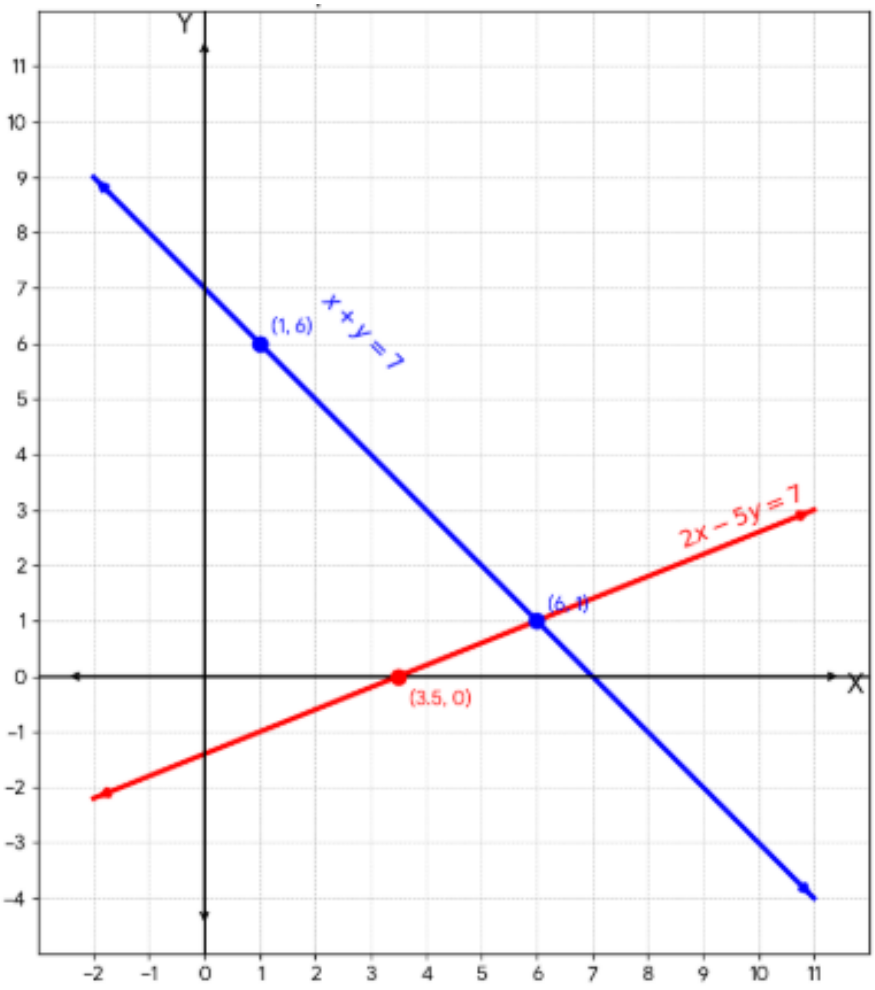
Solution: (a) (i) Let the larger number be x and smaller number be y

$x - y = 12$ — 1

$x - 2y = -6$ — 1

(ii) $\frac{a_1}{a_2} = \frac{1}{1}$ and $\frac{b_1}{b_2} = \frac{-1}{-2}$ — 1

$\frac{1}{1} \neq \frac{-1}{-2}$ $\Rightarrow$ equations have unique solution.

(iii) Solving the above equations to get $x = 30$ $y = 18$	1 + 1
OR	
(b) Getting correct points and plotting correct lines.	2 + 2
	
The solution is $x = 6$ and $y = 1$	1

33. The third and ninth term of an A.P. are 4 and – 8 respectively.
    (i) Which term of the A.P. is zero ?
    (ii) Find the value of n if $S_n = -36$.

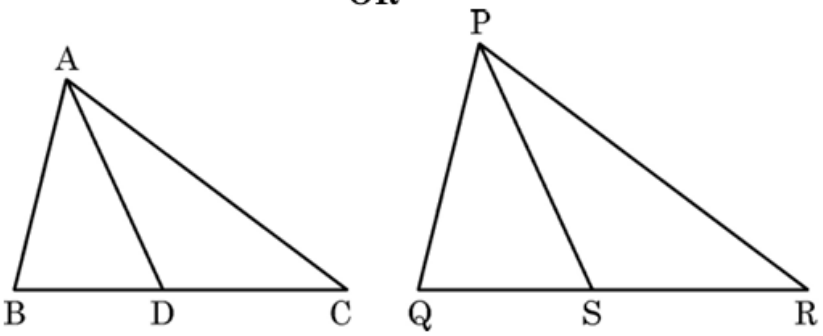
Solution: (i) $a + 2d = 4$ ……. (i)	½
$a + 8d = -8$ ……. (ii)	½
solving (i) and (ii) to get $d = -2$, $a = 8$	½ + ½
$a_n = 0 \Rightarrow 8 + (n - 1)(-2) = 0$	1

$\Rightarrow$ n = 5 i.e. 5th term is zero.	1
(ii) $S_n = -36 \Rightarrow \frac{n}{2}[16 + (n-1)(-2)] = -36$	½
$\Rightarrow n^2 - 9n - 36 = 0$	½
$\Rightarrow (n-12)(n+3) = 0 \Rightarrow n = 12$ (rejecting n = –3)	

34. (a) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

OR

(b)

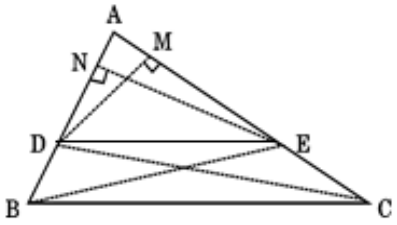


AD and PS are respectively, the medians of ΔABC and ΔPQR. If ΔABC ~ ΔPQR, then prove that

(i) ΔADC ~ ΔPSR

(ii) $\frac{AD}{PS} = \frac{BC}{QR}$

Solution: (a) Correct Given, To Prove, Construction, Figure — 4 x ½ = 2



Given: In Δ ABC, DE ∥ BC

To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Draw DM ⊥ AC, EN ⊥ AB, join BE and CD

Proof : $\frac{ar(\Delta ADE)}{ar(\Delta DBE)} = \frac{\frac{1}{2} \times AD \times EN}{\frac{1}{2} \times DB \times EN} = \frac{AD}{DB}$ ……..(i) — 1

$\frac{ar(\Delta ADE)}{ar(\Delta DCE)} = \frac{\frac{1}{2} \times AE \times DM}{\frac{1}{2} \times EC \times DM} = \frac{AE}{EC}$ ……..(ii) — 1

As ΔDBE and ΔDCE lie on the same base and between same parallels BC and DE

$\therefore$ ar(ΔDBE) = ar(ΔDCE) $\Rightarrow \frac{ar(\Delta ADE)}{ar(\Delta DBE)} = \frac{ar(\Delta ADE)}{ar(\Delta DCE)}$ ……..(iii) — ½

From (i), (ii) and (iii), we get $\frac{AD}{DB}=\frac{AE}{EC}$ ½

OR

(b) (i) $\Delta ABC \sim \Delta PQR \Rightarrow \frac{AB}{PQ}=\frac{AC}{PR}=\frac{BC}{QR}=\frac{2DC}{2SR}$ 2

$\Rightarrow \frac{AC}{PR}=\frac{DC}{SR}$ ½

and $\angle C = \angle R$ ½

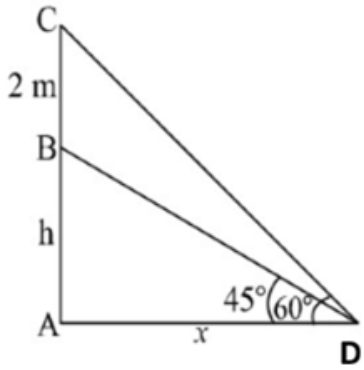
$\therefore \Delta ADC \sim \Delta PSR$ (by SAS similarity)

(ii) Since $\Delta ADC \sim \Delta PSR$, $\frac{AD}{PS}=\frac{DC}{SR}$ 1

$\frac{AD}{PS}=\frac{\frac{BC}{2}}{\frac{QR}{2}}=\frac{BC}{QR}$ 1

35. A statue, 2 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the bottom of the statue is 45°. Find the height of the pedestal and its distance from the point of observation on the ground. (use $\sqrt{3} = 1.73$)

Solution:



For correct figure: 1

Let AB be the pedestal

In ΔCAD, $\tan 60° = \frac{h+2}{x}$ 1

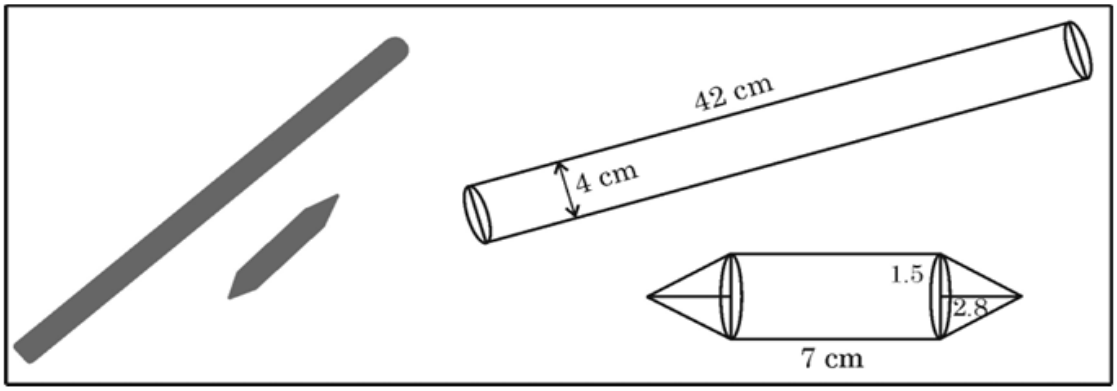
$\Rightarrow h = \sqrt{3}\,x - 2$…….. (i) ½

In ΔBAD, $\tan 45° = \frac{h}{x}$	1
$\Rightarrow h = x$ …….. (ii)	½
Solving and getting, $x = h = \frac{2}{\sqrt{3}-1}$	½
$x = 2.73$ m and $h = 2.73$ m	½

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. 'Gilli Danda' is a very popular traditional game of India which is played with two wooden sticks – the larger one is called 'Danda' and smaller one 'Gilli'.



'Danda' – It is cylindrical in shape with diameter 4 cm and length 42 cm.

Gilli – It is cylindrical in middle with identical conical ends of same radius 1.5 cm and length 2.8 cm. The length of cylindrical part is 7 cm.

Based on the above, answer the following questions :

(i) Find the volume of wood used in making both the conical parts of Gilli. **1**

(ii) Find the volume of wood used in making cylindrical part of Gilli. **1**

(iii) (a) A cylindrical log of wood of radius 1.5 cm and length 14 cm is used to make Gilli. Find the volume of the wood scrapped. **2**

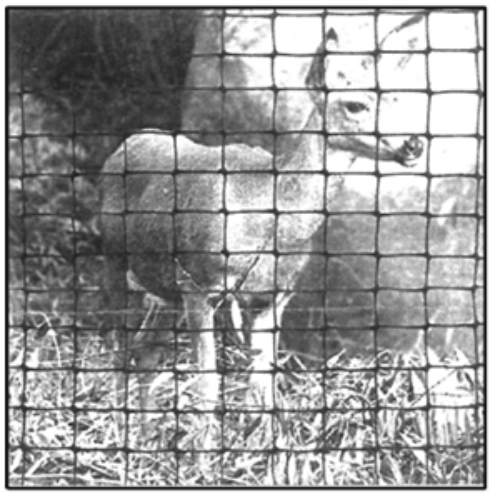
OR

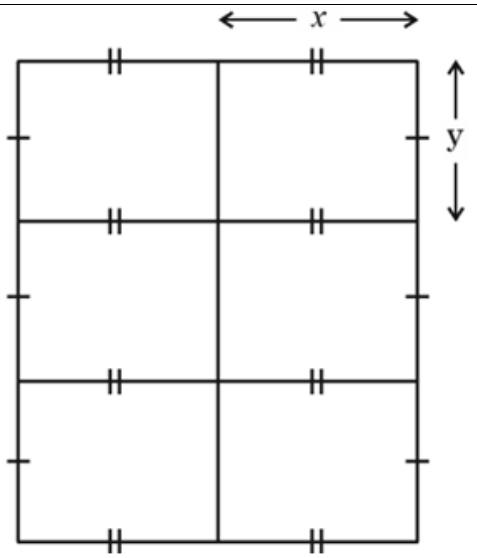
(b) Find the total surface area of 'Danda'. **2**

Solution: (i) Required Volume $= 2 \times \frac{1}{3} \times \frac{22}{7} \times 1.5 \times 1.5 \times 2.8$	½
$= 13.2\ cm^3$	½
(ii) Required Volume $= \frac{22}{7} \times 1.5 \times 1.5 \times 7$	½
$= 49.5\ cm^3$	½
(iii) (a) Volume of cylindrical log $= \frac{22}{7} \times 1.5 \times 1.5 \times 14 = 99\ cm^3$	1
Volume of gilli $= 13.2 + 49.5 = 62.7\ cm^3$	½

Volume of wood scrapped = 99 – 62.7 = 36.3 cm^3	½
OR	
(b) TSA of Danda = $2 \times \frac{22}{7} \times 2 \times 2 + 2 \times \frac{22}{7} \times 2 \times 42$	1
$= \frac{3872}{7}$ cm^2 or 553.14 cm^2	1

37.





Observe the figure given above. It shows six identical rectangular enclosures made by using fencing wire mesh. These enclosures are used to protect baby animals in a zoo. Dimensions of each enclosure is x feet × y feet. The total length of fencing required is 152 feet and area of each enclosure is 80 square feet.

Based on the above, answer the following questions :

(i) Write an expression for length of fencing required in terms of x and y. **1**

(ii) Write the area of each enclosure in terms of x. **1**

(iii) (a) Write the above equation in quadratic equation form and thus find the dimensions of each enclosure using factorisation method. **2**

OR

(b) Using above equation in quadratic form, solve the equation and find the dimensions of each enclosure using quadratic formula. **2**

Solution: (i) 8x + 9y = 152	1
(ii) $\frac{x(152-8x)}{9} = 80$	1

(iii) (a) $x^2 - 19x + 90 = 0$	½
$(x - 10)(x - 9) = 0$	½
$x = 10$ or 9	½
$\Rightarrow y = 8$ or $\frac{80}{9}$	½
OR	
(b) $x^2 - 19x + 90 = 0$	½
$\Rightarrow x = \frac{19 \pm \sqrt{361 - 360}}{2}$	½
$\Rightarrow x = 10$ or 9	½
and $y = 8$ or $\frac{80}{9}$	½

38.

CENTRAL POLLUTION CONTROL BOARD'S AIR QUALITY STANDARDS

AIR QUALITY INDEX (AQI)	CATEGORY
0-50	Good
51-100	Satisfactory
101-200	Moderate
201-300	Poor
301-400	Very Poor
401-500	Severe

The Air Quality Index (AQI) is a scale from 0 to 500 that indicates air quality, with higher numbers signifying more pollution and greater health concerns.

Mansi collected the daily data of AQI of her city for a month and presented it as given below :

AQI Range :	1 – 100	101 – 200	201 – 300	301 – 400	401 – 500
Number of Days :	3	9	12	4	2

(i) Convert the data to continuous frequency distribution. **1**

(ii) What is the quality of air in most of the days of the month ? **1**

(iii) (a) Using table formed in part (i), find mode of the data. **2**

OR

(b) Using table formed in part (i), find median of the data. **2**

Solution: (i)

Class Interval	frequency
0.5 -100.5	3
100.5 - 200.5	9
200.5 - 300.5	12
300.5 - 400.5	4
400.5 - 500.5	2

1

(ii) Air Quality is poor on most of the days — 1

(iii) (a) Modal class is 200.5 - 300.5

$$\text{Mode} = 200.5 + 100\left(\frac{12-9}{2\times12-9-4}\right)$$ — 1½

$$= 227.77$$ — ½

OR

(b)

Class Interval	frequency	cf
0.5 -100.5	3	3
100.5 - 200.5	9	12
200.5 - 300.5	12	24
300.5 - 400.5	4	28
400.5 - 500.5	2	30

For correct table ½

Median class is 200.5 - 300.5

$$\text{Median} = 200.5 + \left(\frac{15-12}{12}\right) \times 100$$ — 1

$$= 225.5$$ — ½