रोल नं.
Roll No.

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 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

सामान्य निर्देश :

निम्नलिखित निर्देशों को बहुत सावधानी से पढ़िए और उनका सख़्ती 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 $\pi = \dfrac{22}{7}$ लीजिए, यदि अन्यथा न दिया गया हो ।

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

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 $\pi = \dfrac{22}{7}$ wherever required, if not stated.
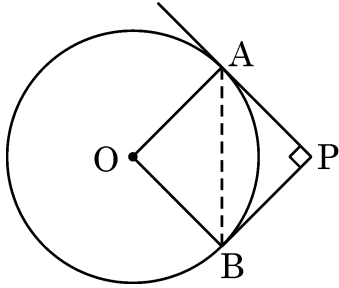
 *(x) Use of calculator is **NOT** allowed.*

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

1. बिंदुओं $(a \cos \theta, -a \sin \theta)$ तथा $(a \sin \theta, a \cos \theta)$ के बीच की दूरी है : **1**

   (A)   a   (B) $a\sqrt{2}$

   (C)   0   (D)   2a

2. 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 cm है, तो AB की लंबाई है : **1**

   (A)   5 cm   (B) $5\sqrt{2}$ cm

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

3. समांतर श्रेढ़ी (A.P.) –29, –26, –23, ..., 61 का कौन सा पद 16 है ? **1**

   (A)   11वाँ   (B)   16वाँ

   (C)   10वाँ   (D)   31वाँ

4. 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) $\dfrac{7}{50}$ (B) $\dfrac{7}{55}$

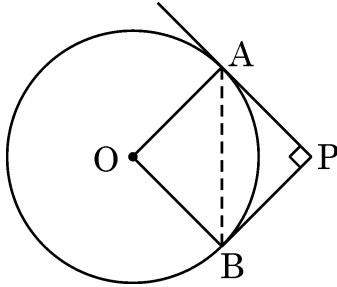   (C) $\dfrac{1}{10}$ (D) $\dfrac{5}{49}$

SECTION – A

20 × 1 = 20

This section consists of 20 questions of 1 mark each.

1. The distance between the points $(a \cos \theta, - a \sin \theta)$ and $(a \sin \theta, a \cos \theta)$ is   **1**

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

2. 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**
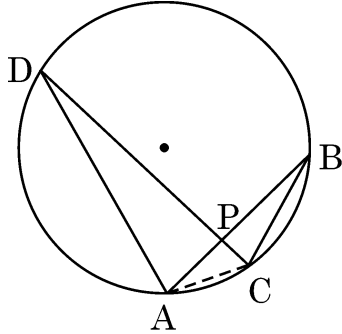

   (A) 5 cm
   (B) $5\sqrt{2}$ cm
   (C) $2\sqrt{5}$ cm
   (D) 10 cm

3. Which term of the A.P. –29, –26, –23, ..., 61 is 16 ?   **1**

   (A) 11th
   (B) 16th
   (C) 10th
   (D) 31st

4. 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) $\dfrac{7}{50}$
   (B) $\dfrac{7}{55}$

   (C) $\dfrac{1}{10}$
   (D) $\dfrac{5}{49}$

5. 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) $\triangle ADP \sim \triangle CBP$

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

है : **1**

(A) $\dfrac{1}{9}$ (B) $\dfrac{1}{6}$

(C) $\dfrac{7}{12}$ (D) $\dfrac{1}{12}$

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. द्विघात समीकरण $4x^2 - 5x + 4 = 0$ के मूल **1**

(A) अपरिमेय हैं ।   (B) परिमेय तथा भिन्न हैं ।

(C) वास्तविक नहीं हैं ।   (D) परिमेय तथा समान हैं ।
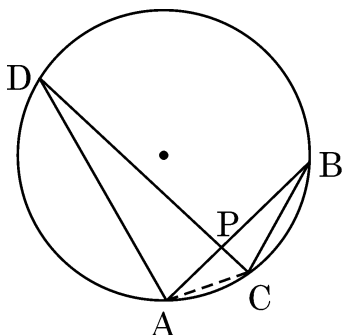
9. समांतर श्रेढ़ी जिसमें $a_{20} - a_{15} = 20$ है, का सार्व अंतर है : **1**

(A) 4   (B) 5

(C) 4d   (D) 5d

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

(A) ΔADP ~ ΔCBA   (B) ΔADP ~ ΔBPC

(C) ΔADP ~ ΔBCP   (D) ΔADP ~ ΔCBP

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

(A) $\dfrac{1}{9}$ (B) $\dfrac{1}{6}$

(C) $\dfrac{7}{12}$ (D) $\dfrac{1}{12}$

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 roots of the quadratic equation $4x^2 - 5x + 4 = 0$ are **1**

(A) irrational   (B) rational and distinct

(C) not real   (D) rational and equal

9. The common difference of an A.P. in which $a_{20} - a_{15} = 20$, is **1**

(A) 4   (B) 5

(C) 4d   (D) 5d

10. 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 ।

11. दो समरूप त्रिभुजों ABC तथा PQR के परिमाप क्रमश: 56 cm तथा 48 cm हैं । PQ/AB बराबर
    है :   1

    (A) $\dfrac{7}{8}$ (B) $\dfrac{6}{7}$

    (C) $\dfrac{7}{6}$ (D) $\dfrac{8}{7}$

12. यदि α तथा β, $(\alpha > \beta)$, बहुपद $-x^2 + 8x + 9$ के शून्यक हैं, तो $(\alpha - \beta)$ का मान है :   1

    (A)   –10   (B)   10

    (C)   ±10   (D)   8

13. 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) $\dfrac{1}{2}$ (D) $-\dfrac{1}{2}$

14. यदि $\sin \theta = \cos \theta$, $(0° < \theta < 90°)$ है, तो $(\sec \theta \cdot \sin \theta)$ का मान है :   1

    (A) $\dfrac{1}{\sqrt{2}}$ (B) $\sqrt{2}$

    (C)   1   (D)   0

10. 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

11. The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. PQ/AB is equal to 1

(A) $\dfrac{7}{8}$ (B) $\dfrac{6}{7}$

(C) $\dfrac{7}{6}$ (D) $\dfrac{8}{7}$

12. If α and β ($\alpha > \beta$) are the zeroes of the polynomial $-x^2 + 8x + 9$, then $(\alpha - \beta)$ is equal to 1

(A) -10 (B) 10

(C) ± 10 (D) 8

13. 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) $\dfrac{1}{2}$ (D) $-\dfrac{1}{2}$

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

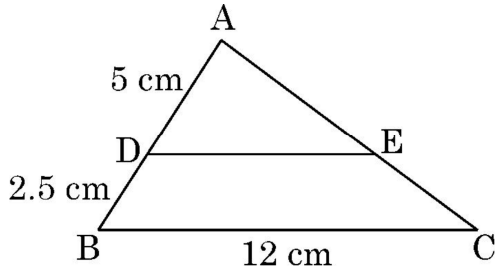(A) $\dfrac{1}{\sqrt{2}}$ (B) $\sqrt{2}$

(C) 1   (D) 0

15. 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) $\left(\dfrac{5}{2}, \dfrac{-3}{2}\right)$

(B) $\left(\dfrac{11}{7}, 0\right)$

(C) $\left(\dfrac{13}{7}, 0\right)$

(D) $\left(0, \dfrac{13}{7}\right)$

16. दी गई आकृति में ΔABC दिखाया गया है और DE ∥ BC है, यदि AD = 5 cm, DB = 2.5 cm तथा BC = 12 cm है, तो DE बराबर है : 1

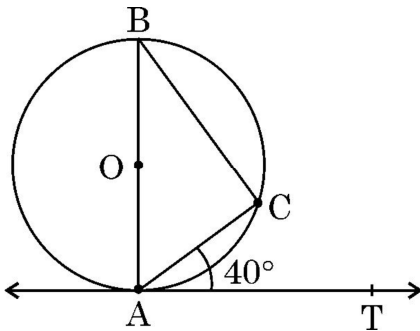(A) 10 cm   (B) 6 cm

(C) 8 cm   (D) 7.5 cm

17. यदि HCF (2520, 6600) = 40 और LCM (2520, 6600) = 252 × k है, तो k का मान है : 1

(A) 1650   (B) 1600

(C) 165   (D) 1625

18. दी गई आकृति में O केंद्र वाले वृत्त पर स्पर्श-रेखा AT है । यदि ∠CAT = 40° है, तो ∠CBA की माप है : 1

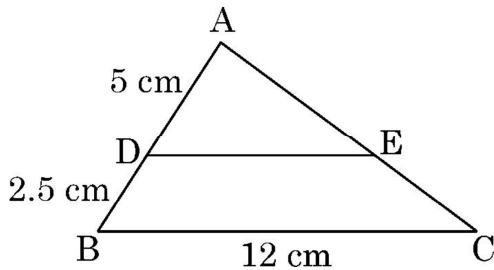
(A) 70°   (B) 50°

(C) 65°   (D) 40°

15. 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) $\left(\dfrac{5}{2}, \dfrac{-3}{2}\right)$ (B) $\left(\dfrac{11}{7}, 0\right)$

(C) $\left(\dfrac{13}{7}, 0\right)$ (D) $\left(0, \dfrac{13}{7}\right)$

16. In the given figure ΔABC 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
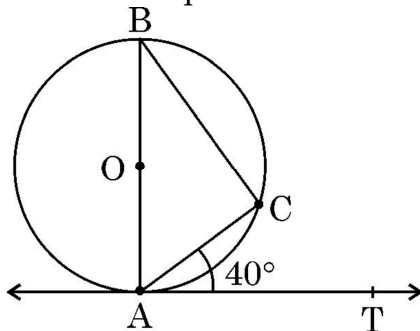

(A) 10 cm   (B) 6 cm
(C) 8 cm   (D) 7.5 cm

17. If the HCF (2520, 6600) = 40 and LCM (2520, 6600) = 252 × k, then the value of k is 1

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

18. In the given figure, AT is tangent to a circle centred at O. If ∠CAT = 40°, then ∠CBA is equal to 1

(A) 70°   (B) 50°
(C) 65°   (D) 40°

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) :** यदि $\sin A = \frac{1}{3}$ $(0° < A < 90°)$ है, तो $\cos A$ का मान $\frac{2\sqrt{2}}{3}$ है ।

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

1

20. **अभिकथन (A) :** 10 cm भुजा वाले दो घनों को किनारे मिलाकर रखने से बने नये घनाभ का संपूर्ण पृष्ठीय क्षेत्रफल 1200 cm^2 है ।

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

1

खण्ड – ख

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

21. (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 । माध्यिका BE की लंबाई ज्ञात 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) :** If $\sin A = \dfrac{1}{3}$ ($0° < A < 90°$), then the value of $\cos A$ is $\dfrac{2\sqrt{2}}{3}$

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

20. **Assertion (A) :** Two cubes each of edge length 10 cm are joined together. The total surface area of newly formed cuboid is 1200 cm².

    Reason (R) : Area of each surface of a cube of side 10 cm is 100 cm².   **1**

SECTION – B

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

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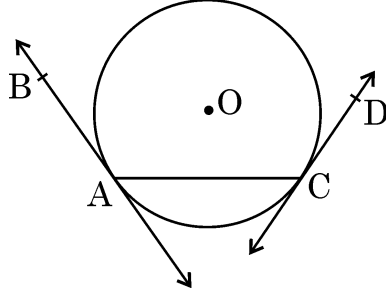
                       OR

   (b) A(3, 0), B(6, 4) and C(–1, 3) are vertices of a triangle ABC. Find length of its median BE.   **2**
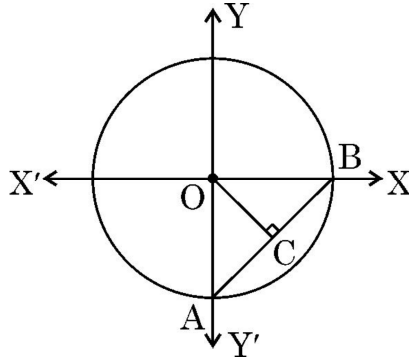
22. दी गई आकृति में, AB तथा CD, केंद्र O वाले वृत्त की दो स्पर्श-रेखाएँ हैं । क्या $\angle BAC = \angle DCA$? अपने उत्तर की पुष्टि कीजिए ।   2

23. दी गई आकृति में मूल बिंदु O पर एक 7 cm त्रिज्या के वृत्त का केंद्र है तथा OC, ΔOAB की माध्यिका है । माध्यिका OC की लंबाई ज्ञात कीजिए ।   2

24. (a) $2 \sin^2 30° \sec 60° + \tan^2 60°$ 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, $0 \le A, B, (A + B) \le 90°$.   2

25. क्या संख्या 8^n, एक प्राकृत संख्या n के लिए , अंक 0 पर समाप्त हो सकती है ? कारण दीजिए ।   2
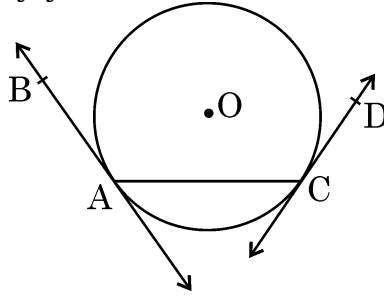
खण्ड – ग

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

26. सिद्ध कीजिए कि $\dfrac{\cosec^2 \theta - \sec^2 \theta}{\cosec^2 \theta + \sec^2 \theta} = \dfrac{3}{4}$, जहाँ $\tan \theta = \dfrac{1}{\sqrt{7}}$ है ।   3
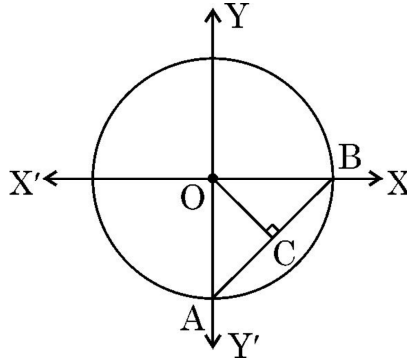
22. In the given figure, AB and CD are tangents to a circle centred at O. Is ∠BAC = ∠DCA ? Justify your answer.　　　　　**2**

23. In the given figure, a circle centred at origin O has radius 7 cm, OC is median of ΔOAB. Find the length of median OC.　　　　**2**

24. (a) Evaluate : $2 \sin^2 30° \sec 60° + \tan^2 60°$.　　　　**2**

OR

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

25. Can the number 8^n, n being a natural number, end with the digit 0 ? Give reasons.　　　　**2**

SECTION – C

This section consists of 6 questions of 3 marks each.

26. Prove that $\dfrac{\cosec^2 \theta - \sec^2 \theta}{\cosec^2 \theta + \sec^2 \theta} = \dfrac{3}{4}$, if $\tan \theta = \dfrac{1}{\sqrt{7}}$　　　　**3**

27. (a) यदि एक समांतर श्रेढ़ी (A.P.) के प्रथम m पदों का योगफल इसके प्रथम n पदों (m ≠ n) के योगफल के समान है, तो दर्शाइए कि इसके प्रथम (m + n) पदों का योगफल शून्य है । 3

अथवा

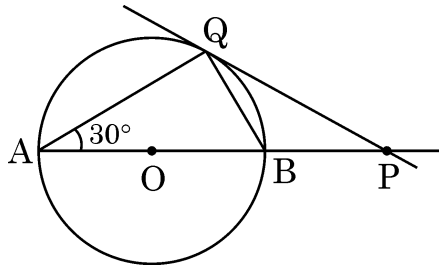(b) एक समांतर श्रेढ़ी के तीन क्रमागत पदों का योगफल 24 है तथा इनके वर्गों का योगफल 194 है । संख्याएँ ज्ञात कीजिए । 3

28. सिद्ध कीजिए कि $\sqrt{5}$ एक अपरिमेय संख्या है । 3

29. (a) दी गई आकृति में, केंद्र O वाले वृत्त की एक स्पर्श-रेखा PQ है तथा ∠BAQ = 30° है, तो दर्शाइए कि BP = BQ । 3
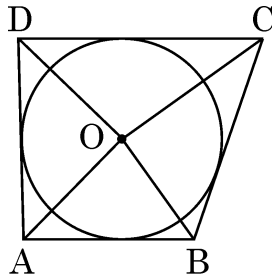

अथवा

(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

∠AOB + ∠COD = 180°

30. एक व्यापारी एक वस्तु को ₹ 75 में बेचकर क्रय मूल्य के बराबर प्रतिशत लाभ प्राप्त करता है । इस वस्तु का क्रय मूल्य ज्ञात कीजिए । 3
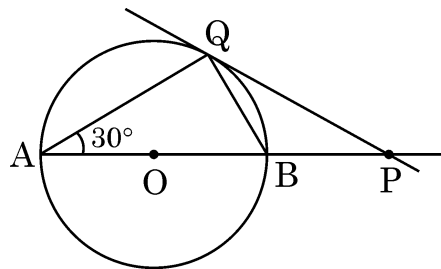
27. (a) If the sum of first m terms of an A.P. is same as sum of its first n terms (m ≠ n), then show that the sum of its first (m + n) terms is zero. **3**

<div align="center">**OR**</div>

(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**

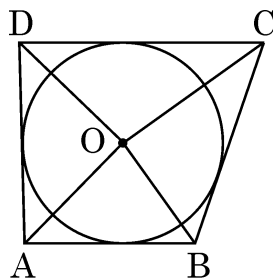28. Prove that $\sqrt{5}$ is an irrational number. **3**

29. (a) In the given figure, PQ is tangent to a circle centred at O and ∠BAQ = 30°; show that BP = BQ. **3**

<div align="center">**OR**</div>

(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 ∠AOB + ∠COD = 180°

30. A dealer sells an article for ₹ 75 and gains as much percent as the cost price of the article. Find the cost price of the article. **3**

31. 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 ।

खण्ड – घ

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

32. एक व्यक्ति एक नदी के एक किनारे पर खड़ा होकर दूसरे किनारे पर सम्मुख खड़ी एक मीनार के शिखर का उन्नयन कोण 60° पाता है । यह व्यक्ति जब किनारे से 30 m दूर जाता है तो मीनार के शिखर का उन्नयन कोण 30° हो जाता है । मीनार की ऊँचाई तथा नदी की चौड़ाई ज्ञात कीजिए । (लीजिए $\sqrt{3}$ = 1.732) 5

33. 5.6 m त्रिज्या के एक वृत्त के एक त्रिज्यखण्ड का परिमाप 20.0 m है । त्रिज्यखण्ड का क्षेत्रफल ज्ञात कीजिए । 5

34. (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 माध्यिका AD एक अन्य त्रिभुज PQR की भुजाओं PQ और PR तथा माध्यिका PM के क्रमश: समानुपाती हैं । दर्शाइए कि ∆ABC ~ ∆PQR । 5

35. (a) आलेखीय विधि से निम्न समीकरण युग्म को हल कीजिए : 5
$3x – 2y = 10$ तथा $5x + 3y = 4$

अथवा

(b) यदि दो संख्याओं में बड़ी संख्या के तीन गुने को छोटी संख्या से भाग करें, तो भागफल 4 तथा शेषफल 3 आता है । यदि छोटी संख्या के 7 गुने को बड़ी संख्या से भाग करें, तो भागफल 5 तथा शेषफल 1 आता है । संख्याएँ ज्ञात कीजिए । 5

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

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

Find the mean marks of the students.

SECTION – D

This section consists of 4 questions of 5 marks each.

32. A person standing on the bank of a river observes that the angle of elevation of the top of a tower on the opposite bank is 60°. When he moves 30 m away from the bank, he finds the angle of elevation to be 30°. Find the height of the tower and width of the river. (Take $\sqrt{3} = 1.732$)   **5**

33. The perimeter of a certain sector of a circle of radius 5.6 m is 20.0 m. Find the area of the sector.   **5**

34. (a) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.   **5**

OR

(b) Sides AB and AC and median AD to ΔABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that ΔABC ~ ΔPQR.   **5**

35. (a) Using graphical method, solve the following system of equations :   **5**
$3x – 2y = 10$ and $5x + 3y = 4$

OR

(b) If three times the greater of two numbers is divided by the smaller one, we get 4 as the quotient and 3 as the remainder. Also, if seven times the smaller number is divided by greater one, we get 5 as the quotient and 1 as the remainder. Find the numbers.   **5**

खण्ड – ङ

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

36. 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 ।
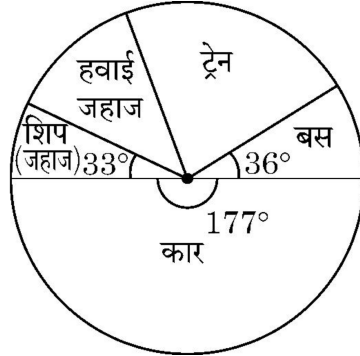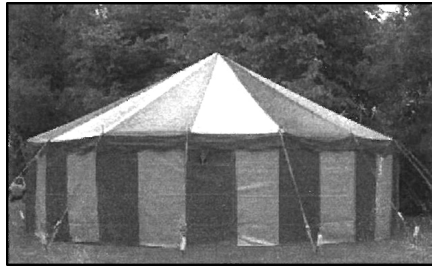

पाई-चार्ट के अवलोकन से निम्न प्रश्नों के उत्तर दीजिए :

(i)   यदि यादृच्छया एक व्यक्ति चुना गया, तो उसके बस अथवा शिप (जहाज) द्वारा यात्रा करने की प्रायिकता ज्ञात कीजिए ।   1

(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

37. 'सर्कस' शब्द मूलत: 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 टैंट 8 m की ऊँचाई तक बेलनाकार है तथा इसके ऊपर शंक्वाकार है । आधार का व्यास 28 m है तथा टैंट की कुल ऊँचाई 18.5 m है ।
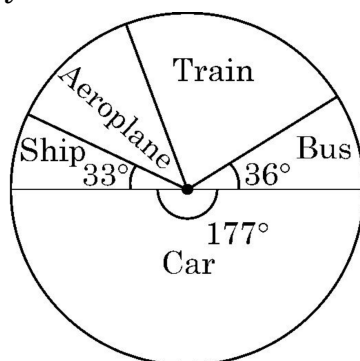
SECTION – E

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

36. 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 4/5, find the number of people who used train. **2**

OR

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

37. 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.
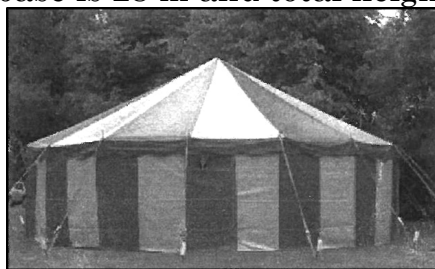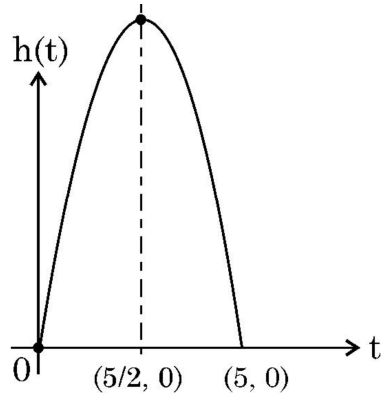
उपरोक्त के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i)   शंक्वाकार भाग की तिर्यक ऊँचाई ज्ञात कीजिए ।   **1**

(ii)   टैंट के फर्श का क्षेत्रफल ज्ञात कीजिए ।   **1**

(iii) (a)   टैंट बनाने में प्रयोग होने वाले कपड़े का क्षेत्रफल ज्ञात कीजिए ।   **2**

अथवा

(iii) (b)   इस खाली टैंट में हवा का कुल आयतन ज्ञात कीजिए ।   **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**

––––––––––
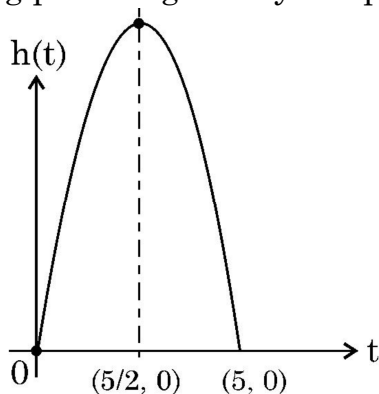
Based on the above, answer the following questions :

(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**

<div align="center">OR</div>

(iii) (b) Find total volume of air inside an empty tent.   **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**

<div align="center">OR</div>

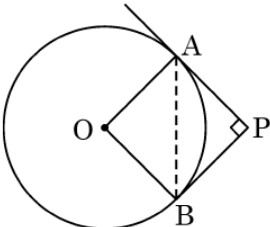(iii) (b) Find the two different values of t when the height of the ball was
           20 m.   **2**

––––––––––

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2024
MATHEMATICS PAPER CODE 30/2/3

General Instructions: -

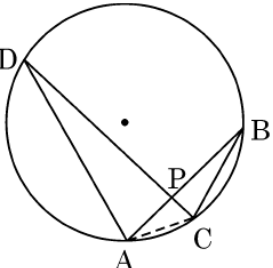|	
1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested 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. 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."**
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 totalled 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.

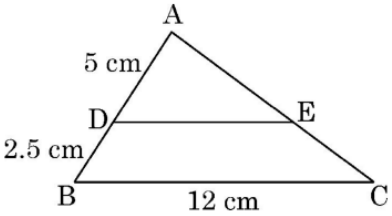| 9	**In Q1-Q20, if a candidate attempts the question more than once (without canceling the previous attempt), marks shall be awarded for the first attempt only and the other answer scored out with a note "Extra Question".**
10	**In Q21-Q38, if a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note "Extra Question".**
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	Ensure that you do not make the following common types of errors committed by the Examiner in the past :- - Leaving answer or part thereof unassessed in an answer book. - Giving more marks for an answer than assigned to it. - Wrong totalling 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 totalling on the title page. - Wrong totalling of marks of the two columns on the title page. - Wrong grand total. - Marks in words and figures not tallying/not same. - Wrong transfer of marks from the answer book to online award list. - Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) - Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
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 "**Guidelines for spot Evaluation**" 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.

MS_X_ Mathematics_041_30/2/3_2023-24

MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/2/3)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A **This section consists of 20 questions of 1 mark each.**	
1.	The distance between the points $(a \cos \theta, -a \sin \theta)$ and $(a \sin \theta, a \cos \theta)$ is (A) a (B) $a\sqrt{2}$ (C) 0 (D) 2a	
Sol.	(B) $a\sqrt{2}$	1
2.	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 (A) 5 cm (B) $5\sqrt{2}$ cm (C) $2\sqrt{5}$ cm (D) 10 cm	
Sol.	(B) $5\sqrt{2}$ cm	1
3.	Which term of the A.P. $-29, -26, -23, ..., 61$ is 16 ? (A) 11th (B) 16th (C) 10th (D) 31st	
Sol.	(B) 16th	1

4.	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	
	(A) $\dfrac{7}{50}$ (B) $\dfrac{7}{55}$	
	(C) $\dfrac{1}{10}$ (D) $\dfrac{5}{49}$	
Sol.	(C) $\dfrac{1}{10}$	1

5.	AB and CD are two chords of a circle intersecting at P. Choose the correct statement from the following :	
	(A) ΔADP ~ ΔCBA (B) ΔADP ~ ΔBPC	
	(C) ΔADP ~ ΔBCP (D) ΔADP ~ ΔCBP	
Sol.	(D) ΔADP~ΔCBP	1

6.	Two dice are rolled together. The probability of getting the sum of the two numbers to be more than 10, is	
	(A) $\dfrac{1}{9}$ (B) $\dfrac{1}{6}$	
	(C) $\dfrac{7}{12}$ (D) $\dfrac{1}{12}$	
Sol.	(D) $\dfrac{1}{12}$	1

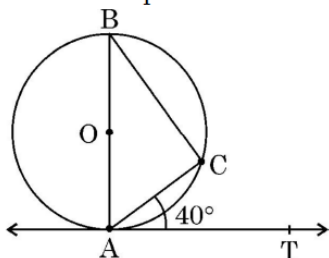MS_X_ Mathematics_041_30/2/3_2023-24

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. (A) median (B) mode (C) mean (D) range	
Sol.	(B) mode	**1**
8.	The roots of the quadratic equation $4x^2 - 5x + 4 = 0$ are (A) irrational (B) rational and distinct (C) not real (D) rational and equal	
Sol.	(C) not real	**1**
9.	The common difference of an A.P. in which $a_{20} - a_{15} = 20$, is (A) 4 (B) 5 (C) 4d (D) 5d	
Sol.	(A) 4	**1**
10.	If value of each observation in a data is increased by 2, then median of the new data (A) increases by 2 (B) increases by 2n (C) remains same (D) decreases by 2	
Sol.	(A) increases by 2	**1**

MS_X_ Mathematics_041_30/2/3_2023-24

11.	The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. PQ/AB is equal to	
	(A) $\dfrac{7}{8}$ (B) $\dfrac{6}{7}$	
	(C) $\dfrac{7}{6}$ (D) $\dfrac{8}{7}$	
Sol.	(B) $\dfrac{6}{7}$	1
12.	If α and β ($\alpha > \beta$) are the zeroes of the polynomial $-x^2 + 8x + 9$, then ($\alpha - \beta$) is equal to	
	(A) -10 (B) 10	
	(C) ± 10 (D) 8	
Sol.	(B) 10	1
13.	The value of k for which the system of equations $3x - y + 8 = 0$ and $6x - ky + 16 = 0$ has infinitely many solutions, is	
	(A) -2 (B) 2	
	(C) $\dfrac{1}{2}$ (D) $-\dfrac{1}{2}$	
Sol.	(B) 2	1
14.	If $\sin \theta = \cos \theta$, ($0° < \theta < 90°$), then value of ($\sec \theta \cdot \sin \theta$) is :	
	(A) $\dfrac{1}{\sqrt{2}}$ (B) $\sqrt{2}$	
	(C) 1 (D) 0	
Sol.	(C) 1	1

15.	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	
	(A) $\left(\dfrac{5}{2}, \dfrac{-3}{2}\right)$ (B) $\left(\dfrac{11}{7}, 0\right)$ (C) $\left(\dfrac{13}{7}, 0\right)$ (D) $\left(0, \dfrac{13}{7}\right)$	
Sol.	(C) $\left(\dfrac{13}{7}, \mathbf{0}\right)$	1
16.	In the given figure ΔABC is shown. DE is parallel to BC. If AD = 5 cm, DB = 2.5 cm and BC = 12 cm, then DE is equal to (A) 10 cm (B) 6 cm (C) 8 cm (D) 7.5 cm	
Sol.	(C) 8 cm	1
17.	If the HCF (2520, 6600) = 40 and LCM (2520, 6600) = 252 × k, then the value of k is (A) 1650 (B) 1600 (C) 165 (D) 1625	
Sol.	(A) 1650	1

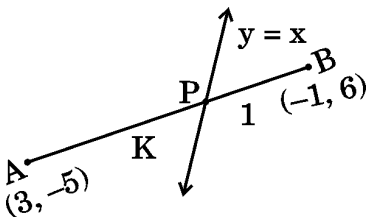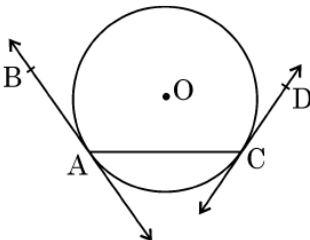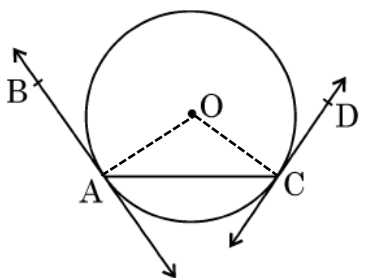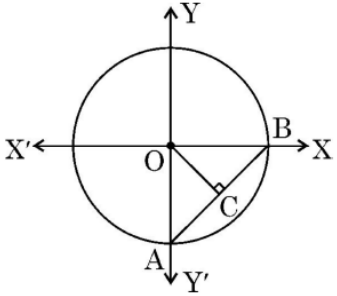| 18.	In the given figure, AT is tangent to a circle centred at O. If $\angle CAT = 40°$, then $\angle CBA$ is equal to B O C 40° A T (A) 70° (B) 50° (C) 65° (D) 40°	
Sol.	(D) **40°**	1
	Directions : In Question **19** and **20**, **Assertion (A)** and **Reason (R)** are given. Select the correct option 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) :** If $\sin A = \dfrac{1}{3}$ $(0° < A < 90°)$, then the value of $\cos A$ is $\dfrac{2\sqrt{2}}{3}$ **Reason (R) :** For every angle θ, $\sin^2\theta + \cos^2\theta = 1$.	
Sol.	(A) Both Assertion (A) and (R) are true. Reason (R) is the correct explanation of Assertion (A)	1

MS_X_ Mathematics_041_30/2/3_2023-24

20.	**Assertion (A) :** Two cubes each of edge length 10 cm are joined together. The total surface area of newly formed cuboid is 1200 cm². **Reason (R) :** Area of each surface of a cube of side 10 cm is 100 cm².	
Sol.	(D) Assertion (A) is not true but Reason (R) is true.	1

<div align="center">

SECTION B

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

</div>

21(a).	In what ratio is the line segment joining the points $(3, -5)$ and $(-1, 6)$ divided by the line $y = x$?	
Sol.	Let the required ratio be K:1 Coordinates of point P are $\left(\dfrac{-K+3}{K+1}, \dfrac{6K-5}{K+1}\right)$ Point P lies on line $y = x \Rightarrow \dfrac{-K+3}{K+1} = \dfrac{6K-5}{K+1}$ Solving, we get $K = \dfrac{8}{7}$ $\therefore$ Required ratio is $8:7$	1 ½ ½

<div align="center">

OR

</div>

21(b).	A(3, 0), B(6, 4) and C(–1, 3) are vertices of a triangle ABC. Find length of its median BE.	
Sol.	Mid-point of AC is $E\left(1, \dfrac{3}{2}\right)$	1

	Length of median BE $$= \sqrt{(6-1)^2 + (4 - \frac{3}{2})^2} = \sqrt{\frac{125}{4}} \text{ or } \frac{5\sqrt{5}}{2}$$	**1**
22.	In the given figure, AB and CD are tangents to a circle centred at O. Is ∠BAC = ∠DCA ? Justify your answer.	
Sol.	Join OA and OC OA = OC ∠OAC = ∠OCA Also, ∠OAB = ∠OCD $\Rightarrow$ ∠OAC + ∠OAB = ∠OCA + ∠OCD $\Rightarrow$ ∠BAC = ∠DCA	½ ½ ½ ½

MS_X_ Mathematics_041_30/2/3_2023-24

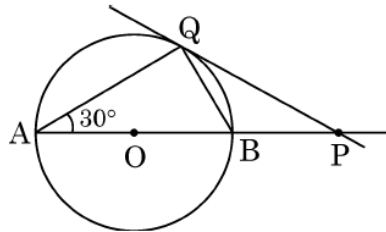| 23.	In the given figure, a circle centred at origin O has radius 7 cm, OC is median of $\triangle$OAB. Find the length of median OC.	
Sol.	$\angle$AOB = 90°	
	$\therefore$ AB^2 = 7^2 + 7^2	½
	$\Rightarrow$ AB = $7\sqrt{2}$ cm	
	$\Rightarrow$ AC = $\dfrac{7\sqrt{2}}{2}$ cm	½
	Now In $\triangle$ AOC,	
	$\Rightarrow$ OC^2 = 7^2 - $\left(\dfrac{7\sqrt{2}}{2}\right)^2$	½
	$\therefore$ OC = $\dfrac{7\sqrt{2}}{2}$ cm	½
24(a).	Evaluate : $2 \sin^2 30° \sec 60° + \tan^2 60°$.	
Sol.	$2sin^2 30° \sec 60° + tan^2 60°$	
	$= 2 \times \left(\frac{1}{2}\right)^2 \times 2 + \left(\sqrt{3}\right)^2$	1½
	$= 4$	½
	OR	
24(b).	If 2 sin (A + B) = $\sqrt{3}$ and cos (A − B) = 1, then find the measures of angles A and B. $0 \leq A, B, (A + B) \leq 90°$.	
Sol.	$\sin(A + B) = \frac{\sqrt{3}}{2} \Rightarrow A + B = 60° \ldots (1)$	½

11 | P a g e

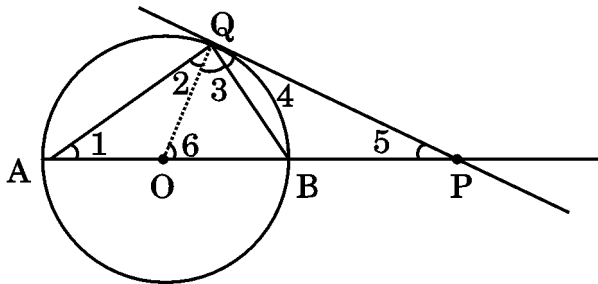|		
	$\cos(A - B) = 1 \Rightarrow A - B = 0°$ ... (2) Solving (1) and (2), we get $A = B = 30°$	½ 1
25.	Can the number 8^n, n being a natural number, end with the digit 0 ? Give reasons.	
Sol.	$8^n = (2 \times 2 \times 2)^n$ or 2^{3n} A number ends with digit 0 if it has two prime factors 2 and 5 both. Since 8^n does not have 5 as a prime factor, so it can't end with digit 0.	1 1
	SECTION C **This section consists of 6 questions of 3 marks each.**	
26.	Prove that $\dfrac{\csc^2 \theta - \sec^2 \theta}{\csc^2 \theta + \sec^2 \theta} = \dfrac{3}{4}$, if $\tan \theta = \dfrac{1}{\sqrt{7}}$	
Sol.	$\tan \theta = \dfrac{1}{\sqrt{7}}$ $\Rightarrow \sec^2\theta = \dfrac{8}{7}$ and $\csc^2\theta = 8$ $\therefore \text{LHS} = \dfrac{8 - \dfrac{8}{7}}{8 + \dfrac{8}{7}} = \dfrac{3}{4} = \text{RHS}$	1+1 1
27(a).	If the sum of first m terms of an A.P. is same as sum of its first n terms (m ≠ n), then show that the sum of its first (m + n) terms is zero.	
Sol.	$S_m = S_n$ $\Rightarrow \dfrac{m}{2}[2a + (m - 1)d] = \dfrac{n}{2}[2a + (n - 1)d]$ $\Rightarrow 2a(m - n) = d(n^2 - m^2) - d(n - m)$ $\Rightarrow 2a = -d(m + n - 1)$	1 1

MS_X_ Mathematics_041_30/2/3_2023-24

	or $2a + (m + n - 1)d = 0$	½
	i.e., $S_{m+n} = \frac{m+n}{2}[2a + (m + n - 1)d] = 0$	½
	OR	
27(b).	In an A.P., the sum of three consecutive terms is 24 and the sum of their squares is 194. Find the numbers.	
Sol.	Let the numbers be $a - d, a, a + d$	½
	$\therefore a - d + a + a + d = 24$	½
	$\Rightarrow a = 8$	
	Also, $(a - d)^2 + a^2 + (a + d)^2 = 194$	
	$\Rightarrow (8 - d)^2 + 8^2 + (8 + d)^2 = 194$	1
	$\Rightarrow d^2 = 1 \Rightarrow d = \pm 1$	½
	$\therefore$ Numbers are 7, 8, 9 or 9,8,7	½
28.	Prove that $\sqrt{5}$ is an irrational number.	
Sol.	Let $\sqrt{5}$ be a rational number.	
	$\therefore \sqrt{5} = \frac{p}{q}$, where q≠0 and let p & q be co-prime.	½
	$5q^2 = p^2 \Rightarrow p^2$ is divisible by 5 $\Rightarrow$ p is divisible by 5 ----- (i)	1
	$\Rightarrow p = 5a$, 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)	1
	(i) and (ii) leads to contradiction as 'p' and 'q' are co-prime.	½
	$\therefore \mathbf{\sqrt{5}}$ is an irrational number.	

29(a).	In the given figure, PQ is tangent to a circle centred at O and ∠BAQ = 30°; show that BP = BQ.	
Sol.	Join OQ OQ=OA $\Rightarrow \angle 2 = 30^0$ $\angle 3 = 90^0 - 30^0 = 60^0$ $\angle 4 = 90^0 - 60^0 = 30^0$ $\angle 6 = \angle 1 + \angle 2 = 60^0$ Hence $\angle 5 = 90^0 - 60^0 = 30^0 = \angle 4$ $\therefore$ BP=BQ	½ ½ ½ ½ ½ ½
	OR	
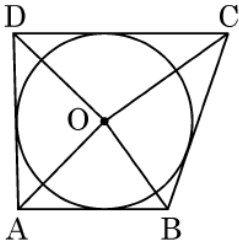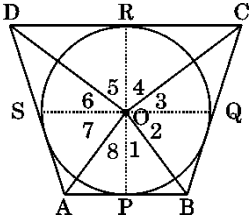
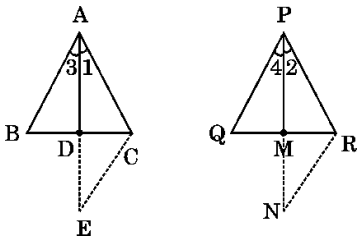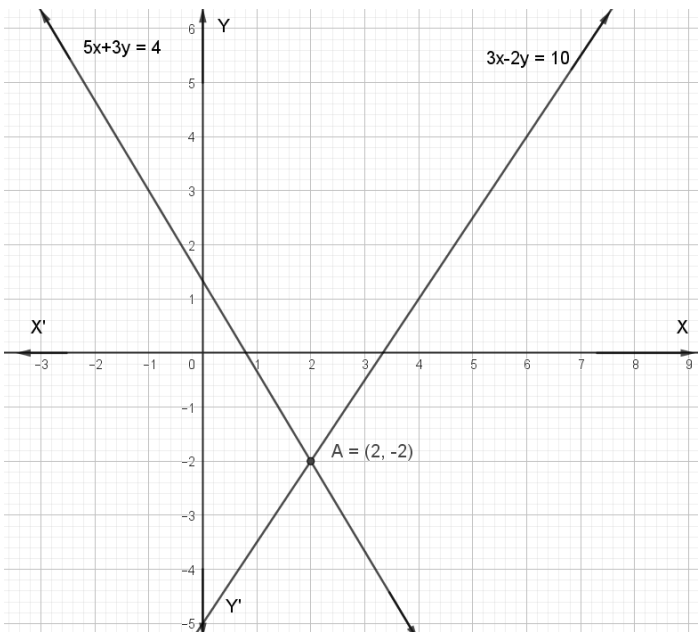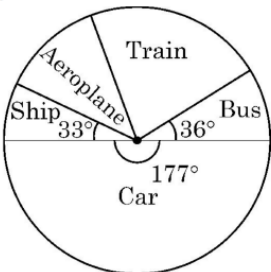|		
29(b).	In the given figure, AB, BC, CD and DA are tangents to the circle with centre O forming a quadrilateral ABCD. Show that ∠AOB + ∠COD = 180° 	
Sol.	 Join OP, OQ, OR and OS ΔPOB ≅ ΔQOB ⇒ ∠1=∠2 Similarly ∠**3** = ∠**4**, ∠**5** = ∠**6**, ∠**7** = ∠**8** **Now,** ∠1+∠2+∠**3** + ∠**4** + ∠**5** + ∠**6** + ∠**7** + ∠**8** = **360°** ⇒ **2(∠1+∠8 + ∠4 + ∠5) = 360°** ∴ ∠**AOB** + ∠**COD** = **180°**	½ **1** ½ ½ ½
30.	A dealer sells an article for ₹ 75 and gains as much percent as the cost price of the article. Find the cost price of the article.	
Sol.	Let the cost price of the article be ₹ x	

15 | P a g e

MS_X_ Mathematics_041_30/2/3_2023-24

	$\therefore$ Gain % = x		½
	$\Rightarrow$ x = $\frac{75-x}{x} \times 100$		1
	$\Rightarrow$ x^2+ 100x $- 7500 = 0$		½
	$\Rightarrow$ (x $- 50)(x + 150) = 0$		½
	x $\neq$ -150 $\therefore$ x = 50		½
	So, the cost price of the article is ₹ 50		

31.

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

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

Find the mean marks of the students.

Sol.

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

1½ marks for correct table

$$\text{Mean} = \frac{2400}{100}$$
$$= 24$$

1

½

SECTION D

This section consists of 4 questions of 5 marks each.

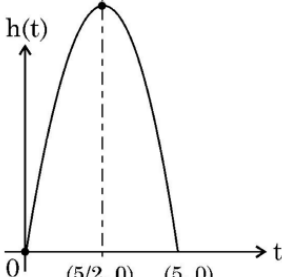| 32.	A person standing on the bank of a river observes that the angle of elevation of the top of a tower on the opposite bank is 60°. When he moves 30 m away from the bank, he finds the angle of elevation to be 30°. Find the height of the tower and width of the river. (Take $\sqrt{3} = 1.732$)	
Sol.	Let the height of tower BA be h m and the width of river BC be x m $\tan 60° = \sqrt{3} = \dfrac{h}{x}$ $\Rightarrow h = \sqrt{3}x$ --- (i) $\tan 30° = \dfrac{1}{\sqrt{3}} = \dfrac{h}{30+x}$ $\Rightarrow h\sqrt{3} = 30 + x$ --- (ii) Solving (i) and (ii), we get x = 15 and $h = 15\sqrt{3} = 15 \times 1.732 = 25.98$ m ∴Height of tower = 25.98 m and width of river = 15 m	**1 mark for correct figure** 1 ½ 1 ½ ½ ½

33.	The perimeter of a certain sector of a circle of radius 5.6 m is 20.0 m. Find the area of the sector.	
Sol.	$2r + \dfrac{2\pi r\theta}{360} = 20$ $\Rightarrow 11.2 + 2 \times \dfrac{22}{7} \times 5.6 \times \dfrac{\theta}{360} = 20$ Solving, we get $\theta = 90°$ $\therefore$ Area of sector $= \dfrac{22}{7} \times 5.6 \times 5.6 \times \dfrac{90}{360}$ $= 24.64 \text{ m}^2$	**2** **1** **1** **1**
34(a).	If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.	
Sol.	Correct Given, to prove, figure, construction Correct proof	**½ ×4=2** **3**
	OR	
34(b).	Sides AB and AC and median AD to ΔABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that ΔABC ~ ΔPQR.	
Sol.		

		Correct figure	**1**

Produce AD to E such that AD = DE and join EC — **½**
Produce PM to N such that PM = MN and join NR
$\Delta ADB \cong \Delta EDC$

$\therefore AB = EC$ — **1**

Similarly, PQ=NR

Since, $\dfrac{\textbf{AB}}{\textbf{PQ}} = \dfrac{\textbf{AC}}{\textbf{PR}} = \dfrac{\textbf{AD}}{\textbf{PM}}$

$\Rightarrow \dfrac{\textbf{EC}}{\textbf{NR}} = \dfrac{\textbf{AC}}{\textbf{PR}} = \dfrac{\frac{\textbf{AE}}{\textbf{2}}}{\frac{\textbf{PN}}{\textbf{2}}}$

$\therefore \ \boldsymbol{\Delta}\text{AEC} \sim \boldsymbol{\Delta}\text{PNR}$ — **1**

$\Rightarrow \angle 1 = \angle \textbf{2}$ — **½**

Similarly, $\angle \textbf{3} = \angle \textbf{4}$

Hence $\angle \textbf{1} + \angle \textbf{3} = \angle \textbf{2} + \angle \textbf{4}$ **or** $\angle \textbf{A} = \angle \textbf{P}$ — **½**

Also, $\dfrac{\textbf{AB}}{\textbf{PQ}} = \dfrac{\textbf{AC}}{\textbf{PR}}$

$\therefore \ \boldsymbol{\Delta}\text{ABC} \sim \boldsymbol{\Delta}\text{PQR}$ — **½**

MS_X_ Mathematics_041_30/2/3_2023-24

35(a).	Using graphical method, solve the following system of equations : $3x - 2y = 10$ and $5x + 3y = 4$	
Sol.	Solution is $x = 2, y = -2$	**2 marks for each correct line** **1**
	OR	
35(b).	If three times the greater of two numbers is divided by the smaller one, we get 4 as the quotient and 3 as the remainder. Also, if seven times the smaller number is divided by greater one, we get 5 as the quotient and 1 as the remainder. Find the numbers.	
Sol.	Let the smaller number be x and the greater number be y $3y = 4x + 3$ ... (i) $7x = 5y + 1$ ... (ii) Solving (i) and (ii), we get	**1½** **1½**

MS_X_ Mathematics_041_30/2/3_2023-24

	$x = 18, y = 25$ ∴ Smaller number is 18 and greater number is 25	1+1

<div align="center">

SECTION E

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

</div>

36.	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 4/5, find the number of people who used train. **2** **OR** (iii) (b) The probability that randomly selected person used aeroplane is 7/60. Find the revenue collected by air company at the rate of ₹ 5,000 per person. **2**	

Sol.	(i) P (travelling by bus or ship) $= \dfrac{36+33}{360} = \dfrac{69}{360}$ or $\dfrac{23}{120}$
	
	(ii) Car
	        Number of people who used car $= \dfrac{177}{360} \times 120 = 59$
	
	(iii) (a) P (person used train) $= 1 - \dfrac{4}{5} = \dfrac{1}{5}$
	
	    ∴ Number of people who used train $= \dfrac{120}{5} = 24$
	 OR
		1
		
		½
		½
		
		1
		
		1

	(iii)	(b) Number of people who used aeroplane $= \frac{7}{60} \times 120 = 14$	1
		$\therefore$ Revenue generated$= 14 \times 5000 = ₹\,70,000$	1

37.	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

Sol.	(i)	Height of conical part $= 18.5 - 8 = 10.5$ m	½
		Radius of conical part $= 14$ m	
		Slant height $= \sqrt{(10.5)^2 + (14)^2} = 17.5$ m	½
	(ii)	Floor area $= \frac{22}{7} \times 14 \times 14 = 616$ m^2	1
	(iii)	(a) Area of cloth used	
		$= 2 \times \frac{22}{7} \times 14 \times 8 + \frac{22}{7} \times 14 \times 17.5$	1
		$= 1474$ m^2	1
		OR	
	(iii)	(b) Volume of air inside the tent	
		$= \frac{22}{7} \times 14 \times 14 \times 8 + \frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times 10.5$	1
		$= 7084$ m^3	1

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 − 5t².	
	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
Sol.	(i) Zeroes of the polynomial are 0 and 5	**1**
	(ii) Maximum height achieved by ball	
	$= 25 \times \frac{5}{2} - 5 \times \left(\frac{5}{2}\right)^2$	½
	$= \frac{125}{4}$ or 31.25 m	½
	(iii) (a) $-5t^2 + 25t = 30$	½
	$\Rightarrow t^2 - 5t + 6 = 0$	½
	$\Rightarrow (t-2)(t-3) = 0$	½
	$t \neq 3, \therefore t = 2$	½
	OR	
	(iii) (b) $-5t^2 + 25t = 20$	½
	$\Rightarrow t^2 - 5t + 4 = 0$	½
	$\Rightarrow (t-4)(t-1) = 0$	½
	$\Rightarrow t = 4, 1$	½