



Series C4ABD/4

SET~1

रोल नं.							
Roll No.							

प्रश्न-पत्र कोड
Q.P. Code **430/4/1**

परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें ।

Candidates must write the Q.P. Code on the title page of the answer-book.

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) कृपया जाँच कर लें कि इस प्रश्न-पत्र में **38** प्रश्न हैं ।
Please check that this question paper contains **38** questions.
- (iii) 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.
- (iv) कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।
Please write down the serial number of the question in the answer-book 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 छात्र 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 students will read the question paper only and will not write any answer on the answer-book during this period.

गणित (बुनियादी)

MATHEMATICS (BASIC)



निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80



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 बहुविकल्पीय प्रश्न (MCQ) हैं, जिनमें प्रत्येक प्रश्न 1 अंक का है।

20×1=20

1. बिन्दुओं (2, -1) और (-1, -5) के बीच की दूरी है :
 (A) 15 इकाई (B) 5 इकाई
 (C) 25 इकाई (D) 41 इकाई
2. बिन्दुओं A(4, x) और B(-2, 4) को मिलाने वाले रेखा खंड AB का मध्य-बिन्दु यदि C(1, -1) है, तो x का मान है :
 (A) 5 (B) -5
 (C) 6 (D) -6
3. निम्नलिखित में से कौन-सा संबंध सही है ?
 (A) $P(E) = 1 + P(\bar{E})$ (B) $P(\bar{E}) - P(E) = 1$
 (C) $P(E) + P(\bar{E}) = 1$ (D) $P(E) = 2P(\bar{E})$



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 comprises Multiple Choice Questions (MCQs) of 1 mark each. 20×1=20

- 1. The distance between the points (2, – 1) and (– 1, – 5) is :
 - (A) 15 units
 - (B) 5 units
 - (C) 25 units
 - (D) 41 units
- 2. If C(1, –1) is the mid-point of the line segment AB joining points A(4, x) and B(– 2, 4), then value of x is :
 - (A) 5
 - (B) – 5
 - (C) 6
 - (D) – 6
- 3. Which of the following relationship is correct ?
 - (A) $P(E) = 1 + P(\bar{E})$
 - (B) $P(\bar{E}) - P(E) = 1$
 - (C) $P(E) + P(\bar{E}) = 1$
 - (D) $P(E) = 2P(\bar{E})$



4. निम्नलिखित बंटन एक फैक्टरी के 50 श्रमिकों की दैनिक आय दर्शाता है :

आय (₹ में)	400 – 424	425 – 449	450 – 474	475 – 499	500 – 524
श्रमिकों की संख्या	12	14	8	6	10

बहुलक वर्ग की निचली सीमा है :

- (A) 425 (B) 449
(C) 424.5 (D) 425.5
5. 9 m ऊँचे बिजली के खंभे की ज़मीन पर $3\sqrt{3}$ m लम्बी छाया है। उस समय पर सूर्य का उन्नतांश है :
- (A) 60° (B) 90°
(C) 45° (D) 30°
6. यदि द्विघात बहुपद $kx^2 + 4x + k$ का एक शून्यक 1 है, तो k का मान है :
- (A) 2 (B) -2
(C) 4 (D) -4
7. द्विघात बहुपदों, जिनके शून्यक -1 और 3 हैं, की संख्या है :
- (A) 1 (B) 2
(C) 3 (D) 3 से अधिक
8. द्विघात समीकरण $x^2 - 4 = 0$ का/के मूल है/हैं :
- (A) केवल 2 (B) -2, 2
(C) केवल 4 (D) -4, 4
9. निम्नलिखित में से कौन-सा द्विघात समीकरण **नहीं** है ?

- (A) $(x - 2)^2 + 1 = 2x - 3$
(B) $(2x - 1)(x - 3) = (x + 5)(x - 1)$
(C) $x(x + 1) + 8 = (x + 2)(x - 2)$
(D) $2x + \frac{3}{x} = 5$



4. The following distribution gives the daily income of 50 workers of a factory :

Income (in ₹)	400 – 424	425 – 449	450 – 474	475 – 499	500 – 524
Number of workers	12	14	8	6	10

The lower limit of the modal class is :

- (A) 425 (B) 449
(C) 424.5 (D) 425.5
5. A lamp post 9 m high casts a shadow $3\sqrt{3}$ m long on the ground. The Sun's elevation at this moment is :
(A) 60° (B) 90°
(C) 45° (D) 30°
6. If one zero of a quadratic polynomial $kx^2 + 4x + k$ is 1, then the value of k is :
(A) 2 (B) -2
(C) 4 (D) -4
7. The number of quadratic polynomials having zeroes -1 and 3 is :
(A) 1 (B) 2
(C) 3 (D) more than 3
8. The roots of the quadratic equation $x^2 - 4 = 0$ is/are :
(A) 2 only (B) -2, 2
(C) 4 only (D) -4, 4
9. Which of the following is **not** a quadratic equation ?
(A) $(x - 2)^2 + 1 = 2x - 3$
(B) $(2x - 1)(x - 3) = (x + 5)(x - 1)$
(C) $x(x + 1) + 8 = (x + 2)(x - 2)$
(D) $2x + \frac{3}{x} = 5$



10. समांतर श्रेढी का सार्व अंतर, यदि $a_{23} - a_{19} = 32$ है, है :

- (A) 8 (B) - 8
(C) - 4 (D) 4

11. $\left(\frac{1}{\tan^2 \theta} - \frac{1}{\sin^2 \theta} \right)$ बराबर है :

- (A) 1 (B) - 1
(C) $\sec^2 \theta$ (D) $\sin^2 \theta$

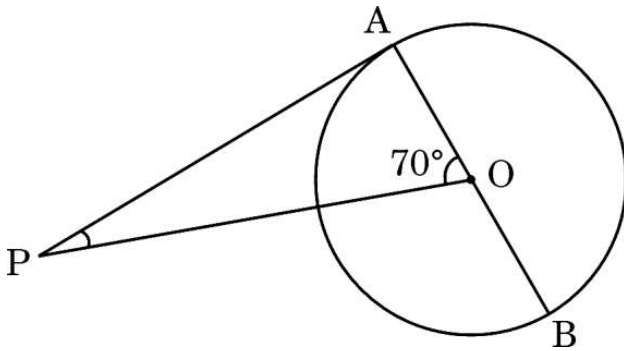
12. वृत्त की एक जीवा और दो चापों में से किसी एक के बीच का प्रत्येक क्षेत्र कहलाता है :

- (A) एक चाप (B) एक त्रिज्यखंड
(C) एक वृत्तखंड (D) एक अर्धवृत्त

13. यदि $1080 = 2^x \times 3^y \times 5$ है, तो $(x - y)$ बराबर है :

- (A) 6 (B) - 1
(C) 1 (D) 0

14. दी गई आकृति में, केन्द्र O वाले एक वृत्त पर बाह्य बिन्दु P से एक स्पर्श-रेखा PA बनी है । यदि $\angle AOP = 70^\circ$ है, तो $\angle APO$ का माप है :



- (A) 70° (B) 90°
(C) 110° (D) 20°



10. The common difference of an A.P., if $a_{23} - a_{19} = 32$, is :

- (A) 8 (B) - 8
(C) - 4 (D) 4

11. $\left(\frac{1}{\tan^2 \theta} - \frac{1}{\sin^2 \theta} \right)$ is equal to :

- (A) 1 (B) - 1
(C) $\sec^2 \theta$ (D) $\sin^2 \theta$

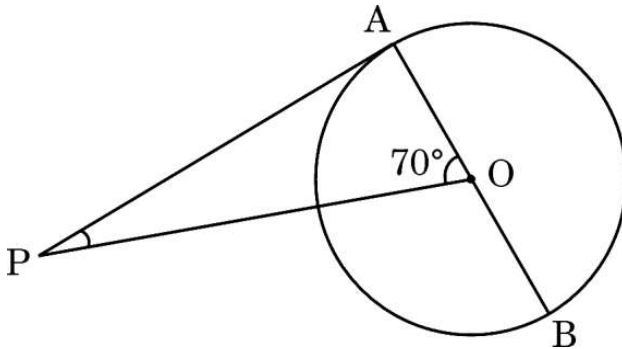
12. The region between a chord and either of the two arcs of a circle is called :

- (A) an arc (B) a sector
(C) a segment (D) a semicircle

13. If $1080 = 2^x \times 3^y \times 5$, then $(x - y)$ is equal to :

- (A) 6 (B) - 1
(C) 1 (D) 0

14. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle AOP = 70^\circ$, then the measure of $\angle APO$ is :



- (A) 70° (B) 90°
(C) 110° (D) 20°



15. निम्नलिखित बारंबारता बंटन का माध्यक वर्ग है :

वर्ग	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
बारंबारता	5	8	20	15	7	5

- (A) 10 – 20 (B) 20 – 30
(C) 30 – 40 (D) 40 – 50

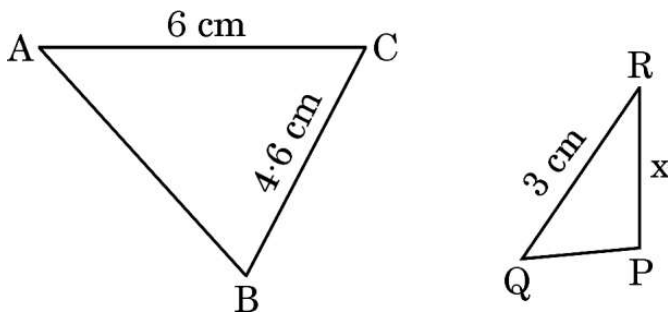
16. 21 cm त्रिज्या के एक वृत्त में, यदि एक चाप वृत्त के केन्द्र पर 60° का कोण अंतरित करता है, तो इस चाप की लंबाई है :

- (A) 11 cm (B) 44 cm
(C) $\frac{22}{7}$ cm (D) 22 cm

17. किसी वृत्त की स्पर्श-रेखा वह रेखा होती है जो वृत्त को स्पर्श करती है :

- (A) केवल एक ही बिन्दु पर (B) दो बिन्दुओं पर
(C) तीन बिन्दुओं पर (D) अनंत बिन्दुओं पर

18. दी गई आकृति में, यदि $\triangle ABC \sim \triangle QPR$ है, तो x का मान है :



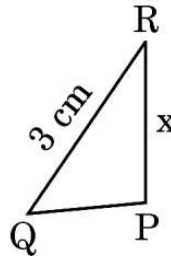
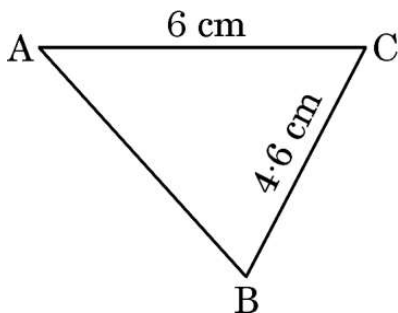
- (A) 5.3 cm (B) 4.6 cm
(C) 2.3 cm (D) 4 cm



15. The median group in the following frequency distribution is :

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Frequency	5	8	20	15	7	5

- (A) 10 – 20 (B) 20 – 30
(C) 30 – 40 (D) 40 – 50
16. In a circle of radius 21 cm, if an arc subtends an angle of 60° at the centre of the circle, then the length of the arc is :
- (A) 11 cm (B) 44 cm
(C) $\frac{22}{7}$ cm (D) 22 cm
17. A tangent to a circle is a line that touches the circle at :
- (A) one point only (B) two points
(C) three points (D) infinite number of points
18. In the given figure, if $\triangle ABC \sim \triangle QPR$, then the value of x is :



- (A) 5.3 cm (B) 4.6 cm
(C) 2.3 cm (D) 4 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) ग़लत है।
 (D) अभिकथन (A) ग़लत है, परन्तु तर्क (R) सही है।

19. अभिकथन (A) : रैखिक समीकरण युग्म $5x + 2y + 6 = 0$ और $7x + 6y + 18 = 0$ के अपरिमित रूप से अनेक हल हैं।

तर्क (R) : रैखिक समीकरण युग्म $a_1x + b_1y + c_1 = 0$ और $a_2x + b_2y + c_2 = 0$ के अपरिमित रूप से अनेक हल होंगे, यदि $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ है।

20. अभिकथन (A) : एक पासा फेंकने पर, संख्या 8 प्राप्त होने की प्रायिकता शून्य (0) है।

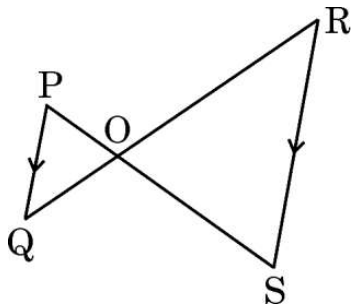
तर्क (R) : एक असंभव घटना की प्रायिकता शून्य (0) होती है।

खण्ड ख

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

5×2=10

21. HCF (306, 1314) = 18 दिया गया है, तो LCM (306, 1314) ज्ञात कीजिए।
 22. किसी वृत्त के व्यास AB के सिरे पर दो स्पर्श-रेखाएँ XY और PQ खींची गई हैं। सिद्ध कीजिए कि $XY \parallel PQ$ है।
 23. (a) दी गई आकृति में, $PQ \parallel RS$ है। सिद्ध कीजिए कि $OP \times OR = OQ \times OS$.



अथवा



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) : The pair of linear equations $5x + 2y + 6 = 0$ and $7x + 6y + 18 = 0$ have infinitely many solutions.

Reason (R) : The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

20. Assertion (A) : The probability of getting number 8 on rolling a die is zero (0).

Reason (R) : The probability of an impossible event is zero (0).

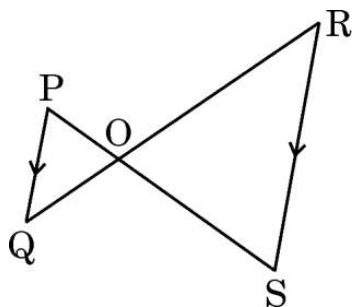
SECTION B

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

21. Given that $\text{HCF}(306, 1314) = 18$, find LCM of (306, 1314).

22. XY and PQ are two tangents drawn at the end points of the diameter AB of a circle. Prove that $XY \parallel PQ$.

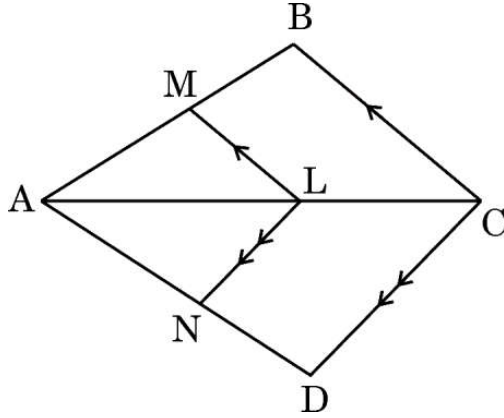
23. (a) In the given figure, $PQ \parallel RS$. Prove that $OP \times OR = OQ \times OS$.



OR



- (b) दी गई आकृति में, $LM \parallel CB$ और $LN \parallel CD$ है। सिद्ध कीजिए कि $\frac{AM}{AN} = \frac{AB}{AD}$.



24. (a) यदि बहुपद $8x^2 + 14x + 3$ के शून्यक α, β हैं, तो $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ का मान ज्ञात कीजिए।

अथवा

- (b) एक द्विघात बहुपद ज्ञात कीजिए जिसके शून्यक -9 और 6 हैं।

25. मान ज्ञात कीजिए :

$$\sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ - \cot 45^\circ$$

खण्ड ग

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

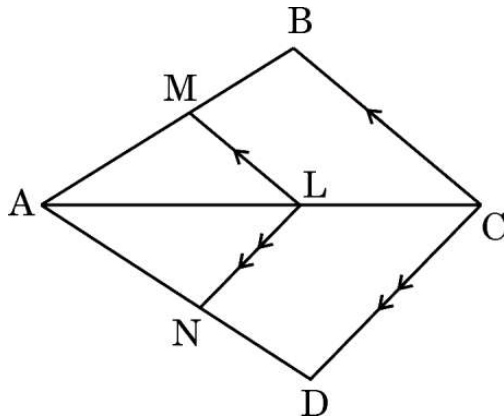
6×3=18

26. 10 cm त्रिज्या वाले एक वृत्त की कोई जीवा वृत्त के केन्द्र पर एक समकोण अंतरित करती है। संगत (i) लघु त्रिज्यखंड (ii) दीर्घ त्रिज्यखंड के क्षेत्रफल ज्ञात कीजिए। ($\pi = 3.14$ का प्रयोग कीजिए)
27. (a) सिद्ध कीजिए कि वृत्त के परिगत बने चतुर्भुज के आमने-सामने की भुजाएँ वृत्त के केन्द्र पर संपूरक कोण अंतरित करती हैं।

अथवा



- (b) In the given figure, $LM \parallel CB$ and $LN \parallel CD$. Prove that $\frac{AM}{AN} = \frac{AB}{AD}$.



24. (a) If α, β are zeroes of the polynomial $8x^2 + 14x + 3$, then find the value of $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$.

OR

- (b) Find a quadratic polynomial whose zeroes are -9 and 6 .

25. Evaluate :

$$\sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ - \cot 45^\circ$$

SECTION C

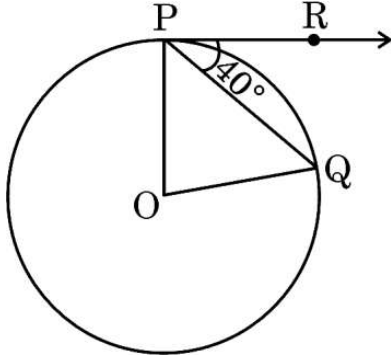
This section comprises Short Answer (SA) type questions of 3 marks each. $6 \times 3 = 18$

26. A chord of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding (i) minor sector (ii) major sector. (Use $\pi = 3.14$)
27. (a) Prove that opposite sides of a quadrilateral circumscribing a circle subtends supplementary angles at the centre of the circle.

OR



- (b) यदि एक वृत्त का केन्द्र O, जीवा PQ और P पर खींची गई स्पर्श-रेखा PR, जीवा PQ से 40° का कोण बनाती हो, तो $\angle POQ$ का माप ज्ञात कीजिए ।



28. (a) द्विघाती सूत्र का प्रयोग करके, समीकरण $2x^2 + 2x + 9 = 0$ के वास्तविक मूल, यदि उनका अस्तित्व है, ज्ञात कीजिए ।

अथवा

- (b) 'k' के वे मान ज्ञात कीजिए जिनके लिए द्विघात समीकरण $kx^2 - 2kx + 6 = 0$ के वास्तविक और समान मूल हैं । यह मूल भी ज्ञात कीजिए ।

29. ताश के 52 पत्तों की अच्छी तरह से फेंटी गई एक गड्डी से एक पत्ता यादृच्छया निकाला जाता है । प्रायिकता ज्ञात कीजिए कि निकाला गया पत्ता :

- (i) लाल रंग का बादशाह है ।
- (ii) काले रंग का पत्ता नहीं है ।
- (iii) पान का इक्का है ।

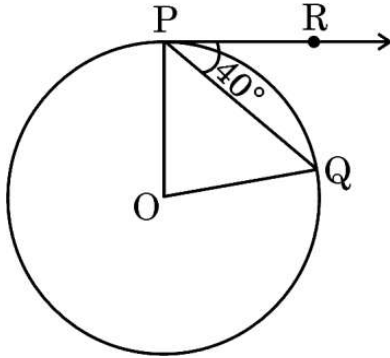
30. सिद्ध कीजिए कि $2 + 5\sqrt{3}$ एक अपरिमेय संख्या है, यदि दिया गया है कि $\sqrt{3}$ एक अपरिमेय संख्या है ।

31. सिद्ध कीजिए कि :

$$(\tan A + \sec A)^2 + (\tan A - \sec A)^2 = 2 \left(\frac{1 + \sin^2 A}{1 - \sin^2 A} \right)$$



- (b) If O is the centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 40° with PQ, then find the measure of $\angle POQ$.



28. (a) Using quadratic formula, find the real roots of the equation $2x^2 + 2x + 9 = 0$, if they exist.

OR

- (b) Find the values of 'k' for which the quadratic equation $kx^2 - 2kx + 6 = 0$ has real and equal roots. Also, find the roots.
29. One card is drawn at random from a well-shuffled deck of 52 playing cards. Find the probability that the card drawn is :
- (i) a red king.
 - (ii) not a black card.
 - (iii) an ace of hearts.
30. Prove that $2 + 5\sqrt{3}$ is an irrational number, if it is given that $\sqrt{3}$ is an irrational number.
31. Prove that :

$$(\tan A + \sec A)^2 + (\tan A - \sec A)^2 = 2 \left(\frac{1 + \sin^2 A}{1 - \sin^2 A} \right)$$



खण्ड घ

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

4×5=20

32. (a) दो घनों, जिनमें से प्रत्येक का आयतन 125 cm^3 है, के संलग्न फलकों को मिलाकर रखा जाता है। प्राप्त घनाभ का आयतन और पृष्ठीय क्षेत्रफल ज्ञात कीजिए।

अथवा

- (b) एक ठोस एक अर्धगोले पर अध्यारोपित एक शंकु के आकार का है जिसमें दोनों के व्यास 7 cm के बराबर हैं और शंकु की ऊँचाई उसकी त्रिज्या के बराबर है। ठोस का आयतन ज्ञात कीजिए।

33. एक ठेकेदार बच्चों को खेलने के लिए एक पार्क में दो फिसलन पट्टी लगाना चाहता है। 6 वर्ष से कम उम्र के बच्चों के लिए, वह एक ऐसी फिसलन पट्टी लगाना चाहता है जिसका शिखर 2.0 m की ऊँचाई पर हो और भूमि के साथ 30° के कोण पर झुकी हुई है, जबकि इससे अधिक उम्र के बच्चों के लिए, वह 4.0 m की ऊँचाई पर अधिक ढाल की फिसलन पट्टी लगाना चाहता है जो भूमि के साथ 60° के कोण पर झुकी हुई हो। प्रत्येक स्थिति में फिसलन पट्टी की लंबाई क्या होगी ?

34. (a) यदि BD और QM क्रमशः त्रिभुज ABC और PQR की माधिकाएँ हैं, जहाँ $\triangle ABC \sim \triangle PQR$ है, तो सिद्ध कीजिए कि $\frac{AB}{PQ} = \frac{BD}{QM}$.

अथवा

- (b) CD और GH क्रमशः $\angle ACB$ और $\angle EGF$ के ऐसे समद्विभाजक हैं कि बिन्दु D और H क्रमशः $\triangle ABC$ और $\triangle FEG$ की भुजाओं AB तथा FE पर स्थित हैं। यदि $\triangle ABC \sim \triangle FEG$ है, तो दर्शाइए कि :

(i) $\frac{CD}{GH} = \frac{AC}{FG}$

(ii) $\triangle DCB \sim \triangle HGE$

35. टी.वी. सेटों का एक निर्माता चौथे वर्ष में 720 टी.वी. सेट तथा आठवें वर्ष में 880 टी.वी. सेट का उत्पादन करता है। यह मानते हुए कि प्रत्येक वर्ष उत्पादन में एकसमान रूप से एक निश्चित संख्या में वृद्धि होती है, तो दसवें वर्ष का उत्पादन और पहले सात वर्षों का कुल उत्पादन ज्ञात कीजिए।



SECTION D

This section comprises Long Answer (LA) type questions of 5 marks each. 4×5=20

- 32.** (a) Two cubes each of volume 125 cm^3 are joined end to end. Find the volume and the surface area of the resulting cuboid.

OR

- (b) A solid is in the shape of a cone surmounted on a hemisphere with both their diameters being equal to 7 cm and the height of the cone is equal to its radius. Find the volume of the solid.
- 33.** A contractor plans to install two slides for the children to play in a park. For the children below the age of 6 years, he prefers to have a slide whose top is at a height of 2.0 m and is inclined at an angle of 30° to the ground, whereas for older children, he wants to have a steep slide at a height of 4.0 m and inclined at an angle of 60° to the ground. What would be the length of the slide in each case ?
- 34.** (a) If BD and QM are medians of triangles ABC and PQR, respectively, where $\triangle ABC \sim \triangle PQR$, prove that $\frac{AB}{PQ} = \frac{BD}{QM}$.

OR

- (b) CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$ such that D and H lie on sides AB and FE of $\triangle ABC$ and $\triangle FEG$ respectively. If $\triangle ABC \sim \triangle FEG$, show that :
- (i) $\frac{CD}{GH} = \frac{AC}{FG}$
- (ii) $\triangle DCB \sim \triangle HGE$
- 35.** A manufacturer of TV sets produced 720 TV sets in the fourth year and 880 TV sets in the eighth year. Assuming that the production increases uniformly by a fixed number every year, find the production in the tenth year and the total production in the first seven years.



खण्ड ड

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

3×4=12

प्रकरण अध्ययन – 1

36. म्यूचुअल फंड : म्यूचुअल फंड एक प्रकार का निवेश माध्यम है जो स्टॉक, बॉन्ड या अन्य प्रतिभूतियों में निवेश करने के लिए कई निवेशकों से पैसा एकत्र करता है । म्यूचुअल फंड पेशेवर मनी मैनेजर द्वारा संचालित होते हैं, जो फंड की परिसंपत्ति आबंटित करते हैं और फंड के निवेशकों के लिए पूंजीगत लाभ या आय उत्पन्न करने का प्रयास करते हैं ।



शुद्ध परिसंपत्ति मूल्य (NAV) किसी फंड के प्रति शेयर बाज़ार मूल्य का प्रतिनिधित्व करता है । यह वह कीमत है जिस पर निवेशक किसी फंड कंपनी से फंड शेयर खरीदते हैं और उन्हें किसी फंड कंपनी को बेचते हैं ।

निम्नलिखित तालिका ICICI म्यूचुअल फंडों के म्यूचुअल फंड की प्रति यूनिट शुद्ध परिसंपत्ति मूल्य (NAV) को दर्शाती है :

NAV (₹ में)	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
म्यूचुअल फंडों की संख्या	13	16	22	18	11

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

- आँकड़ों के बहुलक वर्ग की ऊपरी सीमा क्या है ?
- आँकड़ों का माध्यक वर्ग क्या है ?

1

1



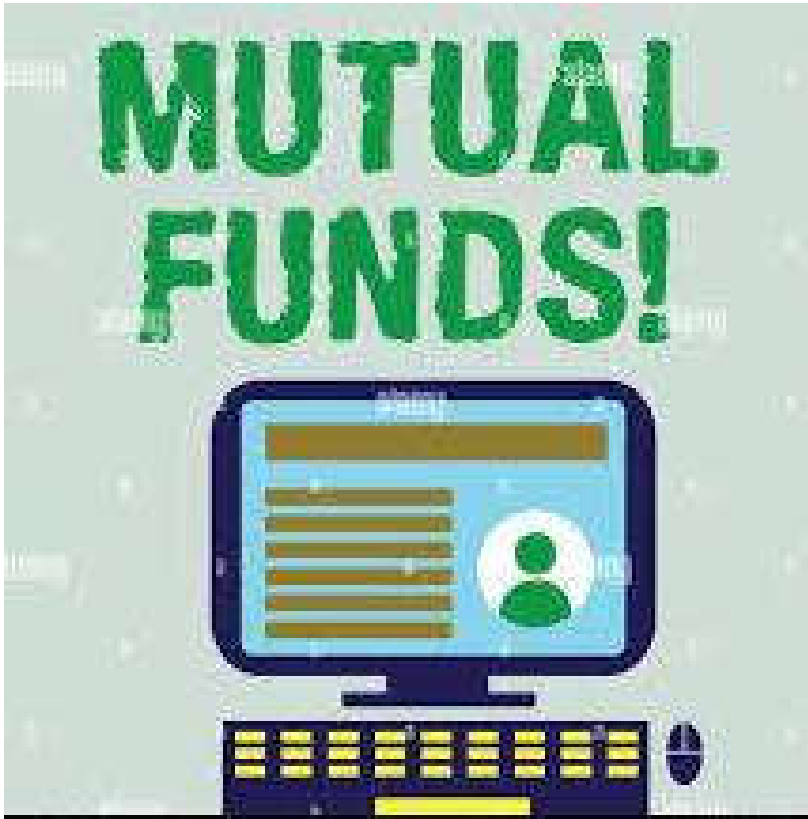
SECTION E

This section comprises 3 case study based questions of 4 marks each.

3×4=12

Case Study – 1

36. **Mutual Fund :** A mutual fund is a type of investment vehicle that pools money from multiple investors to invest in securities like stocks, bonds or other securities. Mutual funds are operated by professional money managers, who allocate the fund's assets and attempt to produce capital gains or income for the fund's investors.



Net Asset Value (NAV) represents a fund's per share market value. It is the price at which the investors buy fund shares from a fund company and sell them to a fund company.

The following table shows the Net Asset Value (NAV) per unit of mutual fund of ICICI mutual funds :

NAV (in ₹)	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Number of mutual funds	13	16	22	18	11

Based on the above information, answer the following questions :

- (i) What is the upper limit of modal class of the data ? 1
- (ii) What is the median class of the data ? 1



(iii) (a) म्यूचुअल फंडों का बहुलक NAV क्या है ?

2

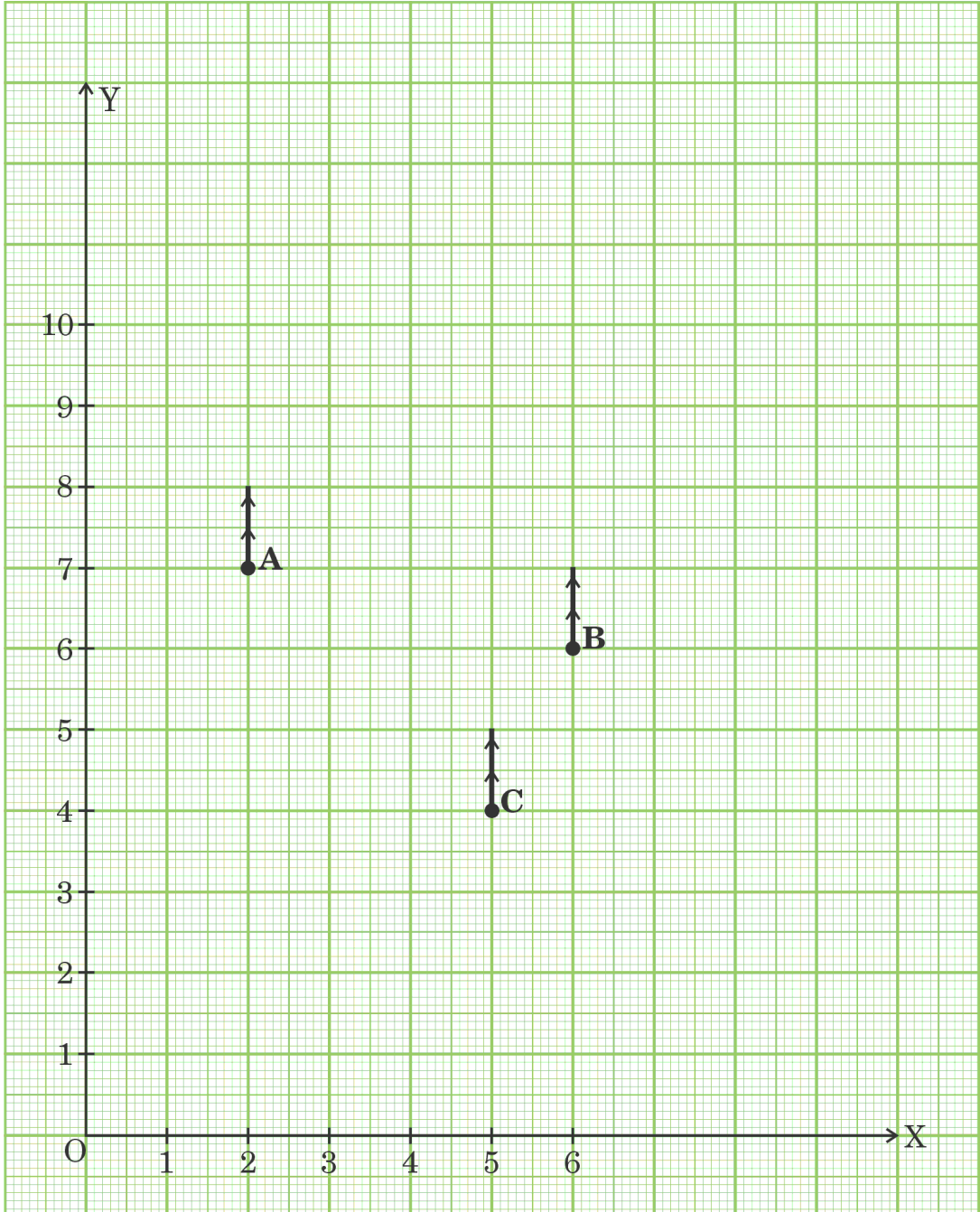
अथवा

(b) म्यूचुअल फंडों का माध्यक NAV क्या है ?

2

प्रकरण अध्ययन - 2

37. दिल्ली में गुलमोहर सोसाइटी के आवासीय कल्याण संघ (RWA) ने सोसाइटी के कॉमन पार्क में तीन बिजली के खंभे A, B और C लगाए हैं। इन तीन खंभों के बावजूद, पार्क के कुछ हिस्से अब भी अँधेरे में हैं। इसलिए, RWA ने पार्क में एक और बिजली का खंभा D लगाने का फैसला किया। पार्क को नीचे दी गई निर्देशांक प्रणाली के रूप में तैयार किया जा सकता है।





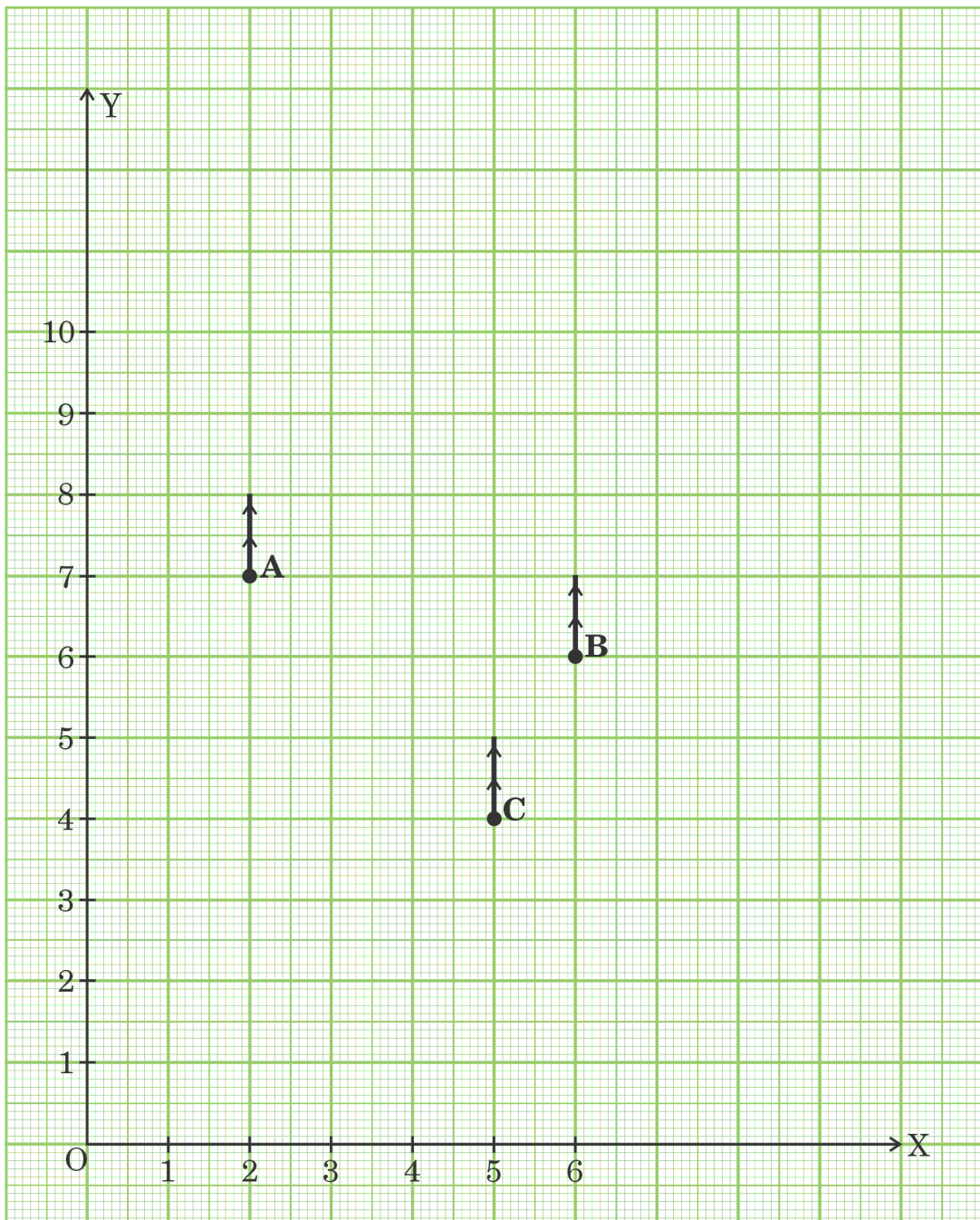
- (iii) (a) What is the mode NAV of mutual funds ? 2

OR

- (b) What is the median NAV of mutual funds ? 2

Case Study – 2

37. Resident Welfare Association (RWA) of Gulmohar Society in Delhi, have installed three electric poles A, B and C in the society's common park. Despite these three poles, some parts of the park are still in the dark. So, RWA decides to have one more electric pole D in the park. The park can be modelled as a coordinate system given below.





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

- (i) खंभे C का स्थान क्या है ? 1
- (ii) पार्क के कोने O से खंभे B की दूरी कितनी है ? 1
- (iii) (a) चौथे खंभे D का स्थान ज्ञात कीजिए जिससे चार बिन्दु A, B, C और D एक समांतर चतुर्भुज ABCD बनाएँ । 2

अथवा

- (b) खंभे A और C के बीच की दूरी ज्ञात कीजिए । 2

प्रकरण अध्ययन – 3

- 38.** दिपांकर ने स्कूल की पुस्तक की दुकान से 3 नोटबुक और 2 पेन ₹ 80 में खरीदे और उसके मित्र सूर्याश ने 4 नोटबुक और 3 पेन ₹ 110 में खरीदे ।



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

- (i) यदि एक नोटबुक का मूल्य ₹ x और एक पेन का मूल्य ₹ y है, तो दी गई स्थिति को बीजगणितीय रूप में लिखिए । 1

- (ii) (a) एक नोटबुक का मूल्य क्या है ? 2

अथवा

- (b) एक पेन का मूल्य क्या है ? 2

- (iii) सूर्याश यदि 6 नोटबुक और 3 पेन खरीदता है, तो उसे कुल कितनी राशि खर्च करनी पड़ेगी ? 1



On the basis of the above information, answer the following questions :

- (i) What is the position of the pole C ? 1
- (ii) What is the distance of the pole B from the corner O of the park ? 1
- (iii) (a) Find the position of the fourth pole D so that the four points A, B, C and D form a parallelogram ABCD. 2

OR

- (b) Find the distance between poles A and C. 2

Case Study – 3

38. Deepankar bought 3 notebooks and 2 pens for ₹ 80 and his friend Suryansh bought 4 notebooks and 3 pens for ₹ 110 from the school bookshop.



Based on the above information, answer the following questions.

- (i) If the price of one notebook be ₹ x and the price of one pen be ₹ y , write the given situation algebraically. 1
 - (ii) (a) What is the price of one notebook ? 2
- OR**
- (b) What is the price of one pen ? 2
 - (iii) What is the total amount to be paid by Suryansh, if he purchases 6 notebooks and 3 pens ? 1

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2024
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/4/1)

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	<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 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) 430/4/1

SECTION A

This section comprises Multiple Choice Questions (MCQs) of 1 mark each. $20 \times 1 = 20$

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

(A) 15 units (B) 5 units
(C) 25 units (D) 41 units

Answer (B) 5 units

1

2. If $C(1, -1)$ is the mid-point of the line segment AB joining points $A(4, x)$ and $B(-2, 4)$, then value of x is :

(A) 5 (B) -5
(C) 6 (D) -6

Answer (D) -6

1

3. Which of the following relationship is correct ?

(A) $P(E) = 1 + P(\bar{E})$ (B) $P(\bar{E}) - P(E) = 1$
(C) $P(E) + P(\bar{E}) = 1$ (D) $P(E) = 2P(\bar{E})$

Answer (C) $P(E) + P(\bar{E}) = 1$

1

4. The following distribution gives the daily income of 50 workers of a factory :

Income (in ₹)	400 – 424	425 – 449	450 – 474	475 – 499	500 – 524
Number of workers	12	14	8	6	10

The lower limit of the modal class is :

(A) 425 (B) 449
(C) 424.5 (D) 425.5

Answer (C) 424.5

1

5. A lamp post 9 m high casts a shadow $3\sqrt{3}$ m long on the ground. The Sun's elevation at this moment is :

(A) 60° (B) 90°
(C) 45° (D) 30°

Answer (A) 60°

1

6. If one zero of a quadratic polynomial $kx^2 + 4x + k$ is 1, then the value of k is :

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

Answer (B) - 2

1

7. The number of quadratic polynomials having zeroes -1 and 3 is :

- (A) 1 (B) 2
(C) 3 (D) more than 3

Answer (D) more than 3

1

8. The roots of the quadratic equation $x^2 - 4 = 0$ is/are :

- (A) 2 only (B) -2, 2
(C) 4 only (D) -4, 4

Answer (B) - 2, 2

1

9. Which of the following is **not** a quadratic equation ?

- (A) $(x - 2)^2 + 1 = 2x - 3$
(B) $(2x - 1)(x - 3) = (x + 5)(x - 1)$
(C) $x(x + 1) + 8 = (x + 2)(x - 2)$
(D) $2x + \frac{3}{x} = 5$

Answer (C) $x(x + 1) + 8 = (x + 2)(x - 2)$

1

10. The common difference of an A.P., if $a_{23} - a_{19} = 32$, is :

- (A) 8 (B) -8
(C) -4 (D) 4

Answer (A) 8

1

11. $\left(\frac{1}{\tan^2 \theta} - \frac{1}{\sin^2 \theta} \right)$ is equal to :

- (A) 1 (B) -1
(C) $\sec^2 \theta$ (D) $\sin^2 \theta$

Answer (B) - 1

1

12. The region between a chord and either of the two arcs of a circle is called :

- (A) an arc (B) a sector
(C) a segment (D) a semicircle

Answer (C) a segment

1

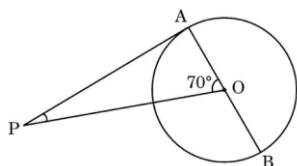
13. If $1080 = 2^x \times 3^y \times 5$, then $(x - y)$ is equal to :

- (A) 6 (B) -1
(C) 1 (D) 0

Answer (D) 0

1

14. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle AOP = 70^\circ$, then the measure of $\angle APO$ is :



- (A) 70° (B) 90°
(C) 110° (D) 20°

Answer (D) 20°

1

15. The median group in the following frequency distribution is :

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Frequency	5	8	20	15	7	5

- (A) 10 – 20 (B) 20 – 30
(C) 30 – 40 (D) 40 – 50

Answer (B) 20 – 30

1

16. In a circle of radius 21 cm, if an arc subtends an angle of 60° at the centre of the circle, then the length of the arc is :

- (A) 11 cm (B) 44 cm
(C) $\frac{22}{7}$ cm (D) 22 cm

Answer (D) 22 cm

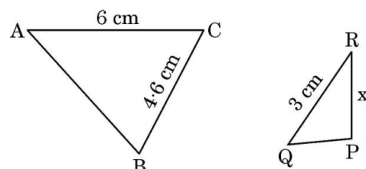
1

17. A tangent to a circle is a line that touches the circle at :
- (A) one point only (B) two points
(C) three points (D) infinite number of points

Answer (A) one point only

1

18. In the given figure, if $\triangle ABC \sim \triangle QPR$, then the value of x is :



- (A) 5.3 cm (B) 4.6 cm
(C) 2.3 cm (D) 4 cm

Answer (C) 2.3 cm

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) : The pair of linear equations $5x + 2y + 6 = 0$ and $7x + 6y + 18 = 0$ have infinitely many solutions.

Reason (R) : The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

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

1

20. Assertion (A) : The probability of getting number 8 on rolling a die is zero (0).

Reason (R) : The probability of an impossible event is zero (0).

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

1

SECTION B

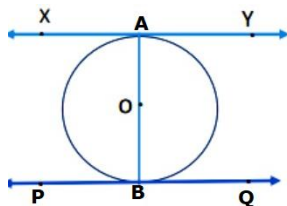
This section comprises Very Short Answer (VSA) type questions of 2 marks each. 5×2=10

21. Given that $HCF(306, 1314) = 18$, find LCM of (306, 1314).

Solution: $LCM \times 18 = 306 \times 1314$ 1
 $LCM = \frac{306 \times 1314}{18} = 22,338$ 1

22. XY and PQ are two tangents drawn at the end points of the diameter AB of a circle. Prove that $XY \parallel PQ$.

Solution:



$\frac{1}{2}$ For figure

Given: XY & PQ are tangents, AB is the diameter

To prove: $XY \parallel PQ$

Proof: $XY \perp OA$ (Tangent is perpendicular to radius)

$$\therefore \angle OAY = 90^\circ$$

$\frac{1}{2}$

$PQ \perp OB$ (Tangent is perpendicular to radius)

$$\therefore \angle OBP = 90^\circ$$

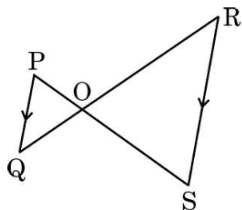
$\frac{1}{2}$

But $\angle OAY$ and $\angle OBP$ are alternate interior angles

$$\therefore XY \parallel PQ$$

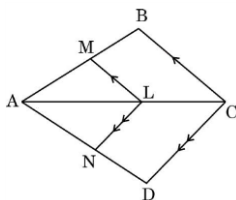
$\frac{1}{2}$

23. (a) In the given figure, $PQ \parallel RS$. Prove that $OP \times OR = OQ \times OS$.



OR

(b) In the given figure, $LM \parallel CB$ and $LN \parallel CD$. Prove that $\frac{AM}{AN} = \frac{AB}{AD}$.



Solution: (a) In $\triangle POQ$ and $\triangle SOR$

$$\angle POQ = \angle SOR \quad (\text{vertically opposite angles})$$

$$\angle OPQ = \angle OSR \quad (\text{alternate interior angles as } PQ \parallel SR)$$

$$\therefore \triangle POQ \sim \triangle SOR \quad (\text{AA criteria})$$

$$\Rightarrow \frac{OP}{OS} = \frac{OQ}{OR} \quad \text{or} \quad OP \times OR = OQ \times OS$$

OR

(b) In $\triangle ABC$, $LM \parallel CB$

$$\therefore \frac{AM}{AB} = \frac{AL}{AC} \quad \text{_____ (i)}$$

In $\triangle ADC$, $LN \parallel CD$

$$\therefore \frac{AN}{AD} = \frac{AL}{AC} \quad \text{_____ (ii)}$$

$$\text{from (i) and (ii)} \quad \frac{AM}{AB} = \frac{AN}{AD} \quad \text{or} \quad \frac{AM}{AN} = \frac{AB}{AD}$$

$\frac{1}{2}$
 $\frac{1}{2}$
 $\frac{1}{2}$
 $\frac{1}{2}$
 $\frac{1}{2}$

$1 \frac{1}{2}$

$\frac{1}{2}$

- 24.** (a) If α, β are zeroes of the polynomial $8x^2 + 14x + 3$, then find the value of $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$.

OR

- (b) Find a quadratic polynomial whose zeroes are -9 and 6 .

Solution: (a) As α, β are zeroes of the polynomial

$$\therefore \alpha + \beta = \frac{-14}{8}$$

$$\alpha\beta = \frac{3}{8}$$

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{-14}{3}$$

OR

- (b) Sum of zeroes $= -3$

$$\text{Product of zeroes} = -54$$

$$\text{Quadratic polynomial is : } k(x^2 + 3x - 54) \quad \text{or} \quad x^2 + 3x - 54$$

$\frac{1}{2}$
 $\frac{1}{2}$
 $\frac{1}{2}$
 $\frac{1}{2}$
 $\frac{1}{2} + \frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

1

25. Evaluate :

$$\sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ - \cot 45^\circ$$

Solution $\sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ - \cot 45^\circ$

$$= \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} - 1$$

$$= 0$$

$$1\frac{1}{2}$$

$$\frac{1}{2}$$

SECTION C

This section comprises Short Answer (SA) type questions of 3 marks each. 6×3=18

- 26.** A chord of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding (i) minor sector (ii) major sector. (Use $\pi = 3.14$)

Solution

(i) Area of minor sector = $\frac{\pi r^2 \theta}{360^\circ} = \frac{3.14 \times 10 \times 10 \times 90}{360}$ 1

$$= \frac{314}{4} \text{ cm}^2 \text{ or } \frac{157}{2} \text{ cm}^2 \text{ or } 78.5 \text{ cm}^2$$
 $\frac{1}{2}$

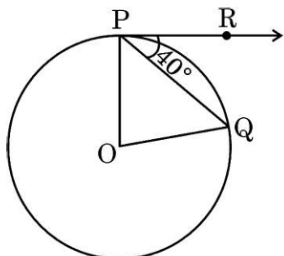
(ii) Area of circle = $\pi r^2 = 3.14 \times 10 \times 10 = 314 \text{ cm}^2$ 1

\therefore Area of major sector = $314 - 78.5 = 235.5 \text{ cm}^2$ $\frac{1}{2}$

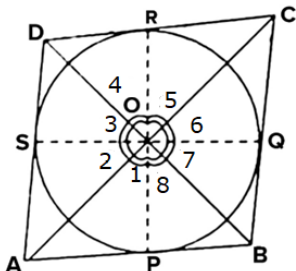
- 27.** (a) Prove that opposite sides of a quadrilateral circumscribing a circle subtends supplementary angles at the centre of the circle.

OR

- (b) If O is the centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 40° with PQ, then find the measure of $\angle POQ$.



Solution: (a) Given: A quadrilateral ABCD circumscribes a circle with centre O



$\frac{1}{2}$ for fig.

To Prove: $\angle AOB + \angle COD = 180^\circ$ and $\angle BOC + \angle AOD = 180^\circ$

Proof: In $\triangle AOP$ and $\triangle AOS$

$OA = OA$ (common)

$OP = OS$ (radii)

$AP = AS$ (tangents from an external point)

$\therefore \triangle AOP \cong \triangle AOS$ (SSS criteria)

1

$\therefore \angle 1 = \angle 2$

||ly, $\angle 3 = \angle 4, \angle 5 = \angle 6$ and $\angle 7 = \angle 8$

$\frac{1}{2}$

Now $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360^\circ$

$\Rightarrow 2(\angle 1 + \angle 4 + \angle 5 + \angle 8) = 360^\circ$

$\Rightarrow (\angle 1 + \angle 8) + (\angle 4 + \angle 5) = 180^\circ$

$\frac{1}{2}$

$\Rightarrow \angle AOB + \angle COD = 180^\circ$

||ly, $\angle BOC + \angle AOD = 180^\circ$

$\frac{1}{2}$

OR

(b) $\angle RPQ = 40^\circ$ (given)

$\angle OPR = 90^\circ$ (radius \perp tangent)

$\therefore \angle OPQ = 90^\circ - 40^\circ = 50^\circ$

1

In $\triangle POQ$, $OP = OQ$ (radii of same circle)

$\therefore \angle OPQ = \angle OQP = 50^\circ$ (angles opposite to equal sides)

1

Now, $\angle OPQ + \angle OQP + \angle POQ = 180^\circ$

$50^\circ + 50^\circ + \angle POQ = 180^\circ$

$\angle POQ = 80^\circ$

1

28. (a) Using quadratic formula, find the real roots of the equation

$2x^2 + 2x + 9 = 0$, if they exist.

OR

(b) Find the values of 'k' for which the quadratic equation

$kx^2 - 2kx + 6 = 0$ has real and equal roots. Also, find the roots.

Solution (a) $D = -68$ 2
 since $D < 0$, the equation does not have real roots. 1

OR

(b) $kx^2 - 2kx + 6 = 0$
 Quadratic Equation has equal roots (given)
 $\therefore D = 0 \Rightarrow 4k^2 - 24k = 0$ 1
 $4k(k - 6) = 0$
 $\Rightarrow k = 6 (k \neq 0)$ 1
 Putting $k = 6$ we get
 $6x^2 - 12x + 6 = 0$ or $x^2 - 2x + 1 = 0$
 $\Rightarrow (x - 1)^2 = 0 \Rightarrow x = 1$ 1

29. One card is drawn at random from a well-shuffled deck of 52 playing cards. Find the probability that the card drawn is :

- (i) a red king.
- (ii) not a black card.
- (iii) an ace of hearts.

Solution: (i) $P(\text{Red king}) = \frac{2}{52}$ or $\frac{1}{26}$ 1
 (ii) $P(\text{not a black card}) = \frac{26}{52}$ or $\frac{1}{2}$ 1
 (iii) $P(\text{ace of hearts}) = \frac{1}{52}$ 1

30. Prove that $2 + 5\sqrt{3}$ is an irrational number, if it is given that $\sqrt{3}$ is an irrational number.

Solution: Let us assume that $x = 2 + 5\sqrt{3}$ is a rational number 1
 $\Rightarrow \sqrt{3} = \frac{x-2}{5}$ 1
 Now RHS is rational number but LHS is an irrational number
 \therefore our assumption is wrong 1
 Hence $2 + 5\sqrt{3}$ is an irrational number

31. Prove that :

$$(\tan A + \sec A)^2 + (\tan A - \sec A)^2 = 2 \left(\frac{1 + \sin^2 A}{1 - \sin^2 A} \right)$$

$$\begin{aligned}
 \text{Solution: LHS} &= \tan^2 A + \sec^2 A + 2\sec A \tan A + \tan^2 A + \sec^2 A - 2\sec A \tan A & 1 \\
 &= 2 \left[\frac{\sin^2 A + 1}{\cos^2 A} \right] & 1\frac{1}{2} \\
 &= 2 \left[\frac{1 + \sin^2 A}{1 - \sin^2 A} \right] = \text{RHS} & \frac{1}{2}
 \end{aligned}$$

SECTION D

This section comprises Long Answer (LA) type questions of 5 marks each. 4×5=20

- 32.** (a) Two cubes each of volume 125 cm^3 are joined end to end. Find the volume and the surface area of the resulting cuboid.

OR

- (b) A solid is in the shape of a cone surmounted on a hemisphere with both their diameters being equal to 7 cm and the height of the cone is equal to its radius. Find the volume of the solid.

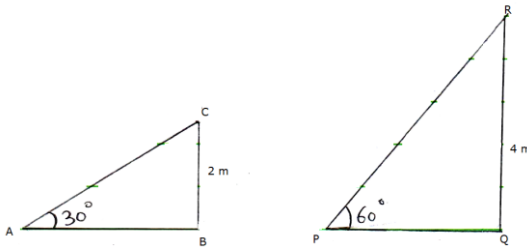
$$\begin{aligned}
 \text{Solution: (a) Volume of one cube} &= 125 \text{ cm}^3 \\
 \therefore \text{side of the cube} &= 5 \text{ cm} & 1 \\
 \text{Volume of the resulting cuboid} &= \text{volume of 2 cubes} = 250 \text{ cm}^3 & 1 \\
 \therefore \text{Length of new cuboid} &= 5 + 5 = 10 \text{ cm} \\
 \text{Breadth of new cuboid} &= 5 \text{ cm} \\
 \text{Height of new cuboid} &= 5 \text{ cm} & 1\frac{1}{2} \\
 \text{Surface area of the resulting cuboid} &= 2 (lb + bh + hl) \\
 &= 2 (10 \times 5 + 5 \times 5 + 5 \times 10) & 1 \\
 &= 250 \text{ cm}^2 & \frac{1}{2}
 \end{aligned}$$

OR

$$\begin{aligned}
 \text{(b) Radius of hemisphere} &= \text{radius of cone} = \frac{7}{2} \text{ cm} & 1 \\
 \text{Height of cone} &= \frac{7}{2} \text{ cm} & \frac{1}{2} \\
 \text{Volume of the solid} &= \text{Volume of hemisphere} + \text{Volume of cone} \\
 &= \frac{2}{3} \pi r^3 + \frac{1}{3} \pi r^2 h \\
 &= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \left(2 \times \frac{7}{2} + \frac{7}{2} \right) & 3 \\
 &= \frac{539}{4} \text{ cm}^3 \text{ or } 134.75 \text{ cm}^3 & \frac{1}{2}
 \end{aligned}$$

- 33.** A contractor plans to install two slides for the children to play in a park. For the children below the age of 6 years, he prefers to have a slide whose top is at a height of 2.0 m and is inclined at an angle of 30° to the ground, whereas for older children, he wants to have a steep slide at a height of 4.0 m and inclined at an angle of 60° to the ground. What would be the length of the slide in each case ?

Solution:



$$\text{In } \triangle ABC, \frac{BC}{AC} = \sin 30^\circ$$

$$\frac{2}{AC} = \frac{1}{2}$$

$$\Rightarrow AC = 4 \text{ m}$$

\therefore length of slide meant for children below 6 years = 4 m

$$\text{In } \triangle PQR, \frac{QR}{PR} = \sin 60^\circ$$

$$\frac{4}{PR} = \frac{\sqrt{3}}{2}$$

$$\Rightarrow PR = \frac{8\sqrt{3}}{3} \text{ m or } \frac{13.856}{3} \text{ m or } 4.62 \text{ m approx.}$$

\therefore length of slide meant for older children = 4.62 m

1 for figure

1

$\frac{1}{2}$

$\frac{1}{2}$

1

$\frac{1}{2}$

$\frac{1}{2}$

- 34.** (a) If BD and QM are medians of triangles ABC and PQR, respectively, where $\triangle ABC \sim \triangle PQR$, prove that $\frac{AB}{PQ} = \frac{BD}{QM}$.

OR

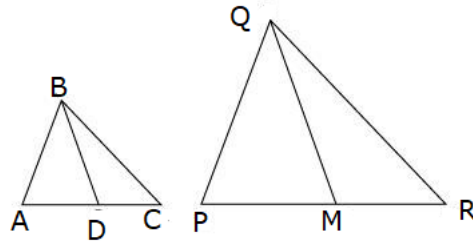
- (b) CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$ such that D and H lie on sides AB and FE of $\triangle ABC$ and $\triangle FEG$ respectively. If $\triangle ABC \sim \triangle FEG$, show that :

(i) $\frac{CD}{GH} = \frac{AC}{FG}$

(ii) $\triangle DCB \sim \triangle HGE$

Solution (a)

1 for figure



Given : $\triangle ABC \sim \triangle PQR$ and BD, QM are medians

To prove : $\frac{AB}{PQ} = \frac{BD}{QM}$

Proof : $\triangle ABC \sim \triangle PQR$

(given)

$$\therefore \frac{AB}{PQ} = \frac{AC}{PR}$$

1

$$\Rightarrow \frac{AB}{PQ} = \frac{2AD}{2PM}$$

(BD and QM are medians)

$$\Rightarrow \frac{AB}{PQ} = \frac{AD}{PM}$$

1

In $\triangle ABD$ and $\triangle PQM$

$$\frac{AB}{PQ} = \frac{AD}{PM}$$

(proved above)

$$\angle A = \angle P$$

($\triangle ABC \sim \triangle PQR$)

$$\therefore \triangle ABD \sim \triangle PQM$$

(SAS criteria)

$1\frac{1}{2}$

$$\therefore \frac{AB}{PQ} = \frac{BD}{QM}$$

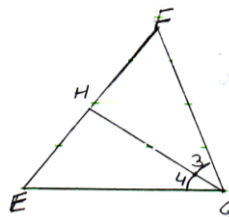
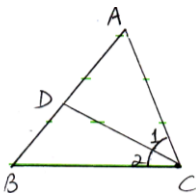
(C.P.S.T.)

$\frac{1}{2}$

OR

(b) Given: $\triangle ABC \sim \triangle FEG$ and CD, GH are bisectors of $\angle ACB$ and $\angle EGF$ respectively.

To Prove (i) $\frac{CD}{GH} = \frac{AC}{FG}$ (ii) $\triangle DCB \sim \triangle HGE$



1 for figure

Proof: (i) $\angle ACB = \angle FGE$ ($\triangle ABC \sim \triangle FEG$)	$\frac{1}{2}$
$\Rightarrow \frac{1}{2} \angle ACB = \frac{1}{2} \angle FGE$ (CD and GH are bisectors of $\angle ACB$ and $\angle EGF$)	
$\Rightarrow \angle 1 = \angle 3$ and $\angle 2 = \angle 4$	$\frac{1}{2} + \frac{1}{2}$
In $\triangle ACD$ and $\triangle FGH$	
$\angle A = \angle F$ ($\triangle ABC \sim \triangle FEG$)	
$\angle 1 = \angle 3$ (proved above)	
$\Rightarrow \triangle ACD \sim \triangle FGH$ (AA criteria)	1
$\Rightarrow \frac{CD}{GH} = \frac{AC}{FG}$	$\frac{1}{2}$
(ii) In $\triangle DCB$ and $\triangle HGE$	
$\angle B = \angle E$ ($\triangle ABC \sim \triangle FEG$)	
$\angle 2 = \angle 4$ (proved above)	
$\therefore \triangle DCB \sim \triangle HGE$ (AA criteria)	1

- 35.** A manufacturer of TV sets produced 720 TV sets in the fourth year and 880 TV sets in the eighth year. Assuming that the production increases uniformly by a fixed number every year, find the production in the tenth year and the total production in the first seven years.

Solution: Let first term = a and common difference = d

Production in 4 th year = 720	
$a_4 = 720 \Rightarrow a + 3d = 720$ _____ (i)	1
Production in 8 th year = 880	
$a_8 = 880 \Rightarrow a + 7d = 880$ _____ (ii)	1
Solving (i) and (ii)	
$d = 40$ and $a = 600$	$\frac{1}{2} + \frac{1}{2}$
\therefore Production in 10 th year = $a_{10} = 600 + 9 \times 40$	$\frac{1}{2}$
$= 960$	$\frac{1}{2}$
Total Production in the first seven years = $S_7 = \frac{7}{2} [2(600) + 6(40)]$	$\frac{1}{2}$
$= 5040$	$\frac{1}{2}$

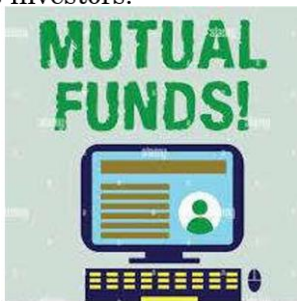
SECTION E

This section comprises 3 case study based questions of 4 marks each.

3×4=12

Case Study – 1

- 36.** **Mutual Fund :** A mutual fund is a type of investment vehicle that pools money from multiple investors to invest in securities like stocks, bonds or other securities. Mutual funds are operated by professional money managers, who allocate the fund's assets and attempt to produce capital gains or income for the fund's investors.



Net Asset Value (NAV) represents a fund's per share market value. It is the price at which the investors buy fund shares from a fund company and sell them to a fund company.

The following table shows the Net Asset Value (NAV) per unit of mutual fund of ICICI mutual funds :

NAV (in ₹)	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Number of mutual funds	13	16	22	18	11

Based on the above information, answer the following questions :

- | | |
|--|---|
| (i) What is the upper limit of modal class of the data ? | 1 |
| (ii) What is the median class of the data ? | 1 |
| (iii) (a) What is the mode NAV of mutual funds ? | 2 |
| OR | |
| (b) What is the median NAV of mutual funds ? | 2 |

Solution: (i) Upper limit of modal class = 15 1

(ii) Median class = 10 – 15 1

(iii)(a) $l = 10, f_0 = 16, f_1 = 22, f_2 = 18, h = 5$

$$\begin{aligned} \text{Mode} &= l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h = 10 + \left(\frac{22 - 16}{44 - 16 - 18} \right) \times 5 \\ &= 13 \end{aligned} \quad \begin{array}{l} 1\frac{1}{2} \\ \frac{1}{2} \end{array}$$

OR

(iii) (b)

NAV (in ₹)	f	cf
0 – 5	13	13
5 – 10	16	29
10 – 15	22	51
15 – 20	18	69
20 – 25	11	80

$\frac{1}{2}$ for table

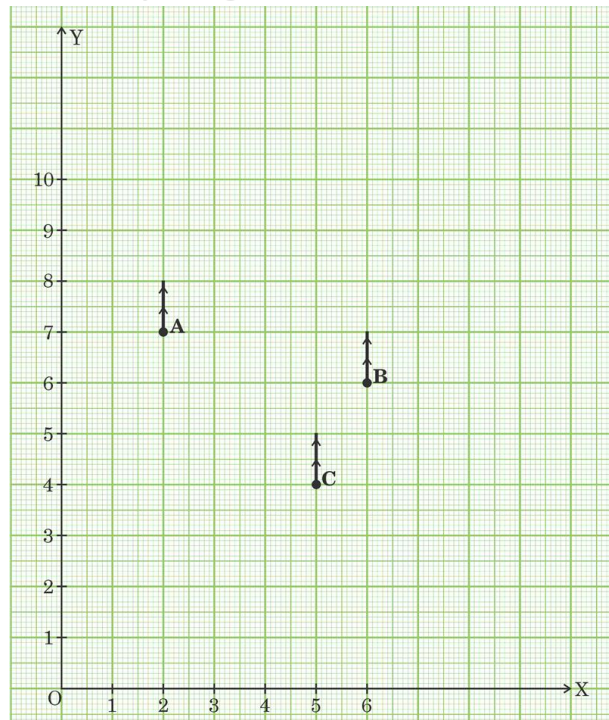
$$\text{Median} = l + \left(\frac{\frac{N}{2} - cf}{f} \right) \times h = 10 + \left(\frac{40 - 29}{22} \right) \times 5$$
$$= 12.5$$

1

$\frac{1}{2}$

Case Study – 2

37. Resident Welfare Association (RWA) of Gulmohar Society in Delhi, have installed three electric poles A, B and C in the society's common park. Despite these three poles, some parts of the park are still in the dark. So, RWA decides to have one more electric pole D in the park. The park can be modelled as a coordinate system given below.



On the basis of the above information, answer the following questions :

- (i) What is the position of the pole C ? 1
- (ii) What is the distance of the pole B from the corner O of the park ? 1
- (iii) (a) Find the position of the fourth pole D so that the four points A, B, C and D form a parallelogram ABCD. 2
- OR**
- (b) Find the distance between poles A and C. 2

Solution: (i) Position of the pole C(5, 4)

(ii) B(6, 6)

$$\therefore BO = \sqrt{(6-0)^2 + (6-0)^2} = \sqrt{36 + 36} = \sqrt{72} \text{ or } 6\sqrt{2}$$

(iii)(a) A(2, 7), B(6, 6), C(5, 4)

Let D(x, y)

· ABCD forms a parallelogram

\therefore Mid-point of AC = Mid-point of BD

$$\left(\frac{2+5}{2}, \frac{7+4}{2}\right) = \left(\frac{6+x}{2}, \frac{6+y}{2}\right)$$

$$\frac{7}{2} = \frac{6+x}{2} \Rightarrow x = 1$$

$$\frac{11}{2} = \frac{6+y}{2} \Rightarrow y = 5$$

Position of the fourth pole D is (1, 5)

OR

$$(iii)(b) AC = \sqrt{(5-2)^2 + (4-7)^2} = \sqrt{9 + 9}$$

$$= \sqrt{18} \text{ or } 3\sqrt{2}$$

Case Study – 3

38. Deepankar bought 3 notebooks and 2 pens for ₹ 80 and his friend Suryansh bought 4 notebooks and 3 pens for ₹ 110 from the school bookshop.



Based on the above information, answer the following questions.

- (i) If the price of one notebook be ₹ x and the price of one pen be ₹ y, write the given situation algebraically. 1
- (ii) (a) What is the price of one notebook ? 2
- OR**
- (b) What is the price of one pen ? 2
- (iii) What is the total amount to be paid by Suryansh, if he purchases 6 notebooks and 3 pens ? 1

Solution: (i) $3x + 2y = 80$ -----(1) $\frac{1}{2}$

$4x + 3y = 110$ -----(2) $\frac{1}{2}$

(ii) (a) Solving (1) and (2) to get $x=20$ 2

OR

- (b) Solving (1) and (2) to get $y=10$ 2
- (iii) Total amount paid = $6 \times 20 + 3 \times 10 = ₹ 150$ 1
-