



Series DA2AB/2

SET~2

रोल नं. Roll No.							

प्रश्न-पत्र कोड  
Q.P. Code **30/2/2**

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 :

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 23 हैं।  
Please check that this question paper contains 23 printed pages.
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 38 प्रश्न हैं।  
Please check that this question paper contains 38 questions.
- 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.
- 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.
- 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 (मानक)

**MATHEMATICS (Standard)**



निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80

30/2/2/DA2AB/21

**107 B**

Page 1

P.T.O.



**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।



### 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 number **1** to **18** are Multiple Choice Questions (MCQs) and question number **19** and **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, carrying **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** question 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** question 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

$20 \times 1 = 20$

इस खण्ड में 20 प्रश्न हैं तथा प्रत्येक प्रश्न का 1 अंक है।

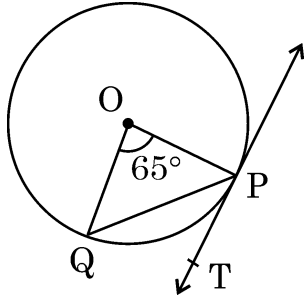
1. समांतर श्रेढ़ी (A.P.)  $-29, -26, -23, \dots, 61$  का कौन सा पद 16 है ?

1

- (A) 11वाँ (B) 16वाँ  
(C) 10वाँ (D) 31वाँ

2. दी गई आकृति में PT केंद्र O वाले वृत्त की एक स्पर्श-रेखा है। जीवा PQ वृत्त के केंद्र पर  $65^\circ$  का कोण अंतरित करती है।  $\angle QPT$  की माप है :

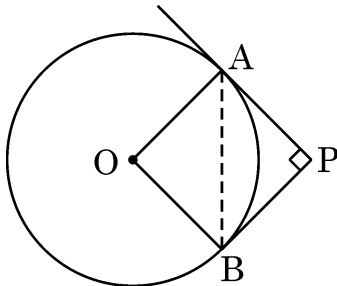
1



- (A)  $65^\circ$  (B)  $57.5^\circ$   
(C)  $67.5^\circ$  (D)  $32.5^\circ$

3. दी गई आकृति में, केंद्र O वाले वृत्त पर बिंदु P से परस्पर लंबवत स्पर्श-रेखाएँ PA और PB खींची गई हैं। यदि  $PA = 5 \text{ cm}$  है, तो AB की लंबाई है :

1



- (A) 5 cm (B)  $5\sqrt{2} \text{ cm}$   
(C)  $2\sqrt{5} \text{ cm}$  (D) 10 cm



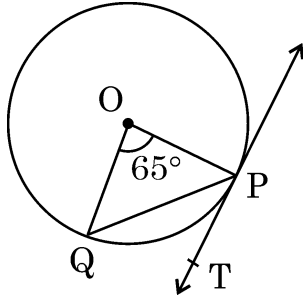
SECTION – A

$20 \times 1 = 20$

This section consists of 20 questions of 1 mark each.

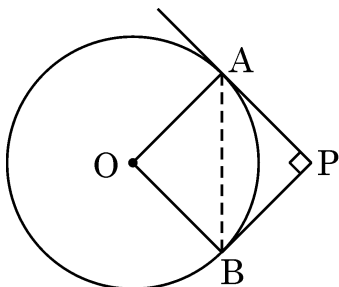
1. Which term of the A.P.  $-29, -26, -23, \dots, 61$  is 16 ? 1
- (A)  $11^{\text{th}}$  (B)  $16^{\text{th}}$   
(C)  $10^{\text{th}}$  (D)  $31^{\text{st}}$

2. In the given figure, PT is tangent to a circle with centre O. Chord PQ subtends an angle of  $65^\circ$  at the centre. The measure of  $\angle QPT$  is : 1



- (A)  $65^\circ$  (B)  $57.5^\circ$   
(C)  $67.5^\circ$  (D)  $32.5^\circ$

3. In the given figure, tangents PA and PB to the circle centred at O, from point P are perpendicular to each other. If  $PA = 5$  cm, then length of AB is equal to 1

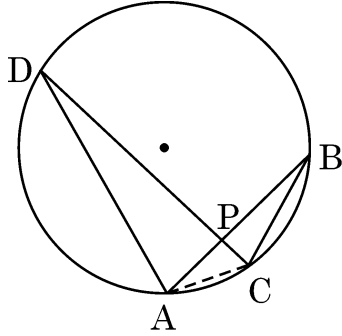


- (A) 5 cm (B)  $5\sqrt{2}$  cm  
(C)  $2\sqrt{5}$  cm (D) 10 cm



4. AB तथा CD एक वृत्त की दो जीवाएँ हैं जो P पर प्रतिच्छेद करती हैं। निम्न में से सही कथन चुनिए :

1



- (A)  $\triangle ADP \sim \triangle CBA$  (B)  $\triangle ADP \sim \triangle BPC$   
(C)  $\triangle ADP \sim \triangle BCP$  (D)  $\triangle ADP \sim \triangle CBP$

5. यदि किन्हीं आँकड़ों के प्रत्येक प्रेक्षण का मान 2 से बढ़ा दिया जाए, तो नए आँकड़ों का माध्यक

1

- (A) 2 से बढ़ जाएगा। (B)  $2n$  से बढ़ जाएगा।  
(C) वही रहेगा। (D) 2 से कम हो जाएगा।

6. यदि  $\alpha$  तथा  $\beta$  बहुपद  $2x^2 - 9x + 5$  के शून्यक हैं, तो  $\alpha^2 + \beta^2$  का मान है :

1

- (A)  $\frac{1}{4}$  (B)  $\frac{61}{4}$   
(C) 1 (D)  $\frac{71}{4}$

7. एक परीक्षा के बाद, अध्यापिका अपनी कक्षा के अधिकतम बच्चों द्वारा प्राप्तांक जानना चाहती है। उसे ज्ञात करना है प्राप्तांकों का

1

- (A) माध्यक (B) बहुलक  
(C) माध्य (D) परिसर

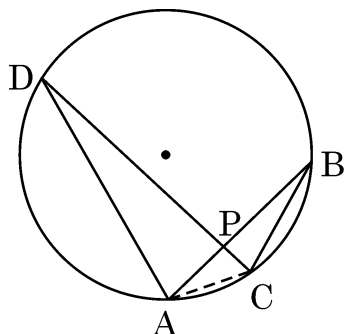
8.  $k$  का वह मान जिसके लिए समीकरण निकाय  $3x - y + 8 = 0$  तथा  $6x - ky + 16 = 0$  के अपरिमित रूप से अनन्त हल हैं, है

1

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



4. AB and CD are two chords of a circle intersecting at P. Choose the correct statement from the following : 1



- (A)  $\triangle ADP \sim \triangle CBA$  (B)  $\triangle ADP \sim \triangle BPC$   
(C)  $\triangle ADP \sim \triangle BCP$  (D)  $\triangle ADP \sim \triangle CBP$

5. If value of each observation in a data is increased by 2, then median of the new data 1

- (A) increases by 2 (B) increases by  $2n$   
(C) remains same (D) decreases by 2

6. If  $\alpha$  and  $\beta$  are zeroes of the polynomial  $2x^2 - 9x + 5$ , then value of  $\alpha^2 + \beta^2$  is 1

- (A)  $\frac{1}{4}$  (B)  $\frac{61}{4}$   
(C) 1 (D)  $\frac{71}{4}$

7. After an examination, a teacher wants to know the marks obtained by Maximum number of the students in her class. She requires to calculate \_\_\_\_\_ of marks. 1

- (A) median (B) mode  
(C) mean (D) range

8. The value of k for which the system of equations  $3x - y + 8 = 0$  and  $6x - ky + 16 = 0$  has infinitely many solutions, is 1

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



9. बिंदु P, बिंदुओं A(4, -5) तथा B(1, 2) को मिलाने वाले रेखाखण्ड को 5:2 के अनुपात में बाँटता है। बिंदु P के निर्देशांक हैं :

1

- (A)  $\left(\frac{5}{2}, \frac{-3}{2}\right)$  (B)  $\left(\frac{11}{7}, 0\right)$   
(C)  $\left(\frac{13}{7}, 0\right)$  (D)  $\left(0, \frac{13}{7}\right)$

10. एक बक्से में कार्ड हैं जिन पर 6 से 55 तक की संख्याएँ अंकित हैं। बक्से में से यादृच्छया एक कार्ड निकालने पर इस पर अंकित संख्या के एक पूर्ण वर्ग संख्या होने की प्रायिकता है :

1

- (A)  $\frac{7}{55}$  (B)  $\frac{7}{55}$   
(C)  $\frac{1}{10}$  (D)  $\frac{5}{49}$

11. यदि  $\sin \theta = \cos \theta$ , ( $0^\circ < \theta < 90^\circ$ ) है, तो  $(\sec \theta \cdot \sin \theta)$  का मान है :

1

- (A)  $\frac{1}{\sqrt{2}}$  (B)  $\sqrt{2}$   
(C) 1 (D) 0

12. दो पासे एक साथ उछाले गए। दोनों पासों पर आई संख्याओं का योग 10 से अधिक आने की प्रायिकता है :

1

- (A)  $\frac{1}{9}$  (B)  $\frac{1}{6}$   
(C)  $\frac{7}{12}$  (D)  $\frac{1}{12}$

13. k का वह मान जिसके लिए  $x = 2$  समीकरण  $5x^2 - 4x + (2 + k) = 0$  का एक हल है, है :

1

- (A) 10 (B) -10  
(C) 14 (D) -14





9. Point P divides the line segment joining the points A(4, -5) and B(1, 2) in the ratio 5:2. Co-ordinates of point P are 1

(A)  $\left(\frac{5}{2}, \frac{-3}{2}\right)$  (B)  $\left(\frac{11}{7}, 0\right)$   
(C)  $\left(\frac{13}{7}, 0\right)$  (D)  $\left(0, \frac{13}{7}\right)$

10. A box contains cards numbered 6 to 55. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square, is 1

(A)  $\frac{7}{50}$  (B)  $\frac{7}{55}$   
(C)  $\frac{1}{10}$  (D)  $\frac{5}{49}$

11. If  $\sin \theta = \cos \theta$ , ( $0^\circ < \theta < 90^\circ$ ), then value of  $(\sec \theta \cdot \sin \theta)$  is : 1

(A)  $\frac{1}{\sqrt{2}}$  (B)  $\sqrt{2}$   
(C) 1 (D) 0

12. Two dice are rolled together. The probability of getting the sum of the two numbers to be more than 10, is 1

(A)  $\frac{1}{9}$  (B)  $\frac{1}{6}$   
(C)  $\frac{7}{12}$  (D)  $\frac{1}{12}$

13. Value of k for which  $x = 2$  is a solution of the equation  $5x^2 - 4x + (2 + k) = 0$ , is 1

(A) 10 (B) -10  
(C) 14 (D) -14



14. दो समरूप त्रिभुजों ABC तथा PQR के परिमाप क्रमशः 56 cm तथा 48 cm हैं। PQ/AB बराबर है :

1

- (A)  $\frac{7}{8}$  (B)  $\frac{6}{7}$   
(C)  $\frac{7}{6}$  (D)  $\frac{8}{7}$

15. प्रथम 200 प्राकृत संख्याओं का योगफल है :

1

- (A) 2010 (B) 2000  
(C) 20100 (D) 21000

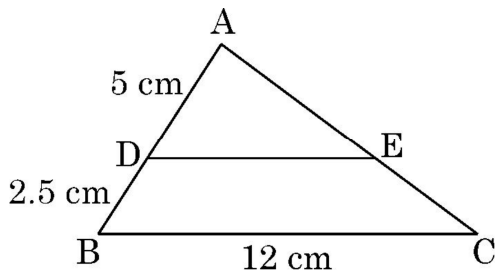
16. यदि  $HCF(2520, 6600) = 40$  और  $LCM(2520, 6600) = 252 \times k$  है, तो k का मान है :

1

- (A) 1650 (B) 1600  
(C) 165 (D) 1625

17. दी गई आकृति में  $\triangle ABC$  दिखाया गया है और  $DE \parallel BC$  है, यदि  $AD = 5$  cm,  $DB = 2.5$  cm तथा  $BC = 12$  cm है, तो DE बराबर है :

1



- (A) 10 cm (B) 6 cm  
(C) 8 cm (D) 7.5 cm

18. XOYZ एक आयत है जिसके शीर्ष  $X(-3, 0)$ ,  $O(0, 0)$ ,  $Y(0, 4)$  तथा  $Z(x, y)$  हैं। इसके प्रत्येक विकर्ण की लंबाई है :

1

- (A) 5 इकाई (B)  $\sqrt{5}$  इकाई  
(C)  $x^2 + y^2$  इकाई (D) 4 इकाई



14. The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. PQ/AB is equal to

1

- (A)  $\frac{7}{8}$  (B)  $\frac{6}{7}$   
(C)  $\frac{7}{6}$  (D)  $\frac{8}{7}$

15. The sum of first 200 natural numbers is

1

- (A) 2010 (B) 2000  
(C) 20100 (D) 21000

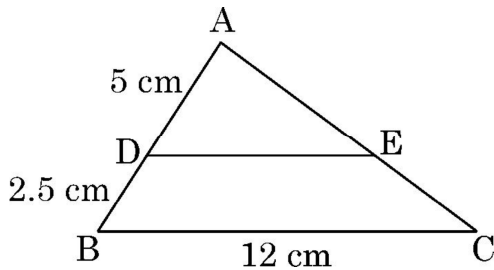
16. If the HCF (2520, 6600) = 40 and LCM (2520, 6600) =  $252 \times k$ , then the value of k is

1

- (A) 1650 (B) 1600  
(C) 165 (D) 1625

17. In the given figure  $\triangle ABC$  is shown. DE is parallel to BC. If AD = 5 cm, DB = 2.5 cm and BC = 12 cm, then DE is equal to

1



- (A) 10 cm (B) 6 cm  
(C) 8 cm (D) 7.5 cm

18. XOYZ is a rectangle with vertices X(-3, 0), O(0, 0), Y(0, 4) and Z(x, y). The length of its each diagonal is

1

- (A) 5 units (B)  $\sqrt{5}$  units  
(C)  $x^2 + y^2$  units (D) 4 units



निर्देश : प्रश्न 19 तथा 20 में प्रत्येक प्रश्न में एक अभिकथन (A) के बाद एक तर्क कथन (R) दिया है । निम्न में से सही विकल्प चुनिए :

- (A) दोनों अभिकथन (A) तथा तर्क कथन (R) सत्य हैं । तर्क कथन (R), अभिकथन (A) की व्याख्या करता है ।
- (B) दोनों अभिकथन (A) तथा तर्क कथन (R) सत्य हैं । तर्क कथन (R), अभिकथन (A) की व्याख्या नहीं करता है ।
- (C) अभिकथन (A) सत्य है परन्तु तर्क कथन (R) असत्य है ।
- (D) अभिकथन (A) असत्य है जबकि तर्क कथन (R) सत्य है ।

19. अभिकथन (A) : 10 cm भुजा वाले दो घनों को किनारे मिलाकर रखने से बने नये घनाभ का संपूर्ण पृष्ठीय क्षेत्रफल  $1200 \text{ cm}^2$  है ।

तर्क कथन (R) : घन, जिसकी भुजा 10 cm है, के प्रत्येक फलक का क्षेत्रफल  $100 \text{ cm}^2$  है ।

1

20. अभिकथन (A) : यदि  $\sin A = \frac{1}{3}$  ( $0^\circ < A < 90^\circ$ ) है, तो  $\cos A$  का मान  $\frac{2\sqrt{2}}{3}$  है ।

तर्क कथन (R) : सभी कोण  $\theta$  के लिए  $\sin^2 \theta + \cos^2 \theta = 1$ .

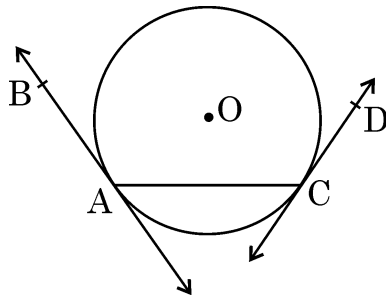
1

### खण्ड – ख

इस खण्ड में 5 प्रश्न हैं तथा प्रत्येक के 2 अंक हैं ।

21. दी गई आकृति में, AB तथा CD, केंद्र O वाले वृत्त की दो स्पर्श-रेखाएँ हैं । क्या  $\angle BAC = \angle DCA$  ? अपने उत्तर की पुष्टि कीजिए ।

2





**Directions :** In Question 19 and 20, **Assertion (A)** and **Reason (R)** are given. Select the correct option from the following :

- (A) Both Assertion (A) and Reason (R) are true. Reason (R) is the correct explanation of Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true. Reason (R) does not give correct explanation of (A).
- (C) Assertion (A) is true but Reason (R) is not true.
- (D) Assertion (A) is not true but Reason (R) is true.

19. **Assertion (A) :** Two cubes each of edge length 10 cm are joined together.

The total surface area of newly formed cuboid is  $1200 \text{ cm}^2$ .

**Reason (R) :** Area of each surface of a cube of side 10 cm is  $100 \text{ cm}^2$ .

1

20. **Assertion (A) :** If  $\sin A = \frac{1}{3}$  ( $0^\circ < A < 90^\circ$ ), then the value of  $\cos A$  is  $\frac{2\sqrt{2}}{3}$

**Reason (R) :** For every angle  $\theta$ ,  $\sin^2 \theta + \cos^2 \theta = 1$ .

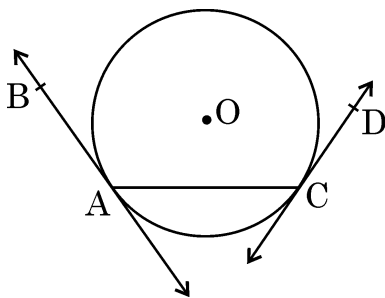
1

### SECTION – B

**In this section, there are 5 questions of 2 marks each.**

21. In the given figure, AB and CD are tangents to a circle centred at O. Is  $\angle BAC = \angle DCA$  ? Justify your answer.

2





22. (a) बिंदुओं  $(3, -5)$  तथा  $(-1, 6)$  को मिलाने वाला रेखाखण्ड रेखा  $y = x$  द्वारा किस अनुपात में विभाजित होता है ?

2

अथवा

- (b)  $A(3, 0)$ ,  $B(6, 4)$  तथा  $C(-1, 3)$  एक  $\triangle ABC$  के शीर्ष हैं। माधिका BE की लंबाई ज्ञात कीजिए।

2

23. व्याख्या कीजिए कि  $7 \times 11 \times 13 + 13$  और  $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$  भाज्य संख्याएँ क्यों हैं।

2

24. यदि एक  $\triangle ABC$  के शीर्ष  $A(-2, 4)$ ,  $B(4, 3)$  तथा  $C(1, -6)$  हैं, तो माधिका BD की लंबाई ज्ञात कीजिए।

2

25. (a)  $2 \sin^2 30^\circ \sec 60^\circ + \tan^2 60^\circ$  का मान ज्ञात कीजिए।

2

अथवा

- (b) यदि  $2 \sin (A + B) = \sqrt{3}$  तथा  $\cos (A - B) = 1$  है, तो कोण A तथा B की माप ज्ञात कीजिए,  $0 \leq A, B, (A + B) \leq 90^\circ$ .

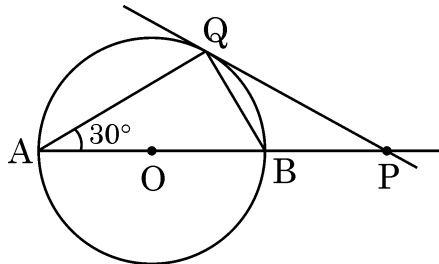
2

खण्ड – ग

इस खण्ड में 6 प्रश्न हैं तथा प्रत्येक के 3 अंक हैं।

26. (a) दी गई आकृति में, केंद्र O वाले वृत्त की एक स्पर्श-रेखा PQ है तथा  $\angle BAQ = 30^\circ$  है, तो दर्शाइए कि  $BP = BQ$ ।

3



अथवा



22. (a) In what ratio is the line segment joining the points  $(3, -5)$  and  $(-1, 6)$  divided by the line  $y = x$  ? 2

**OR**

- (b)  $A(3, 0)$ ,  $B(6, 4)$  and  $C(-1, 3)$  are vertices of a triangle  $ABC$ . Find length of its median  $BE$ . 2

23. Explain why  $7 \times 11 \times 13 + 13$  and  $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$  are composite numbers. 2

24. The vertices of a  $\Delta ABC$  are  $A(-2, 4)$ ,  $B(4, 3)$  and  $C(1, -6)$ . Find length of the median  $BD$ . 2

25. (a) Evaluate :  $2 \sin^2 30^\circ \sec 60^\circ + \tan^2 60^\circ$ . 2

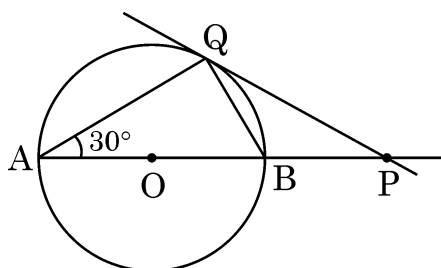
**OR**

- (b) If  $2 \sin (A + B) = \sqrt{3}$  and  $\cos (A - B) = 1$ , then find the measures of angles  $A$  and  $B$ .  $0 \leq A, B, (A + B) \leq 90^\circ$ . 2

### SECTION – C

**This section consists of 6 questions of 3 marks each.**

26. (a) In the given figure,  $PQ$  is tangent to a circle centred at  $O$  and  $\angle BAQ = 30^\circ$ ; show that  $BP = BQ$ . 3



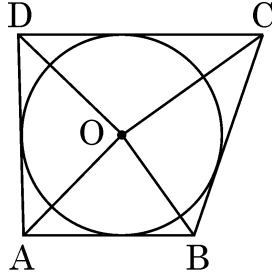
**OR**



- (b) दी गई आकृति में, AB, BC, CD तथा DA केंद्र O वाले वृत्त की स्पर्श-रेखाएँ हैं जो एक चतुर्भुज ABCD बनाती हैं। दर्शाइए कि

3

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



27. एक परीक्षा में 100 विद्यार्थियों के 50 में से प्राप्त अंक नीचे दिए गए हैं :

3

प्राप्तांक :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
विद्यार्थियों की संख्या :	12	23	34	25	6

विद्यार्थियों द्वारा प्राप्त अंकों का माध्य ज्ञात कीजिए।

28. तीन क्रमागत पूर्णांक इस प्रकार के हैं कि दूसरे पूर्णांक के वर्ग को अन्य दो के गुणनफल में जोड़ने पर 161 प्राप्त होता है। ये पूर्णांक ज्ञात कीजिए।

3

29. (a) यदि एक समांतर श्रेढ़ी (A.P.) के प्रथम  $m$  पदों का योगफल इसके प्रथम  $n$  पदों ( $m \neq n$ ) के योगफल के समान है, तो दर्शाइए कि इसके प्रथम  $(m + n)$  पदों का योगफल शून्य है।

3

अथवा

- (b) एक समांतर श्रेढ़ी के तीन क्रमागत पदों का योगफल 24 है तथा इनके वर्गों का योगफल 194 है। संख्याएँ ज्ञात कीजिए।

3

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

3

31. सिद्ध कीजिए :  $\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$ .

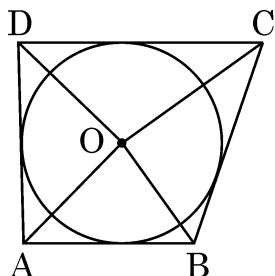
3





- (b) In the given figure, AB, BC, CD and DA are tangents to the circle with centre O forming a quadrilateral ABCD. 3

Show that  $\angle AOB + \angle COD = 180^\circ$



27. In a test, the marks obtained by 100 students (out of 50) are given below : 3

<b>Marks obtained :</b>	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
<b>Number of students :</b>	12	23	34	25	6

Find the mean marks of the students.

28. Three consecutive integers are such that sum of the square of second and product of other two is 161. Find the three integers. 3

29. (a) If the sum of first  $m$  terms of an A.P. is same as sum of its first  $n$  terms ( $m \neq n$ ), then show that the sum of its first  $(m + n)$  terms is zero. 3

**OR**

- (b) In an A.P., the sum of three consecutive terms is 24 and the sum of their squares is 194. Find the numbers. 3

30. Prove that  $\sqrt{5}$  is an irrational number. 3

31. Prove that  $\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$ . 3



खण्ड – घ

इस खण्ड में 4 प्रश्न हैं। प्रत्येक प्रश्न 5 अंकों का है।

32. भूमि पर स्थित एक बिंदु A से आकाश में उड़ रहे एक वायुयान का उन्नयन कोण  $60^\circ$  है। 30 से. की उड़ान के पश्चात् यह उन्नयन कोण  $30^\circ$  हो जाता है जबकि वायुयान एक निश्चित ऊँचाई  $3500\sqrt{3}$  m पर एकसमान चाल से उड़ रहा है। वायुयान की चाल ज्ञात कीजिए।

5

33. यदि एक आयत की लंबाई 5 cm घटा दी जाए तथा चौड़ाई 2 cm बढ़ा दी जाए तो आयत का क्षेत्रफल  $80 \text{ cm}^2$  कम हो जाता है। यदि लंबाई 10 cm बढ़ा दी जाए तथा चौड़ाई 5 cm घटा दी जाए तो आयत का क्षेत्रफल  $50 \text{ cm}^2$  बढ़ जाता है। आयत की लंबाई तथा चौड़ाई ज्ञात कीजिए।

5

34. (a) आलेखीय विधि द्वारा निम्न समीकरण निकाय का हल ज्ञात कीजिए :

5

$$3x + y + 4 = 0 \text{ तथा } 3x - y + 2 = 0$$

अथवा

- (b) तारा ने एक परीक्षा में 40 अंक प्राप्त किए जबकि प्रत्येक सही उत्तर के 3 अंक मिले तथा प्रत्येक गलत उत्तर का 1 अंक कटा था। यदि प्रत्येक सही उत्तर के 4 अंक मिलें तथा प्रत्येक गलत उत्तर के 2 अंक कटें, तो उसे 50 अंक मिलेंगे। यह मानते हुए कि उसने सभी प्रश्नों के उत्तर दिए हैं, तो कुल प्रश्नों की संख्या ज्ञात कीजिए।

5

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

5

अथवा

- (b) एक त्रिभुज ABC की भुजाएँ AB और AC तथा माधिका AD एक अन्य त्रिभुज PQR की भुजाओं PQ और PR तथा माधिका PM के क्रमशः समानुपाती हैं। दर्शाइए कि  $\triangle ABC \sim \triangle PQR$ ।

5



## SECTION – D

**This section consists of 4 questions of 5 marks each.**

32. The angle of elevation of an aircraft from a point A on the ground is  $60^\circ$ . After a flight of 30 seconds, the angle of elevation changes to  $30^\circ$ . The aircraft is flying at a constant height of  $3500\sqrt{3}$  m at a uniform speed. Find the speed of the aircraft. 5

33. If the length of a rectangle is reduced by 5 cm and its breadth is increased by 2 cm, then the area of the rectangle is reduced by  $80 \text{ cm}^2$ . However, if we increase the length by 10 cm and decrease the breadth by 5 cm, its area is increased by  $50 \text{ cm}^2$ . Find the length and breadth of the rectangle. 5

34. (a) Using graphical method, solve the following system of equations : 5

$$3x + y + 4 = 0 \text{ and } 3x - y + 2 = 0$$

**OR**

- (b) Tara scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each wrong answer, then Tara would have scored 50 marks. Assuming that Tara attempted all questions, find the total number of questions in the test. 5

35. (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. 5

**OR**

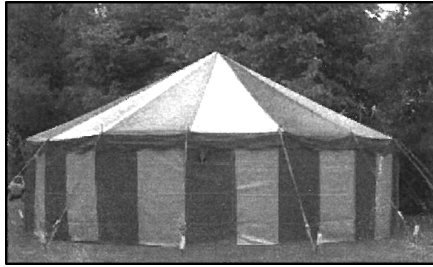
- (b) Sides AB and AC and median AD to  $\triangle ABC$  are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that  $\triangle ABC \sim \triangle PQR$ . 5



### खण्ड – ड

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

36. 'सर्कस' शब्द मूलतः सर्कल (वृत्त) के समान ही है। एक बंद गोलाकार क्षेत्र में मानव कौशल और पशु प्रशिक्षण सहित विभिन्न मनोरंजन कार्यक्रम भीड़ के सामने प्रस्तुत किए जाते हैं। एक सर्कस का टेंट 8 m की ऊँचाई तक बेलनाकार है तथा इसके ऊपर शंकवाकार है। आधार का व्यास 28 m है तथा टेंट की कुल ऊँचाई 18.5 m है।



उपरोक्त के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

- (i) शंकवाकार भाग की तिर्यक ऊँचाई ज्ञात कीजिए।
- (ii) टेंट के फर्श का क्षेत्रफल ज्ञात कीजिए।
- (iii) (a) टेंट बनाने में प्रयोग होने वाले कपड़े का क्षेत्रफल ज्ञात कीजिए।

1

1

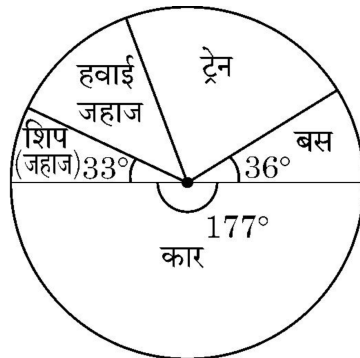
2

अथवा

- (iii) (b) इस खाली टेंट में हवा का कुल आयतन ज्ञात कीजिए।

2

37. छुट्टियों के दिनों के एक सर्वे में 120 व्यक्तियों से अपनी पिछली छुट्टियों में प्रयोग किए गए वाहन के प्रकार के बारे में पूछा गया। निम्न पाई-चार्ट इस सर्वे के परिणाम बताता है।



पाई-चार्ट के अवलोकन से निम्न प्रश्नों के उत्तर दीजिए :

- (i) यदि यादृच्छया एक व्यक्ति चुना गया, तो उसके बस अथवा शिप (जहाज) द्वारा यात्रा करने की प्रायिकता ज्ञात कीजिए।

1



## SECTION – E

This section consists of 3 case based questions of 4 marks each.

36. The word 'circus' has the same root as 'circle'. In a closed circular area, various entertainment acts including human skill and animal training are presented before the crowd.

A circus tent is cylindrical upto a height of 8 m and conical above it. The diameter of the base is 28 m and total height of tent is 18.5 m.



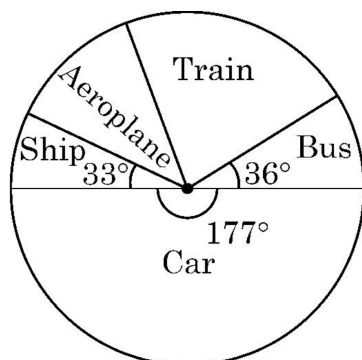
Based on the above, answer the following questions :

- |  |   |
|--|---|
| (i) Find slant height of the conical part.             | 1 |
| (ii) Determine the floor area of the tent.             | 1 |
| (iii) (a) Find area of the cloth used for making tent. | 2 |

OR

- |  |   |
|--|---|
| (iii) (b) Find total volume of air inside an empty tent. | 2 |
|--|---|

37. In a survey on holidays, 120 people were asked to state which type of transport they used on their last holiday. The following pie chart shows the results of the survey.



Observe the pie chart and answer the following questions :

- (i) If one person is selected at random, find the probability that he/she travelled by bus or ship.

1



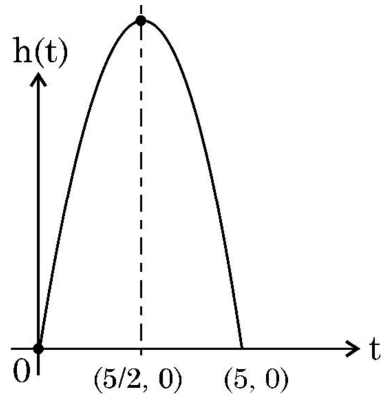
(ii) सबसे अधिक प्रचलित/पसंदीदा परिवहन का साधन कौन सा है और कितने लोगों ने इसका उपयोग किया ? 1

(iii) (a) एक यादृच्छया चुने गए व्यक्ति के ट्रेन द्वारा न जाने की प्रायिकता  $4/5$  है तो ज्ञात कीजिए कितने लोगों ने ट्रेन का प्रयोग किया ? 2

अथवा

(iii) (b) एक यादृच्छया चुने गए व्यक्ति द्वारा हवाई जहाज के प्रयोग करने की प्रायिकता  $7/60$  है, तो हवाई कम्पनी द्वारा अर्जित आय ज्ञात कीजिए, यदि उन्होंने प्रति व्यक्ति ₹ 5,000 लिए । 2

38. एक गेंद हवा में इस प्रकार फेंकी गई कि  $t$  सेकण्ड के बाद इसकी ऊँचाई, अपने आरम्भिक बिंदु से  $h$  मीटर है तथा बहुपद  $h = 25t - 5t^2$  द्वारा व्यक्त की गई है ।



बहुपद के ग्राफ का अवलोकन करके निम्न प्रश्नों के उत्तर दीजिए :

(i) दिए गए बहुपद के शून्यक लिखिए । 1

(ii) गेंद द्वारा प्राप्त की गई अधिकतम दूरी ज्ञात कीजिए । 1

(iii) (a) ऊपर फेंकने के कितने समय के पश्चात् गेंद 30 m की ऊँचाई पर होगी ? 2

अथवा

(iii) (b) जब गेंद की ऊँचाई 20 m है तो  $t$  के दो विभिन्न मान ज्ञात कीजिए । 2

\_\_\_\_\_



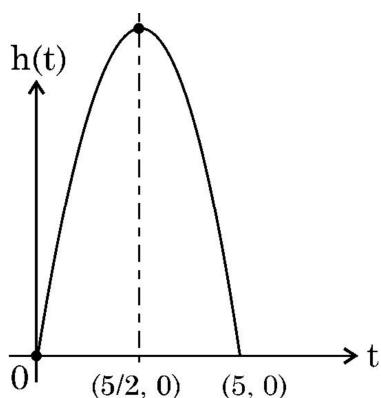
(ii) Which is most favourite mode of transport and how many people used it ? 1

(iii) (a) A person is selected at random. If the probability that he did not use train is  $\frac{4}{5}$ , find the number of people who used train. 2

OR

(iii) (b) The probability that randomly selected person used aeroplane is  $\frac{7}{60}$ . Find the revenue collected by air company at the rate of ₹ 5,000 per person. 2

38. A ball is thrown in the air so that  $t$  seconds after it is thrown, its height  $h$  metre above its starting point is given by the polynomial  $h = 25t - 5t^2$ .



Observe the graph of the polynomial and answer the following questions :

(i) Write zeroes of the given polynomial. 1

(ii) Find the maximum height achieved by ball. 1

(iii) (a) After throwing upward, how much time did the ball take to reach to the height of 30 m ? 2

OR

(iii) (b) Find the two different values of  $t$  when the height of the ball was 20 m. 2





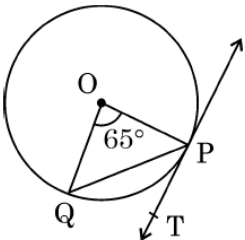
**Marking Scheme**  
**Strictly Confidential**  
**(For Internal and Restricted use only)**  
**Secondary School Examination, 2024**  
**MATHEMATICS PAPER CODE 30/2/2**

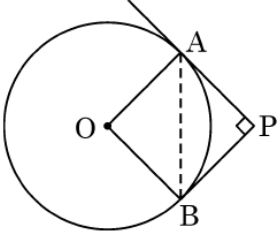
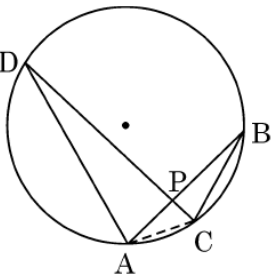
**General Instructions: -**

<b>1</b>	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.
<b>2</b>	<b>“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its’ 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.”</b>
<b>3</b>	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. <b>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.</b>
<b>4</b>	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.
<b>5</b>	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.
<b>6</b>	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. <b>This is most common mistake which evaluators are committing.</b>
<b>7</b>	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totalled up and written in the left-hand margin and encircled. This may be followed strictly.
<b>8</b>	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	<b><u>In Q1-Q20, if a candidate attempts the question more than once (without canceling the previous attempt), marks shall be awarded for the first attempt only and the other answer scored out with a note “Extra Question”.</u></b>
10	<b><u>In Q21-Q38, 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”.</u></b>
11	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
12	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.
13	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.
14	<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"> <li>● Leaving answer or part thereof unassessed in an answer book.</li> <li>● Giving more marks for an answer than assigned to it.</li> <li>● Wrong totalling of marks awarded on an answer.</li> <li>● Wrong transfer of marks from the inside pages of the answer book to the title page.</li> <li>● Wrong question wise totalling on the title page.</li> <li>● Wrong totalling of marks of the two columns on the title page.</li> <li>● Wrong grand total.</li> <li>● Marks in words and figures not tallying/not same.</li> <li>● Wrong transfer of marks from the answer book to online award list.</li> <li>● 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.)</li> <li>● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</li> </ul>
15	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.
16	Any un assessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
17	The Examiners should acquaint themselves with the guidelines given in the “ <b>Guidelines for spot Evaluation</b> ” before starting the actual evaluation.
18	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
19	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

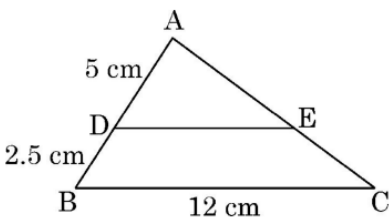
**MARKING SCHEME**  
**MATHEMATICS (Subject Code–041)**  
**(PAPER CODE: 30/2/2)**

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	<b>SECTION A</b> <b>This section consists of 20 questions of 1 mark each.</b>	
<b>1.</b>	Which term of the A.P. $-29, -26, -23, \dots, 61$ is 16 ? (A) 11 <sup>th</sup> (B) 16 <sup>th</sup> (C) 10 <sup>th</sup> (D) 31 <sup>st</sup>	
<b>Sol.</b>	(B) 16 <sup>th</sup>	<b>1</b>
<b>2.</b>	<p>In the given figure, PT is tangent to a circle with centre O. Chord PQ subtends an angle of <math>65^\circ</math> at the centre. The measure of <math>\angle QPT</math> is :</p>  <p>(A) <math>65^\circ</math> (B) <math>57.5^\circ</math>  (C) <math>67.5^\circ</math> (D) <math>32.5^\circ</math></p>	
<b>Sol.</b>	(D) $32.5^\circ$	<b>1</b>

3.	<p>In the given figure, tangents PA and PB to the circle centred at O, from point P are perpendicular to each other. If PA = 5 cm, then length of AB is equal to</p>  <p>(A) 5 cm (B) <math>5\sqrt{2}</math> cm (C) <math>2\sqrt{5}</math> cm (D) 10 cm</p>	
Sol.	(B) $5\sqrt{2}$ cm	1
4.	<p>AB and CD are two chords of a circle intersecting at P. Choose the correct statement from the following :</p>  <p>(A) <math>\triangle ADP \sim \triangle CBA</math> (B) <math>\triangle ADP \sim \triangle BPC</math> (C) <math>\triangle ADP \sim \triangle BCP</math> (D) <math>\triangle ADP \sim \triangle CBP</math></p>	
Sol.	(D) $\triangle ADP \sim \triangle CBP$	1
5.	<p>If value of each observation in a data is increased by 2, then median of the new data</p> <p>(A) increases by 2 (B) increases by <math>2n</math> (C) remains same (D) decreases by 2</p>	
Sol.	(A) increases by 2	1

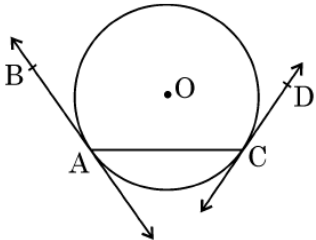
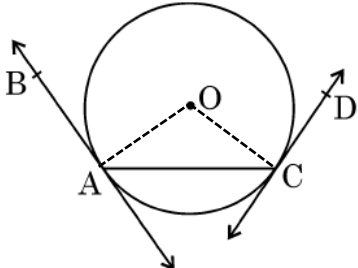
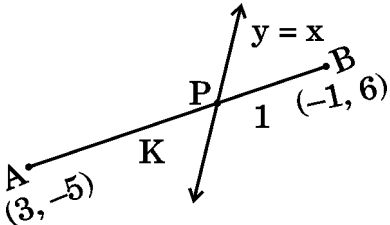
<b>6.</b>	<p>If <math>\alpha</math> and <math>\beta</math> are zeroes of the polynomial <math>2x^2 - 9x + 5</math>, then value of <math>\alpha^2 + \beta^2</math> is</p> <p>(A) <math>\frac{1}{4}</math> (B) <math>\frac{61}{4}</math></p> <p>(C) 1 (D) <math>\frac{71}{4}</math></p>	
<b>Sol.</b>	(B) $\frac{61}{4}$	<b>1</b>
<b>7.</b>	<p>After an examination, a teacher wants to know the marks obtained by maximum number of the students in her class. She requires to calculate _____ of marks.</p> <p>(A) median (B) mode</p> <p>(C) mean (D) range</p>	
<b>Sol.</b>	(B) mode	<b>1</b>
<b>8.</b>	<p>The value of k for which the system of equations <math>3x - y + 8 = 0</math> and <math>6x - ky + 16 = 0</math> has infinitely many solutions, is</p> <p>(A) -2 (B) 2</p> <p>(C) <math>\frac{1}{2}</math> (D) <math>-\frac{1}{2}</math></p>	
<b>Sol.</b>	(B) 2	<b>1</b>
<b>9.</b>	<p>Point P divides the line segment joining the points A(4, -5) and B(1, 2) in the ratio 5:2. Co-ordinates of point P are</p> <p>(A) <math>\left(\frac{5}{2}, \frac{-3}{2}\right)</math> (B) <math>\left(\frac{11}{7}, 0\right)</math></p> <p>(C) <math>\left(\frac{13}{7}, 0\right)</math> (D) <math>\left(0, \frac{13}{7}\right)</math></p>	
<b>Sol.</b>	(C) $\left(\frac{13}{7}, 0\right)$	<b>1</b>

<b>10.</b>	<p>A box contains cards numbered 6 to 55. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square, is</p> <p>(A) <math>\frac{7}{50}</math> (B) <math>\frac{7}{55}</math></p> <p>(C) <math>\frac{1}{10}</math> (D) <math>\frac{5}{49}</math></p>	
<b>Sol.</b>	(C) $\frac{1}{10}$	<b>1</b>
<b>11.</b>	<p>If <math>\sin \theta = \cos \theta</math>, (<math>0^\circ &lt; \theta &lt; 90^\circ</math>), then value of <math>(\sec \theta \cdot \sin \theta)</math> is :</p> <p>(A) <math>\frac{1}{\sqrt{2}}</math> (B) <math>\sqrt{2}</math></p> <p>(C) 1 (D) 0</p>	
<b>Sol.</b>	(C) 1	<b>1</b>
<b>12.</b>	<p>Two dice are rolled together. The probability of getting the sum of the two numbers to be more than 10, is</p> <p>(A) <math>\frac{1}{9}</math> (B) <math>\frac{1}{6}</math></p> <p>(C) <math>\frac{7}{12}</math> (D) <math>\frac{1}{12}</math></p>	
<b>Sol.</b>	(D) $\frac{1}{12}$	<b>1</b>
<b>13.</b>	<p>Value of k for which <math>x = 2</math> is a solution of the equation <math>5x^2 - 4x + (2 + k) = 0</math>, is</p> <p>(A) 10 (B) -10</p> <p>(C) 14 (D) -14</p>	
<b>Sol.</b>	(D) -14	<b>1</b>

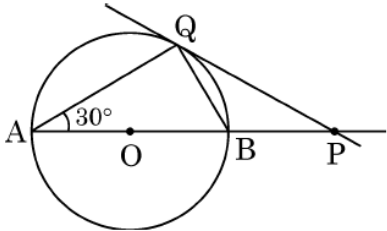
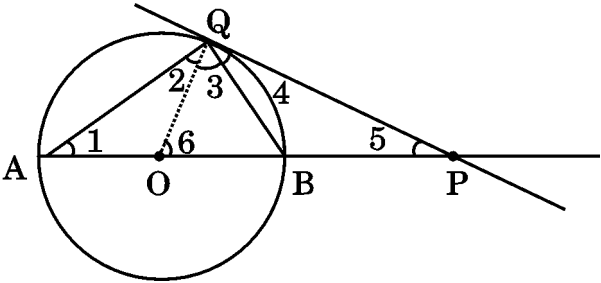
<b>14.</b>	<p>The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. PQ/AB is equal to</p> <p>(A) <math>\frac{7}{8}</math> (B) <math>\frac{6}{7}</math></p> <p>(C) <math>\frac{7}{6}</math> (D) <math>\frac{8}{7}</math></p>	
<b>Sol.</b>	(B) $\frac{6}{7}$	<b>1</b>
<b>15.</b>	<p>The sum of first 200 natural numbers is</p> <p>(A) 2010 (B) 2000</p> <p>(C) 20100 (D) 21000</p>	
<b>Sol.</b>	(C) 20100	<b>1</b>
<b>16.</b>	<p>If the HCF (2520, 6600) = 40 and LCM (2520, 6600) = <math>252 \times k</math>, then the value of k is</p> <p>(A) 1650 (B) 1600</p> <p>(C) 165 (D) 1625</p>	
<b>Sol.</b>	(A) 1650	<b>1</b>
<b>17.</b>	<p>In the given figure <math>\triangle ABC</math> is shown. DE is parallel to BC. If AD = 5 cm, DB = 2.5 cm and BC = 12 cm, then DE is equal to</p>  <p>(A) 10 cm (B) 6 cm</p> <p>(C) 8 cm (D) 7.5 cm</p>	
<b>Sol.</b>	(C) 8 cm	<b>1</b>

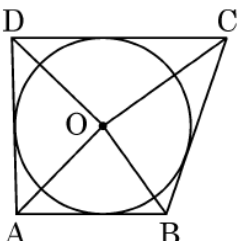
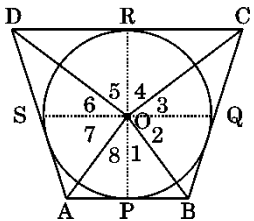
<b>18.</b>	XOYZ is a rectangle with vertices X(-3, 0), O(0, 0), Y(0, 4) and Z(x, y). The length of its each diagonal is (A) 5 units (B) $\sqrt{5}$ units (C) $x^2 + y^2$ units (D) 4 units	
<b>Sol.</b>	(A) 5 units	<b>1</b>
	<p><b>Directions :</b> In Question 19 and 20, Assertion (A) and Reason (R) are given. Select the correct option from the following :</p> <p>(A) Both Assertion (A) and Reason (R) are true. Reason (R) is the correct explanation of Assertion (A).</p> <p>(B) Both Assertion (A) and Reason (R) are true. Reason (R) does not give correct explanation of (A).</p> <p>(C) Assertion (A) is true but Reason (R) is not true.</p> <p>(D) Assertion (A) is not true but Reason (R) is true.</p>	
<b>19.</b>	<p><b>Assertion (A) :</b> Two cubes each of edge length 10 cm are joined together.</p> <p>The total surface area of newly formed cuboid is <math>1200 \text{ cm}^2</math>.</p> <p><b>Reason (R) :</b> Area of each surface of a cube of side 10 cm is <math>100 \text{ cm}^2</math>.</p>	
<b>Sol.</b>	(D) Assertion (A) is not true but Reason (R) is true.	<b>1</b>
<b>20.</b>	<p><b>Assertion (A) :</b> If <math>\sin A = \frac{1}{3}</math> (<math>0^\circ &lt; A &lt; 90^\circ</math>), then the value of <math>\cos A</math> is <math>\frac{2\sqrt{2}}{3}</math></p> <p><b>Reason (R) :</b> For every angle <math>\theta</math>, <math>\sin^2 \theta + \cos^2 \theta = 1</math>.</p>	
<b>Sol.</b>	(A) Both Assertion (A) and (R) are true. Reason (R) is the correct explanation of Assertion (A)	<b>1</b>
	<p style="text-align: center;"><b>SECTION B</b></p> <p style="text-align: center;"><b>In this section, there are 5 questions of 2 marks each.</b></p>	



21.	<p>In the given figure, AB and CD are tangents to a circle centred at O. Is <math>\angle BAC = \angle DCA</math> ? Justify your answer.</p> 	
Sol.	 <p>Construction: Join OA and OC  <math>OA = OC</math>  <math>\angle OAC = \angle OCA</math>  Also, <math>\angle OAB = \angle OCD</math>  <math>\Rightarrow \angle OAC + \angle OAB = \angle OCA + \angle OCD</math>  <math>\Rightarrow \angle BAC = \angle DCA</math></p>	<div>1/2</div> <div>1/2</div> <div>1/2</div> <div>1/2</div>
22(a).	<p>In what ratio is the line segment joining the points (3, -5) and (-1, 6) divided by the line <math>y = x</math> ?</p>	
Sol.	 <p>Let the required ratio be K:1  Coordinates of point P are <math>\left(\frac{-K+3}{K+1}, \frac{6K-5}{K+1}\right)</math>  Point P lies on line <math>y = x \Rightarrow \frac{-K+3}{K+1} = \frac{6K-5}{K+1}</math></p>	<div>1</div> <div>1/2</div>

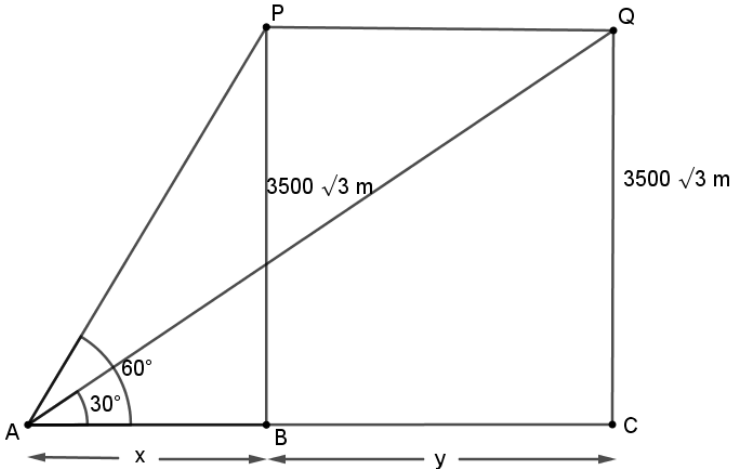
	<p>Solving, we get <math>K = \frac{8}{7}</math></p> <p><math>\therefore</math> Required ratio is 8: 7</p>	$\frac{1}{2}$
	<b>OR</b>	
<b>22(b).</b>	A(3, 0), B(6, 4) and C(-1, 3) are vertices of a triangle ABC. Find length of its median BE.	
<b>Sol.</b>	<p>Mid-point of AC is <math>E\left(1, \frac{3}{2}\right)</math></p> <p>Length of median BE</p> $= \sqrt{(6-1)^2 + \left(4-\frac{3}{2}\right)^2} = \sqrt{\frac{125}{4}} \text{ or } \frac{5\sqrt{5}}{2}$	<p><b>1</b></p> <p><b>1</b></p>
<b>23.</b>	Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.	
<b>Sol.</b>	<p><math>7 \times 11 \times 13 + 13 = 13 \times 78</math> or <math>2 \times 3 \times 13^2</math></p> <p>and <math>7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5 = 5 \times 1009</math></p> <p>Both numbers have two factors other than 1</p> <p><math>\therefore</math> both the numbers are composite</p>	<p><b>1</b></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
<b>24.</b>	The vertices of a $\triangle ABC$ are A(-2, 4), B(4, 3) and C(1, -6). Find length of the median BD.	
<b>Sol.</b>	<p>Mid-point of AC is <math>D\left(-\frac{1}{2}, -1\right)</math></p> <p>Length of median BD</p> $= \sqrt{\left(4+\frac{1}{2}\right)^2 + (3+1)^2} = \sqrt{\frac{145}{4}} \text{ or } \frac{\sqrt{145}}{2}$	<p><b>1</b></p> <p><b>1</b></p>

<b>25(a).</b>	Evaluate : $2 \sin^2 30^\circ \sec 60^\circ + \tan^2 60^\circ$ .	
<b>Sol.</b>	$2\sin^2 30^\circ \sec 60^\circ + \tan^2 60^\circ$ $= 2 \times \left(\frac{1}{2}\right)^2 \times 2 + (\sqrt{3})^2$ $= 4$	<b>1½</b> <b>½</b>
<b>OR</b>		
<b>25(b).</b>	If $2 \sin (A + B) = \sqrt{3}$ and $\cos (A - B) = 1$ , then find the measures of angles A and B. $0 \leq A, B, (A + B) \leq 90^\circ$ .	
<b>Sol.</b>	$\sin(A + B) = \frac{\sqrt{3}}{2} \Rightarrow A + B = 60^\circ \dots (1)$ $\cos(A - B) = 1 \Rightarrow A - B = 0^\circ \dots (2)$ <p>Solving (1) and (2), we get <math>A = B = 30^\circ</math></p>	<b>½</b> <b>½</b> <b>1</b>
<b>SECTION C</b> <b>This section consists of 6 questions of 3 marks each.</b>		
<b>26(a).</b>	<p>In the given figure, PQ is tangent to a circle centred at O and <math>\angle BAQ = 30^\circ</math>; show that <math>BP = BQ</math>.</p> 	
<b>Sol.</b>		

	<p>Join OQ</p> <p><math>OQ = OA</math></p> <p><math>\Rightarrow \angle 2 = 30^\circ</math></p> <p><math>\angle 3 = 90^\circ - 30^\circ = 60^\circ</math></p> <p><math>\angle 4 = 90^\circ - 60^\circ = 30^\circ</math></p> <p><math>\angle 6 = \angle 1 + \angle 2 = 60^\circ</math></p> <p>Hence <math>\angle 5 = 90^\circ - 60^\circ = 30^\circ = \angle 4</math></p> <p><math>\therefore BP = BQ</math></p>	$\frac{1}{2}$  $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	<b>OR</b>	
<b>26(b).</b>	<p>In the given figure, AB, BC, CD and DA are tangents to the circle with centre O forming a quadrilateral ABCD.</p> <p>Show that <math>\angle AOB + \angle COD = 180^\circ</math></p> 	
<b>Sol.</b>	 <p>Join OP, OQ, OR and OS</p> <p><math>\triangle POB \cong \triangle QOB</math></p> <p><math>\Rightarrow \angle 1 = \angle 2</math></p> <p>Similarly <math>\angle 3 = \angle 4, \angle 5 = \angle 6, \angle 7 = \angle 8</math></p> <p>Now, <math>\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360^\circ</math></p> <p><math>\Rightarrow 2(\angle 1 + \angle 8 + \angle 4 + \angle 5) = 360^\circ</math></p>	$\frac{1}{2}$  <b>1</b>  $\frac{1}{2}$ $\frac{1}{2}$

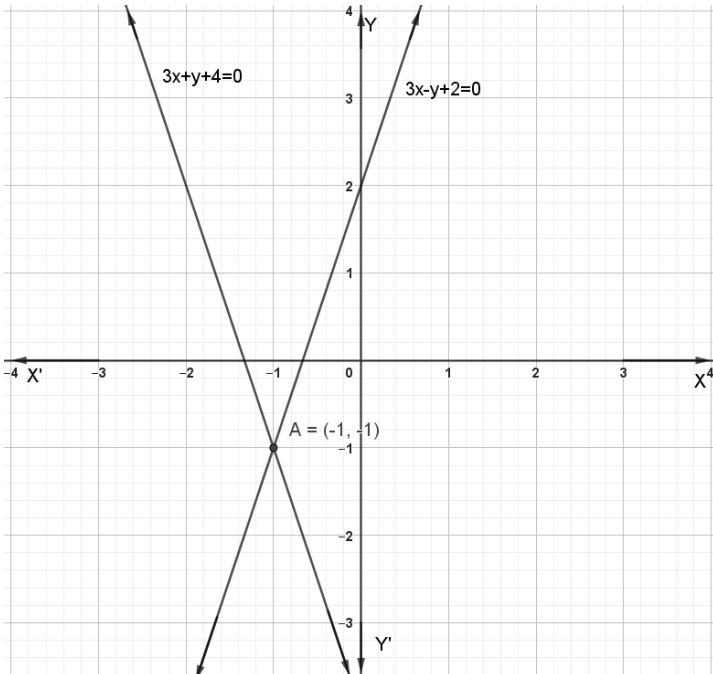
	$\therefore \angle AOB + \angle COD = 180^\circ$	$\frac{1}{2}$																												
27.	<p>In a test, the marks obtained by 100 students (out of 50) are given below :</p> <table><tr><td>Marks obtained :</td><td>0 – 10</td><td>10 – 20</td><td>20 – 30</td><td>30 – 40</td><td>40 – 50</td></tr><tr><td>Number of students :</td><td>12</td><td>23</td><td>34</td><td>25</td><td>6</td></tr></table> <p>Find the mean marks of the students.</p>	Marks obtained :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	Number of students :	12	23	34	25	6																	
Marks obtained :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50																									
Number of students :	12	23	34	25	6																									
Sol.	<table><tr><td>Marks Obtained</td><td>Number of students (<math>f_i</math>)</td><td><math>x_i</math></td><td><math>f_i x_i</math></td></tr><tr><td>0 – 10</td><td>12</td><td>5</td><td>60</td></tr><tr><td>10 – 20</td><td>23</td><td>15</td><td>345</td></tr><tr><td>20 – 30</td><td>34</td><td>25</td><td>850</td></tr><tr><td>30 – 40</td><td>25</td><td>35</td><td>875</td></tr><tr><td>40 – 50</td><td>6</td><td>45</td><td>270</td></tr><tr><td>Total</td><td>100</td><td></td><td>2400</td></tr></table> <p>Mean = <math>\frac{2400}{100}</math> = 24</p>	Marks Obtained	Number of students ( $f_i$ )	$x_i$	$f_i x_i$	0 – 10	12	5	60	10 – 20	23	15	345	20 – 30	34	25	850	30 – 40	25	35	875	40 – 50	6	45	270	Total	100		2400	<p><math>1\frac{1}{2}</math> marks for correct table</p> <p>1</p> <p><math>\frac{1}{2}</math></p>
Marks Obtained	Number of students ( $f_i$ )	$x_i$	$f_i x_i$																											
0 – 10	12	5	60																											
10 – 20	23	15	345																											
20 – 30	34	25	850																											
30 – 40	25	35	875																											
40 – 50	6	45	270																											
Total	100		2400																											
28.	Three consecutive integers are such that sum of the square of second and product of other two is 161. Find the three integers.																													
Sol.	Let the three numbers be x, x+1 and x+2 $\Rightarrow (x + 1)^2 + x(x + 2) = 161$ $\Rightarrow x^2 + 2x - 80 = 0$ $\Rightarrow (x + 10)(x - 8) = 0$ $\therefore x = 8$ or $-10$ So, the numbers are 8, 9, 10 or -10, -9, -8	<p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>																												

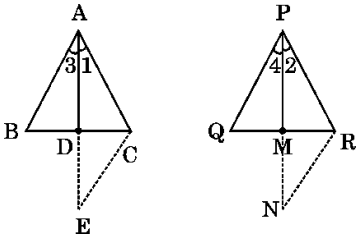
<b>29(a).</b>	If the sum of first $m$ terms of an A.P. is same as sum of its first $n$ terms ( $m \neq n$ ), then show that the sum of its first $(m + n)$ terms is zero.	
<b>Sol.</b>	$S_m = S_n$ $\Rightarrow \frac{m}{2} [2a + (m - 1)d] = \frac{n}{2} [2a + (n - 1)d]$ $\Rightarrow 2a(m - n) = d(n^2 - m^2) - d(n - m)$ $\Rightarrow 2a = -d(m + n - 1)$ or $2a + (m + n - 1)d = 0$ i.e., $S_{m+n} = \frac{m+n}{2} [2a + (m + n - 1)d] = 0$	<b>1</b> <b>1</b>  $\frac{1}{2}$ $\frac{1}{2}$
<b>OR</b>		
<b>29(b).</b>	In an A.P., the sum of three consecutive terms is 24 and the sum of their squares is 194. Find the numbers.	
<b>Sol.</b>	Let the numbers be $a - d, a, a + d$ $\therefore a - d + a + a + d = 24$ $\Rightarrow a = 8$ Also, $(a - d)^2 + a^2 + (a + d)^2 = 194$ $\Rightarrow (8 - d)^2 + 8^2 + (8 + d)^2 = 194$ $\Rightarrow d^2 = 1 \Rightarrow d = \pm 1$ $\therefore$ Numbers are 7, 8, 9 or 9, 8, 7	$\frac{1}{2}$ $\frac{1}{2}$   <b>1</b> $\frac{1}{2}$ $\frac{1}{2}$
<b>30.</b>	Prove that $\sqrt{5}$ is an irrational number.	
<b>Sol.</b>	Let $\sqrt{5}$ be a rational number. $\therefore \sqrt{5} = \frac{p}{q}$ , where $q \neq 0$ and let $p$ & $q$ be co-prime. $5q^2 = p^2 \Rightarrow p^2$ is divisible by 5 $\Rightarrow p$ is divisible by 5 ----- (i) $\Rightarrow p = 5a$ , where 'a' is some integer $25a^2 = 5q^2 \Rightarrow q^2 = 5a^2 \Rightarrow q^2$ is divisible by 5 $\Rightarrow q$ is divisible by 5 ----- (ii) (i) and (ii) leads to contradiction as 'p' and 'q' are co-prime.	$\frac{1}{2}$  <b>1</b>  <b>1</b> $\frac{1}{2}$


<b>31.</b>	Prove that $\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$ .	
<b>Sol.</b>	$\begin{aligned} \text{LHS} &= \sin^6 \theta + \cos^6 \theta \\ &= (\sin^2 \theta)^3 + (\cos^2 \theta)^3 \\ &= (\sin^2 \theta + \cos^2 \theta)[(\sin^2 \theta)^2 + (\cos^2 \theta)^2 - \sin^2 \theta \cos^2 \theta] \\ &= \sin^4 \theta + \cos^4 \theta - \sin^2 \theta \cos^2 \theta \\ \\ &= (\sin^2 \theta + \cos^2 \theta)^2 - 2\sin^2 \theta \cos^2 \theta - \sin^2 \theta \cos^2 \theta \\ &= 1 - 3 \sin^2 \theta \cos^2 \theta \\ &= \text{RHS} \end{aligned}$	$\frac{1}{2}$  <b>1</b>  <b>1</b> $\frac{1}{2}$
	<b>SECTION D</b> <b>This section consists of 4 questions of 5 marks each.</b>	
<b>32.</b>	The angle of elevation of an aircraft from a point A on the ground is $60^\circ$ . After a flight of 30 seconds, the angle of elevation changes to $30^\circ$ . The aircraft is flying at a constant height of $3500\sqrt{3}$ m at a uniform speed. Find the speed of the aircraft.	
<b>Sol.</b>	 <p>Let P and Q be the positions of aircraft at two different times.</p>	<b>1 mark for correct figure</b>

	$\tan 60^\circ = \sqrt{3} = \frac{3500\sqrt{3}}{x}$ $\Rightarrow x = 3500 \text{ m ... (i)}$ $\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{3500\sqrt{3}}{x+y} \Rightarrow x+y = 10500$ <p>Using (i), we get <math>y = 7000</math></p> $\therefore \text{Speed of aircraft} = \frac{7000}{30} = \frac{700}{3} \text{ or } 233.3 \text{ m/s approx.}$	<p><b>1</b></p> <p><math>\frac{1}{2}</math></p> <p><b>1</b></p> <p><math>\frac{1}{2}</math></p> <p><b>1</b></p>
<b>33.</b>	If the length of a rectangle is reduced by 5 cm and its breadth is increased by 2 cm, then the area of the rectangle is reduced by 80 cm <sup>2</sup> . However, if we increase the length by 10 cm and decrease the breadth by 5 cm, its area is increased by 50 cm <sup>2</sup> . Find the length and breadth of the rectangle.	
<b>Sol.</b>	<p>Let the length of rectangle be x cm and the breadth be y cm</p> <p>Area of rectangle = xy</p> $(x-5)(y+2) = xy - 80 \Rightarrow 2x - 5y + 70 = 0$ $(x+10)(y-5) = xy + 50 \Rightarrow -5x + 10y - 100 = 0$ <p>Solving the two equations, we get</p> <p><math>x = 40</math> and <math>y = 30</math></p> <p><math>\therefore</math> Length of rectangle = 40 cm and Breadth of rectangle = 30 cm</p>	<p><math>\frac{1}{2}</math></p> <p><b>1½</b></p> <p><b>1½</b></p> <p><b>1+½</b></p>



34(a).	Using graphical method, solve the following system of equations : $3x + y + 4 = 0$ and $3x - y + 2 = 0$	
Sol.	 <p>Correct solution <math>x = -1, y = -1</math></p>	<p><b>2 marks for each correct line</b></p> <p><b>1</b></p>
	<b>OR</b>	
34(b).	Tara scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each wrong answer, then Tara would have scored 50 marks. Assuming that Tara attempted all questions, find the total number of questions in the test.	
Sol.	Let number of correct answers be $x$ and number of incorrect answers be $y$	

	$3x - y = 40$ $4x - 2y = 50$ Solving, we get $x = 15, y = 5$ $\therefore$ Total number of questions = 20	$1\frac{1}{2}$ $1\frac{1}{2}$ 1 1
<b>35(a).</b>	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.	
<b>Sol.</b>	Correct Given, to prove, figure, construction Correct proof	$\frac{1}{2} \times 4 = 2$ 3
<b>OR</b>		
<b>35(b).</b>	Sides AB and AC and median AD to $\triangle ABC$ are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\triangle ABC \sim \triangle PQR$ .	
<b>Sol.</b>	<div style="text-align: center;">  </div> <p style="text-align: right;">Correct figure</p> <p>Produce AD to E such that <math>AD = DE</math> and join EC  Produce PM to N such that <math>PM = MN</math> and join NR  <math>\triangle ADB \cong \triangle EDC</math>  <math>\therefore AB = EC</math></p> <p>Similarly, <math>PQ = NR</math>  Since, <math>\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM}</math>  <math>\Rightarrow \frac{EC}{NR} = \frac{AC}{PR} = \frac{\frac{AE}{2}}{\frac{PN}{2}}</math>  <math>\therefore \triangle AEC \sim \triangle PNR</math>  <math>\Rightarrow \angle 1 = \angle 2</math>  Similarly, <math>\angle 3 = \angle 4</math></p>	1 $\frac{1}{2}$ 1  1 $\frac{1}{2}$

	<p>Hence <math>\angle 1 + \angle 3 = \angle 2 + \angle 4</math> or <math>\angle A = \angle P</math></p> <p>Also, <math>\frac{AB}{PQ} = \frac{AC}{PR}</math></p> <p><math>\therefore \triangle ABC \sim \triangle PQR</math></p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
	<p style="text-align: center;"><b>SECTION E</b></p> <p><b>This section comprises of 3 case-study based questions of 4 marks each.</b></p>	
36.	<p>The word 'circus' has the same root as 'circle'. In a closed circular area, various entertainment acts including human skill and animal training are presented before the crowd.</p> <p>A circus tent is cylindrical upto a height of 8 m and conical above it. The diameter of the base is 28 m and total height of tent is 18.5 m.</p>  <p>Based on the above, answer the following questions :</p> <p>(i) Find slant height of the conical part. <span style="float: right;">1</span></p> <p>(ii) Determine the floor area of the tent. <span style="float: right;">1</span></p> <p>(iii) (a) Find area of the cloth used for making tent. <span style="float: right;">2</span></p> <p style="text-align: center;"><b>OR</b></p> <p>(iii) (b) Find total volume of air inside an empty tent. <span style="float: right;">2</span></p>	
Sol.	<p>(i) Height of conical part = <math>18.5 - 8 = 10.5</math> m</p> <p>Radius of conical part = 14 m</p> <p>Slant height = <math>\sqrt{(10.5)^2 + (14)^2} = 17.5</math> m</p> <p>(ii) Floor area = <math>\frac{22}{7} \times 14 \times 14 = 616 \text{ m}^2</math> <span style="float: right;">1</span></p> <p>(iii) (a) Area of cloth used <span style="float: right;">1</span></p> <p style="padding-left: 40px;"><math>= 2 \times \frac{22}{7} \times 14 \times 8 + \frac{22}{7} \times 14 \times 17.5</math></p> <p style="padding-left: 40px;"><math>= 1474 \text{ m}^2</math> <span style="float: right;">1</span></p> <p style="text-align: center;"><b>OR</b></p> <p>(iii) (b) Volume of air inside the tent</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>

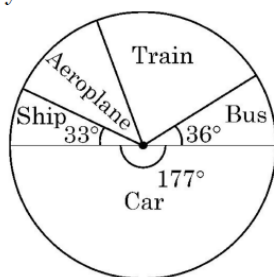
$$= \frac{22}{7} \times 14 \times 14 \times 8 + \frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times 10.5$$

$$= 7084 \text{ m}^3$$

1  
1

37.

In a survey on holidays, 120 people were asked to state which type of transport they used on their last holiday. The following pie chart shows the results of the survey.



Observe the pie chart and answer the following questions :

- (i) If one person is selected at random, find the probability that he/she travelled by bus or ship. 1
- (ii) Which is most favourite mode of transport and how many people used it ? 1
- (iii) (a) A person is selected at random. If the probability that he did not use train is  $\frac{4}{5}$ , find the number of people who used train. 2
- OR**
- (iii) (b) The probability that randomly selected person used aeroplane is  $\frac{7}{60}$ . Find the revenue collected by air company at the rate of ₹ 5,000 per person. 2

Sol.

(i)  $P(\text{travelling by bus or ship}) = \frac{36+33}{360} = \frac{69}{360} \text{ or } \frac{23}{120}$

(ii) Car

Number of people who used car =  $\frac{177}{360} \times 120 = 59$

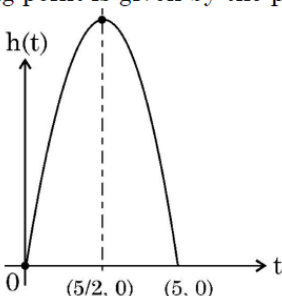
(iii) (a)  $P(\text{person used train}) = 1 - \frac{4}{5} = \frac{1}{5}$

$\therefore$  Number of people who used train =  $\frac{120}{5} = 24$

**OR**

(iii) (b) Number of people who used aeroplane =  $\frac{7}{60} \times 120 = 14$

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

	$\therefore$ Revenue generated = $14 \times 5000 = ₹ 70,000$	<b>1</b>
<b>38.</b>	<p>A ball is thrown in the air so that <math>t</math> seconds after it is thrown, its height <math>h</math> metre above its starting point is given by the polynomial <math>h = 25t - 5t^2</math>.</p>  <p>Observe the graph of the polynomial and answer the following questions :</p> <p>(i) Write zeroes of the given polynomial. <b>1</b></p> <p>(ii) Find the maximum height achieved by ball. <b>1</b></p> <p>(iii) (a) After throwing upward, how much time did the ball take to reach to the height of 30 m ? <b>2</b></p> <p style="text-align: center;"><b>OR</b></p> <p>(iii) (b) Find the two different values of <math>t</math> when the height of the ball was 20 m. <b>2</b></p>	
<b>Sol.</b>	<p>(i) Zeroes of the polynomial are 0 and 5</p> <p>(ii) Maximum height achieved by ball</p> $= 25 \times \frac{5}{2} - 5 \times \left(\frac{5}{2}\right)^2$ $= \frac{125}{4} \text{ or } 31.25 \text{ m}$ <p>(iii) (a) <math>-5t^2 + 25t = 30</math></p> $\Rightarrow t^2 - 5t + 6 = 0$ $\Rightarrow (t - 2)(t - 3) = 0$ $t \neq 3, \therefore t = 2$ <p style="text-align: center;"><b>OR</b></p> <p>(iii) (b) <math>-5t^2 + 25t = 20</math></p> $\Rightarrow t^2 - 5t + 4 = 0$ $\Rightarrow (t - 4)(t - 1) = 0$ $\Rightarrow t = 4, 1$	<p><b>1</b></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>

