Series : 4MNKL

SET ~ 3

रोल नं.

Roll No.

प्रश्न–पत्र कोड
Q.P. Code **30/4/3**

परीक्षार्थी प्रश्न–पत्र कोड को उत्तर–पुस्तिका के मुख–पृष्ठ पर अवश्य लिखें ।
Candidates must write the Q.P. Code on the title page of the answer-book.

नोट/ NOTE :

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

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

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

Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.

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

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

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

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

(V) इस प्रश्न–पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न–पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा । 10.15 बजे से 10.30 बजे तक परीक्षार्थी केवल प्रश्न–पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर–पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।

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

गणित (मानक)

MATHEMATICS (Standard)

निर्धारित समय : 3 घण्टे *अधिकतम अंक : 80*

Time allowed : 3 hours *Maximum Marks : 80*

सामान्य निर्देश :

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

(i) *इस प्रश्न-पत्र में **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 प्रश्न (MCQs) 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 2 अंकों 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 questions 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**, questions number **36** to **38** are Case Study based questions carrying **4** marks each. Internal choice is provided in **2** marks question in each case-study.*

(viii) *There is no overall choice. However, an internal choice has been provided in **2** questions in Section–**B**, **2** questions in Section–**C**, **2** questions in Section–**D** and **3** questions of **2** marks 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

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

1. बिन्दुओं $(a \cos \theta + b \sin \theta, 0)$ तथा $(0, a \sin \theta - b \cos \theta)$ के बीच की दूरी है

   (A) $\sqrt{a^2 + b^2}$ (B) $a^2 - b^2$

   (C) $\sqrt{a^2 - b^2}$ (D) $a^2 + b^2$

2. त्रिज्या r तथा ऊँचाई h वाला आइसक्रीम का शंकु आइसक्रीम के दो गोलों से पूरा-पूरा भरा जा सकता है । यदि प्रत्येक गोले की त्रिज्या $\frac{r}{2}$ हो, तो $h : 2r$ बराबर है

   (A) 1 : 8 (B) 1 : 2

   (C) 1 : 1 (D) 2 : 1

3. रैखिक समीकरण युग्म $kx - y - 2 = 0$ तथा $6x - 2y - 3 = 0$ के अपरिमित रूप से अनेक हल हैं । k का मान है

   (A) $\frac{1}{2}$ (B) 3

   (C) 4 (D) कोई नहीं

4. एक वृत्त को 16 एकसमान त्रिज्यखंडों में विभाजित किया गया है । यदि वृत्त की त्रिज्या 7 cm है, तो प्रत्येक त्रिज्यखंड का क्षेत्रफल है

   (A) $\frac{77}{4}$ cm^2 (B) 77 cm^2

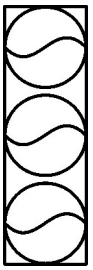
   (C) 154 cm^2 (D) $\frac{77}{8}$ cm^2

5. एक बारम्बारता बंटन का माध्य तथा माध्यक क्रमशः 43 तथा 40 हैं । इसके बहुलक का मान है

   (A) 34 (B) 43

   (C) 38.5 (D) 41.5

6. तीन टेनिस की गेंदें एक बेलनाकार जार में पूरी तरह से फिट हो गयी हैं । यदि प्रत्येक गेंद की त्रिज्या r है, तो जार में मौज़ूद हवा का आयतन है



   (A) $2\pi r^3$ (B) $3\pi r^3$

   (C) $5\pi r^3$ (D) $4\pi r^3$

SECTION – A

Q. Number 1 to 20 are multiple choice questions of 1 mark each.

1. The distance between the points $(a \cos \theta + b \sin \theta, 0)$ and $(0, a \sin \theta - b \cos \theta)$ is

   (A) $\sqrt{a^2 + b^2}$ (B) $a^2 - b^2$

   (C) $\sqrt{a^2 - b^2}$ (D) $a^2 + b^2$

2. An ice-cream cone of radius r and height h is completely filled by two spherical scoopes of ice-cream. If radius of each spherical scoop is $\frac{r}{2}$, then h : 2r equals

   (A) 1 : 8 (B) 1 : 2

   (C) 1 : 1 (D) 2 : 1

3. The value of k for which the system of linear equations $kx - y - 2 = 0$ and $6x - 2y - 3 = 0$ has infinitely many solutions, is (does)

   (A) $\frac{1}{2}$ (B) 3

   (C) 4 (D) Not exist

4. A circle is divided into 16 identical sectors. If radius of the circle is 7 cm, area of each sector is

   (A) $\frac{77}{4}$ cm^2 (B) 77 cm^2

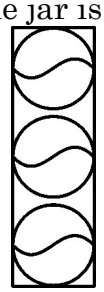
   (C) 154 cm^2 (D) $\frac{77}{8}$ cm^2

5. Mean and Median of a frequency distribution are 43 and 40 respectively. The value of mode is

   (A) 34 (B) 43

   (C) 38.5 (D) 41.5

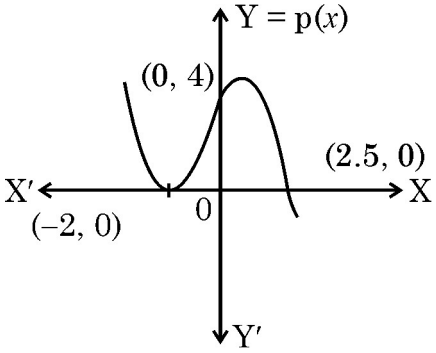
6. Three tennis balls are just packed in a cylindrical jar. If radius of each ball is r, volume of air inside the jar is



   (A) $2\pi r^3$ (B) $3\pi r^3$

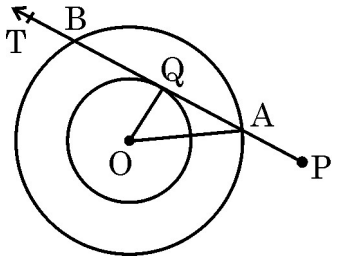
   (C) $5\pi r^3$ (D) $4\pi r^3$

7. बहुपद $p(x)$ का ग्राफ ध्यानपूर्वक देखिये । बहुपद के शून्यक हैं



(A) –2, 0, 2.5 (B) –2, 2.5
(C) 0, 4 (D) –2, 0

8. त्रिज्या 3 cm तथा O केन्द्र वाले वृत्त पर बाह्य बिंदु P से एक-स्पर्श रेखा PT खींची गयी जो इसके संकेन्द्रित वृत्त को बिन्दु A तथा B पर काटती है । यदि AB = 8 cm तथा OA = AP हो, तो PQ बराबर है

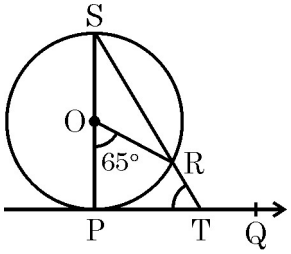


(A) 8 cm (B) 10 cm
(C) 9 cm (D) 12 cm

9. $\frac{\sec^2 A - 1}{\sin^2 A}$ बराबर है

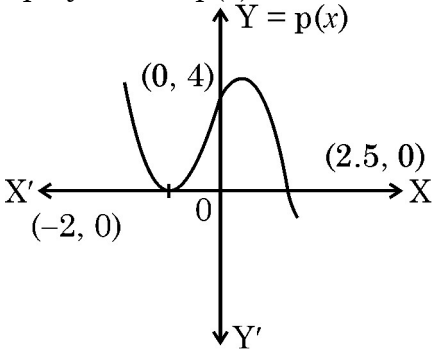
(A) $\cos^2 A$ (B) $\sec^2 A$
(C) $-\sec^2 A$ (D) $\cot^2 A$

10. O केन्द्र वाले वृत्त पर खींची गयी स्पर्श-रेखा PQ है । यदि $\angle POR = 65^\circ$ है, तो $\angle PTR$ का मान है



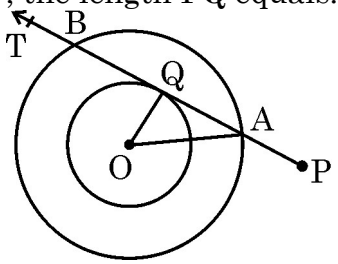
(A) 65° (B) 58.5°
(C) 57.5° (D) 45°

7. Observe the graph of polynomial p(x). The zeroes of the polynomial are



(A) –2, 0, 2.5 (B) –2, 2.5
(C) 0, 4 (D) –2, 0

8. From an external point P, a tangent PT has been drawn to a circle with centre at O and radius 3 cm, intersecting its concentric circle at A and B. If AB = 8 cm and OA = AP, the length PQ equals.

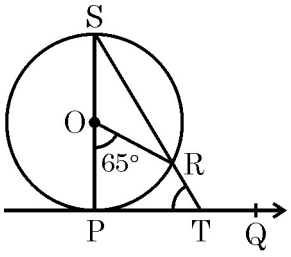


(A) 8 cm (B) 10 cm
(C) 9 cm (D) 12 cm

9. $\frac{\sec^2 A - 1}{\sin^2 A}$ is same as

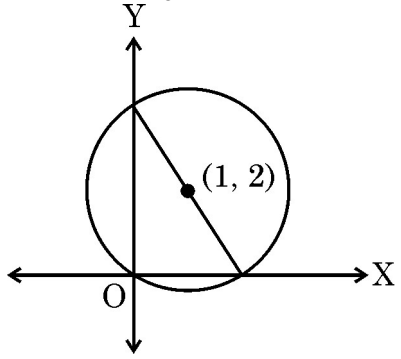
(A) $\cos^2 A$ (B) $\sec^2 A$
(C) $-\sec^2 A$ (D) $\cot^2 A$

10. PQ is tangent to a circle with centre O. If $\angle POR = 65^\circ$, then m$\angle PTR$ is



(A) 65° (B) 58.5°
(C) 57.5° (D) 45°

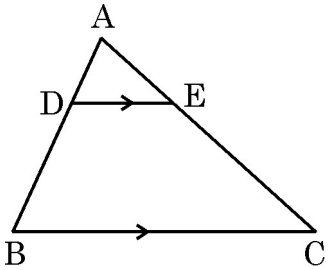
11. दी गयी आकृति में, बिन्दु (1, 2) केन्द्र वाले वृत्त का व्यास है



(A) 4 (B) $2\sqrt{2}$

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

12. दी गयी आकृति में, DE || BC है । यदि $\frac{AD}{DB} = \frac{1}{3}$ तथा AC = 6 cm है, तो AE की लम्बाई है



(A) 1.5 cm (B) 1 cm

(C) 2 cm (D) 3 cm

13. दिया गया है कि $\Delta ABC \sim \Delta EDF$ है । निम्न में से कौन सा विकल्प सही नहीं है ?

(A) $\frac{\Delta ABC \text{ का परिमाप}}{\Delta EDF \text{ का परिमाप}} = \frac{AB}{ED}$ (B) $\frac{AB}{ED} = \frac{AC}{EF}$

(C) $\angle A = \angle D, \angle C = \angle F$ (D) $\frac{AB + BC}{AC} = \frac{DE + DF}{EF}$

14. यदि द्विघात समीकरण $9x^2 + 8kx + 16 = 0$ के मूल वास्तविक तथा समान हैं, तो k का मान है

(A) 3 (B) –3

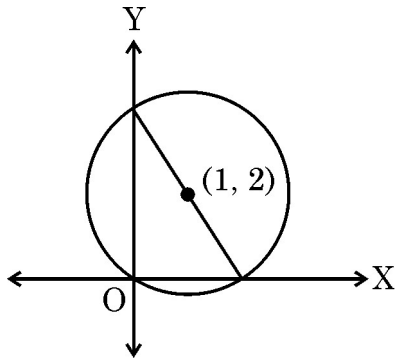
(C) –4 (D) $\frac{3}{2}$

15. $\frac{1 + \tan^2 A}{1 + \cot^2 A}$ बराबर है

(A) $\tan^2 A$ (B) –1

(C) $-\tan^2 A$ (D) $\cot^2 A$

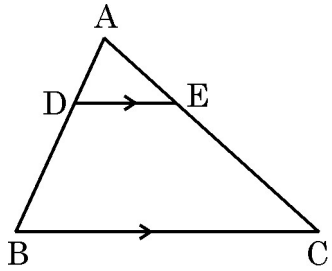
11. In the given figure, a circle is centred at (1, 2). The diameter of the circle is



(A) 4 (B) $2\sqrt{2}$

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

12. In the given figure, DE $\parallel$ BC. If $\frac{AD}{DB} = \frac{1}{3}$ and AC = 6 cm, then length AE is



(A) 1.5 cm (B) 1 cm

(C) 2 cm (D) 3 cm

13. It is given that $\Delta ABC \sim \Delta EDF$. Which of the following is not true ?

(A) $\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta EDF} = \frac{AB}{ED}$ (B) $\frac{AB}{ED} = \frac{AC}{EF}$

(C) $\angle A = \angle D, \angle C = \angle F$ (D) $\frac{AB + BC}{AC} = \frac{DE + DF}{EF}$

14. If the quadratic equation $9x^2 + 8kx + 16 = 0$ has real and equal roots, then the value of k is

(A) 3 (B) –3

(C) –4 (D) $\frac{3}{2}$

15. $\frac{1 + \tan^2 A}{1 + \cot^2 A}$ equals to :

(A) $\tan^2 A$ (B) –1

(C) $-\tan^2 A$ (D) $\cot^2 A$

16. यदि एक A.P. में प्रथम दस पदों का योग शून्य है जिसका प्रथम पद a और सार्व-अन्तर d है, तो निम्न में से कौन सा सम्बन्ध सही है ?

(A) $10a + 9d = 0$ (B) $2a = 9d$

(C) $a_{10} = -a$ (D) $a_{10} = a$

17. दो पासे एक साथ फेंके जाते हैं । प्राप्त संख्याओं के योग के अधिकतम 12 होने की प्रायिकता है

(A) 1 (B) 0

(C) $\frac{1}{2}$ (D) $\frac{35}{36}$

18. त्रिज्या 6.3 cm वाले वृत्त की चाप PQ केन्द्र पर θ कोण अंतरित करती है । यदि $\overset{\frown}{PQ} = 11$ cm है, तो θ का मान है

(A) 10^o (B) 60^o

(C) 45^o (D) 100^o

(अभिकथन एवं तर्क आधारित प्रश्न)

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

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

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

(C) अभिकथन (A) सही है, परन्तु तर्क (R) गलत है ।

(D) अभिकथन (A) गलत है, परन्तु तर्क (R) सही है ।

19. **अभिकथन (A)** : यदि किसी घटना के घटित होने की प्रायिकता $0.2p$, $p > 0$ है, तो p का मान 5 से अधिक नहीं हो सकता है ।

तर्क (R) : $P(\overline{E}) = 1 - P(E)$ जहाँ E एक घटना है ।

20. **अभिकथन (A)** : $(\sqrt{3} + \sqrt{5})$ एक अपरिमेय संख्या है ।

तर्क (R) : किन्हीं भी दो अपरिमेय संख्याओं का योग हमेशा अपरिमेय होता है ।

16. If sum of first ten terms of an A.P. is zero with a as the first term and d, the common difference, which of the following relation is true ?

(A) $10a + 9d = 0$ (B) $2a = 9d$

(C) $a_{10} = -a$ (D) $a_{10} = a$

17. Two dice are rolled together. The probability that sum of the numbers obtained is atmost 12, is

(A) 1 (B) 0

(C) $\frac{1}{2}$ (D) $\frac{35}{36}$

18. Arc PQ subtends an angle θ at the centre of the circle with radius 6.3 cm.

If $\overset{\frown}{PQ} = 11$ cm, then the value of θ is

(A) 10^o (B) 60^o

(C) 45^o (D) 100^o

(Assertion and Reason based Questions)

Direction : Question Numbers **19** and **20** are Assertion (A) and Reason (R) based questions. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below :

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

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

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

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

19. **Assertion (A) :** If probability of happening of an event is $0.2p$, $p > 0$, then p can't be more than 5.

Reason (R) : $P(\overline{E}) = 1 - P(E)$ for an event E.

20. **Assertion (A) :** $(\sqrt{3} + \sqrt{5})$ is an irrational number.

Reason (R) : Sum of the any two irrational numbers is always irrational.

खण्ड – ख

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

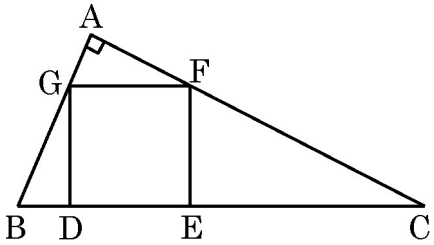
21. (a) सिद्ध कीजिये : $\frac{\tan\theta}{1+\tan^2\theta}+\frac{\cot\theta}{1+\cot^2\theta} = 2\sin\theta\cos\theta.$

अथवा

(b) मान ज्ञात कीजिये : $\frac{1-2\tan^2 30^\circ-\sec^2 45^\circ}{\sin^2 60^\circ}$

22. α तथा β, बहुपद $5x^2 - 16x - 10$ के शून्यक हैं । $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ का मान ज्ञात कीजिये ।

23. दी गयी आकृति में, DEFG एक वर्ग है । ΔABC एक समकोण त्रिभुज है जहाँ $\angle A = 90^\circ$ है । सिद्ध कीजिए कि $AG \times DG = AF \times DB$.



24. सत्यापित कीजिये कि द्विघात समीकरण $(p - q)x^2 + (q - r)x + (r - p) = 0$ के मूल बराबर हैं जब $q + r = 2p$ है ।

25. (a) सिद्ध कीजिए कि $2 + 3\sqrt{5}$ एक अपरिमेय संख्या है । दिया है कि $\sqrt{5}$ एक अपरिमेय संख्या है ।

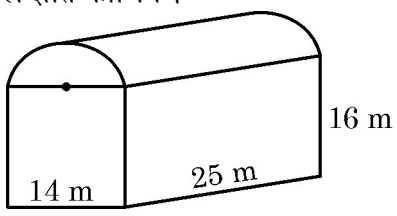
अथवा

(b) यदि 210 और 55 के HCF को $210 \times 5 + 55$ m के द्वारा व्यक्त किया जाये, तो m का मान ज्ञात कीजिए ।

खण्ड – ग

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

26. (a) पौधों को गरमी से बचाने के लिये, लोहे की छड़ों की सहायता से हरे रंग के कपड़े से ढका एक शेड बनाया गया । जैसा कि आकृति में दिखाया गया है – इसका निचला भाग घनाभ के आकार का है तथा ऊपरी भाग अर्धबेलनाकार है । यदि घनाभ की विमायें $14 \text{ m} \times 25 \text{ m} \times 16 \text{ m}$ हैं, तो प्रयुक्त कपड़े का क्षेत्रफल ज्ञात कीजिये ।



अथवा

SECTION – B

Q. Numbers 21 to 25 are very short answer type questions of 2 marks each.

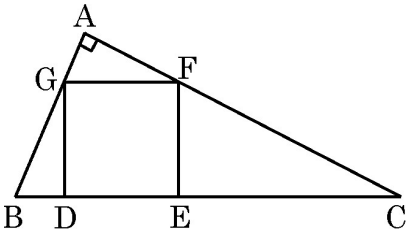
21. (a) Prove that : $\frac{\tan\theta}{1+\tan^2\theta}+\frac{\cot\theta}{1+\cot^2\theta} = 2\sin\theta\cos\theta$.

OR

(b) Evaluate : $\frac{1-2\tan^2 30^\circ-\sec^2 45^\circ}{\sin^2 60^\circ}$

22. α and β are the zeroes of the polynomial $5x^2 - 16x - 10$. Find the value of $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$.

23. In the given figure, DEFG is a square. ΔABC is right angle triangle with $\angle A = 90^\circ$. Prove that AG × DG = AF × DB.



24. Verify that roots of the quadratic equation $(p - q)x^2 + (q - r)x + (r - p) = 0$ are equal when $q + r = 2p$.

25. (a) Prove that $2 + 3\sqrt{5}$ is an irrational number given that $\sqrt{5}$ is irrational number.

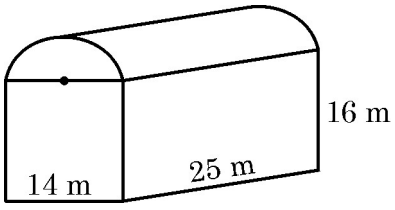
OR

(b) If the HCF of 210 and 55 is expressed as $210 \times 5 + 55m$, then find the value of m.

SECTION – C

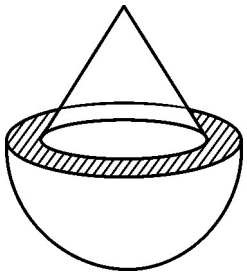
Q. Numbers 26 to 31 are short answer type questions of 3 marks each.

26. (a) To protect plants from heat, a shed of iron rods covered with green cloth is made. The lower part of the shed is a cuboid mounted by semi-cylinder as shown in the figure. Find the area of the cloth required to make this shed, if dimensions of the cuboid are 14 m × 25 m × 16 m



OR

(b) एक खोखले अर्धगोले की आंतरिक तथा बाह्य त्रिज्याएँ क्रमश: $5\sqrt{2}$ cm तथा 10 cm हैं । त्रिज्या $5\sqrt{2}$ cm तथा ऊँचाई $5\sqrt{7}$ cm वाला एक शंकु आकृति में दर्शायेनुसार अर्धगोले पर अध्यारोपित है । वस्तु का सम्पूर्ण पृष्ठीय क्षेत्रफल π के पदों में ज्ञात कीजिये । ($\sqrt{2}$ = 1.4 लीजिये)



27. एक थैले में 30 गेंदें हैं जिसमें से 'm' गेंदें नीले रंग की हैं ।

(i) एक गेंद को यादृच्छया थैले में से निकाला जाता है । प्रायिकता ज्ञात कीजिये कि निकाली गयी गेंद नीले रंग की नहीं है ।

(ii) थैले में 6 नीली गेंदें और डाल दी जाती है । अब निकाली गयी गेंद के नीले रंग के होने की प्रायिकता पहले से $\frac{5}{4}$ गुना हो जाती है । m का मान ज्ञात कीजिये ।

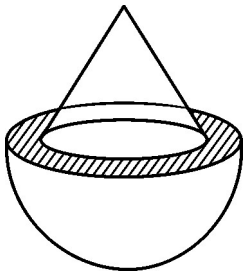
28. वह सबसे बड़ी संख्या ज्ञात कीजिये जिससे 764 तथा 1198 को विभाजित करने पर शेषफल क्रमश: 8 तथा 10 प्राप्त होता है ।

29. (a) कक्षा की एक परीक्षा में, वीर ने केविन के प्राप्तांकों के दोगुने से 6 अधिक अंक प्राप्त किये । यदि दोनों में से किसी के भी 4 अंक अधिक आए होते, तो उनके प्राप्तांकों का योग 40 हो जाता । वीर तथा केविन के प्राप्तांक ज्ञात कीजिए ।

अथवा

(b) रैखिक समीकरणों $3x + y = 14$ तथा $y = 2$ को ग्राफीय विधि से हल कीजिये ।

(b) The internal and external radii of a hollow hemisphere are $5\sqrt{2}$ cm and 10 cm respectively. A cone of height $5\sqrt{7}$ cm and radius $5\sqrt{2}$ cm is surmounted on the hemisphere as shown in the figure. Find the total surface area of the object in terms of π. (Use $\sqrt{2}$ = 1.4)



27. A bag contains 30 balls out of which 'm' number of balls are blue in colour.

(i) Find the probability that a ball drawn at random from the bag is not blue.

(ii) If 6 more blue balls are added in the bag, then the probability of drawing a blue ball will be $\frac{5}{4}$ times the probability of drawing a blue ball in the first case. Find the value of m.

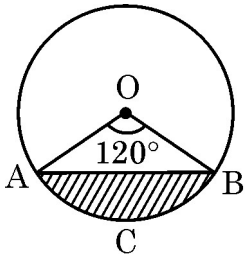
28. Find the greatest number which divides 764 and 1198, leaving remainders 8 and 10 respectively.

29. (a) In a class test, Veer scored 6 more than twice as many marks as Kevin scored. If one of them had scored 4 more marks, their total score would have been 40. Find the marks obtained by Veer and Kevin.

OR

(b) Solve the linear equations $3x + y = 14$ and $y = 2$ graphically.

30. $\frac{21}{2}$ cm त्रिज्या तथा केन्द्र O वाले वृत्त पर जीवा AB, केन्द्र पर 120° का कोण अंतरित करती है । छायांकित भाग ACB का परिमाप ज्ञात कीजिये । ($\sqrt{3} = 1.7$ लीजिये)



31. यदि $\sec\theta + \tan\theta = m$ है तो दर्शाइये कि $\frac{m^2 - 1}{m^2 + 1} = \sin\theta$ है ।

खण्ड – घ

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

32. एक पतंग भूमि की सतह से 60 m की ऊँचाई पर उड़ रही है । इस पतंग की डोरी को रवि ने कसकर पकड़ा हुआ है जो कि अपने घर की छत पर खड़ा है । यहाँ से पतंग का उन्नयन कोण 30° है । इसी घर के पाद बिन्दु से पतंग का उन्नयन कोण 45° है । पतंग की डोरी की लम्बाई तथा छत की भूमि से ऊँचाई ज्ञात कीजिए । ($\sqrt{3} = 1.73$ लीजिए ।)

33. (a) एक व्यक्ति के पास अपनी यात्रा पर होने वाले खर्चे के लिये ₹ 5,400 है । यदि वह अपनी यात्रा की अवधि को 5 दिन के लिये बढ़ाता है तो उसे प्रतिदिन के खर्चे में से ₹ 180 कम करने होंगे । यात्रा की मूल अवधि तथा प्रतिदिन होने वाले खर्चे का मूल्य ज्ञात कीजिये ।

अथवा

(b) कपड़े के एक टुकड़े की कीमत ₹ 2,100 थी । एक विशेष मौके पर दुकानदार ने 2 m अतिरिक्त कपड़ा मुफ्त में देने की पेशकश की जिससे कपड़े का प्रति मीटर मूल्य ₹ 120 से कम हो गया । कपड़े की मूल लम्बाई ज्ञात कीजिये । कपड़े का मूल मूल्य प्रति मीटर भी ज्ञात कीजिए ।

34. (a) निम्न बारंबारता बंटन का माध्य तथा बहुलक ज्ञात कीजिये :

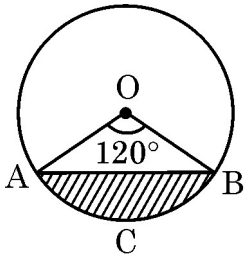
वर्ग :	10–30	30–50	50–70	70–90	90–110	110–130	130–150
बारम्बारता :	6	8	12	10	14	11	9

अथवा

(b) यदि नीचे दिए गए बंटन का माध्यक 28.5 है, तो x तथा y के मान ज्ञात कीजिये :

वर्ग :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	**योग**
बारम्बारता :	5	x	20	15	y	5	**60**

30. Chord AB subtends an angle of 120° at the centre O of the circle with radius $\frac{21}{2}$ cm. Find the perimeter of shaded segment ACB. (Use $\sqrt{3} = 1.7$)



31. If $\sec\theta + \tan\theta = m$, show that $\frac{m^2 - 1}{m^2 + 1} = \sin\theta$.

SECTION – D

Q. Numbers 32 to 35 are long answer type questions of 5 marks each.

32. A kite is flying at a height of 60 m above the ground level. Ravi, standing at the roof of the house is holding the string straight and observes the angle of elevation of kite as 30°. From the bottom of the same building, the angle of elevation of kite is 45°. Find the length of the string and height of roof from the ground. (Use $\sqrt{3} = 1.73$)

33. (a) A person on tour has ₹ 5,400 for his expenses. If he extends his tour by 5 days, he has to cut down his daily expenses by ₹ 180. Find the original duration of the tour and daily expense.

OR

(b) The total cost of certain piece of cloth was ₹ 2,100. During special sale time, the shopkeeper offered 2 m extra cloth for free thus reducing the price of cloth per metre by ₹ 120. What was the original per metre price of cloth and its length ?

34. (a) Find mean and mode of the following frequency distribution :

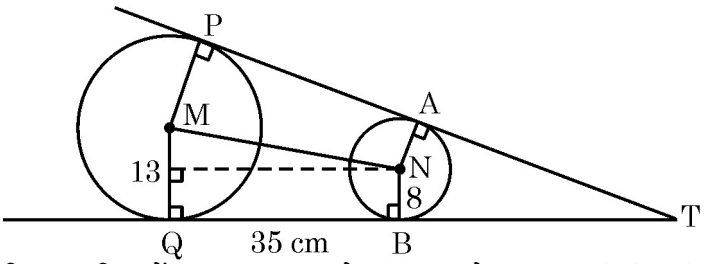
Class :	10–30	30–50	50–70	70–90	90–110	110–130	130–150
Frequency :	6	8	12	10	14	11	9

OR

(b) If the median of the distribution given below is 28.5, find the values of *x* and y.

Class :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	**Total**
Frequency :	5	*x*	20	15	y	5	**60**

35.



दिए गए चित्र में TP तथा TQ केन्द्र M वाले वृत्त पर खींची गयी स्पर्श–रेखायें हैं जो N केन्द्र वाले एक अन्य वृत्त को क्रमश: A तथा B बिन्दु पर स्पर्श करती हैं । दिया गया है कि MQ = 13 cm, NB = 8 cm, BQ = 35 cm तथा TP = 80 cm है ।

(i) चतुर्भुज MQBN का नाम बताइये । **1**

(ii) क्या MN, PA के समांतर है ? तर्क सहित उत्तर दीजिये । **1**

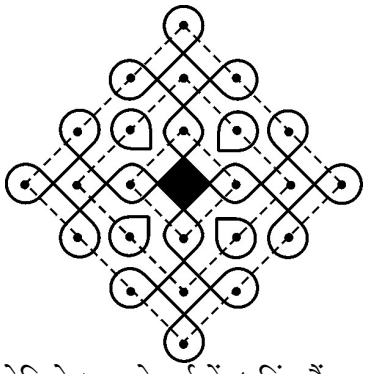
(iii) TB की लम्बाई ज्ञात कीजिये । **1**

(iv) MN की लम्बाई ज्ञात कीजिये । **2**

खण्ड – ङ

प्रश्न संख्या 36 से 38 तक प्रकरण अध्ययन आधारित 4 अंकों के प्रश्न हैं ।

36. 'कोलम' एक रंगोली का नाम है जो दक्षिण भारतीय राज्यों में चावल के आटे द्वारा बनायी जाती है । इसे बिंदुओं के ग्रिड पैटर्न पर बनाते हैं । ऐसी ही एक रंगोली नीचे दिखायी गयी है :



दी गयी आकृति को ध्यानपूर्वक देखिये । पहले वर्ग में 4 बिंदु हैं, दूसरे वर्ग में 8 बिंदु, तीसरे वर्ग में 12 बिंदु हैं । इसी प्रकार पैटर्न बढ़ता जाता है ।

उपरोक्त के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i) दर्शाइये कि ऊपर दी गयी बिंदुओं की संख्या एक समांतर श्रेढ़ी बनाती है । इसका प्रथम पद तथा सार्वअंतर लिखिये । **1**

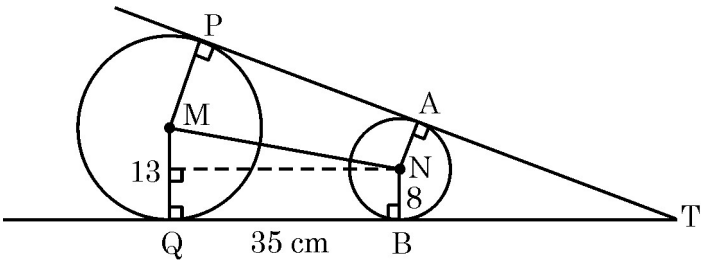
(ii) इस A.P. का nवाँ पद लिखिये । **1**

(iii) (a) एक खुले बड़े मैदान पर इसी पैटर्न को बढ़ाया गया । यदि कुल 220 बिंदुओं का उपयोग हुआ हो तो बने हुये वर्गों की संख्या ज्ञात कीजिये । **2**

अथवा

(b) क्या 100 बिंदुओं का प्रयोग करते हुये पूरे–पूरे n वर्ग बनाये जा सकते हैं ? यदि हाँ, तो n का मान बताइये ।

35.



In the given figure, TP and TQ are tangents to a circle with centre M, touching another circle with centre N at A and B respectively. It is given that MQ = 13 cm, NB = 8 cm, BQ = 35 cm and TP = 80 cm.

(i) Name the quadrilateral MQBN. **1**

(ii) Is MN parallel to PA ? Justify your answer. **1**

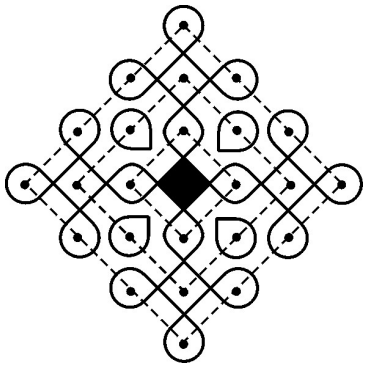
(iii) Find length TB. **1**

(iv) Find length MN. **2**

SECTION – E

Q. Numbers 36 to 38 are case based questions of 4 marks each.

36. 'Kolam' is a decorative art which is made with rice flour in South Indian States. It is drawn on grid pattern of dots. One such art work is shown below.



Observe the given figure carefully. There are 4 dots in first square, 8 dots in second square, 12 dots in third square and so on.

Based on the above, answer the following questions :

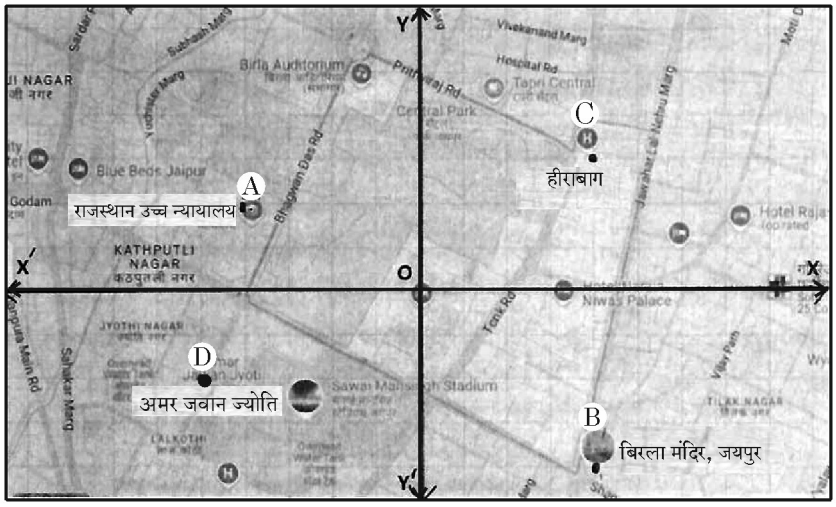
(i) Show that number of dots given above form an A.P. Write the first term and common difference. **1**

(ii) Write n^{th} term of the A.P. formed. **1**

(iii) (a) The pattern is expanded on a large ground. If total 220 dots are used, then find the number of squares formed. **2**

OR

(b) Is it possible to complete n number of squares using 100 dots ? If yes, then find the value of n.

37. 

जयपुर शहर के दिये गये नक्शे को ध्यानपूर्वक देखिये जिसे एक कार्तीय तल (Cartesian plane) पर रखा गया है । रामबाग महल को मूलबिन्दु मानते हुये, कुछ स्थानों के निर्देशांक नीचे दिये गये हैं :

बिन्दु A : (–4, 2) राजस्थान उच्च न्यायालय

बिन्दु B : (4, –4) बिरला मन्दिर

बिन्दु C : (4, 3) हीरा बाग

बिन्दु D : (–5, –2) अमर जवान ज्योति

इस आधार पर निम्न प्रश्नों के उत्तर दीजिये :

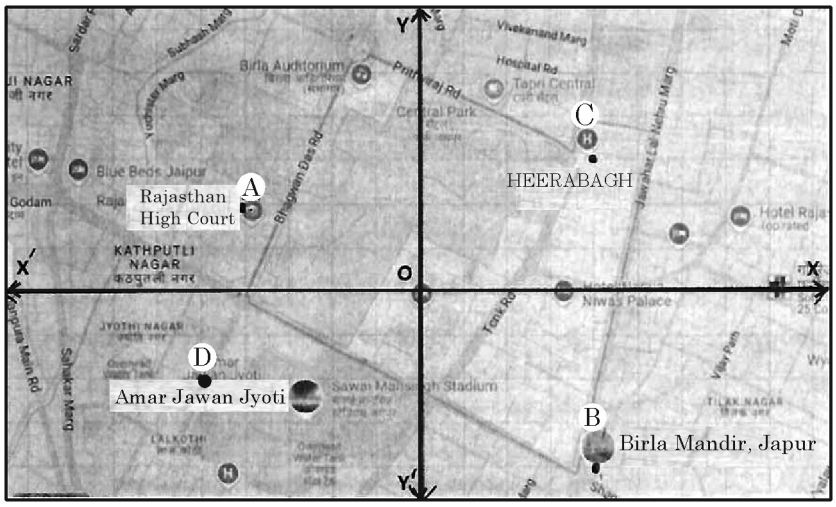
(i) वकील रेहाना हीरा बाग में रहती हैं । उन्हें प्रतिदिन घर से न्यायालय तथा वापिस घर आने में, कितनी दूरी तय करनी होती है ? **1**

(ii) X-अक्ष पर एक चौराहा है जो AD को एक निश्चित अनुपात में विभाजित करता है । अनुपात ज्ञात कीजिये । **1**

(iii) (a) क्या बिरला मन्दिर, हीरा बाग तथा अमर जवान ज्योति से समान दूरी पर है ? तर्क सहित उत्तर दीजिये । **2**

अथवा

(b) विभाजन सूत्र का प्रयोग करते हुये दर्शाइये कि बिंदु A, O तथा B सरेखीय नहीं हैं ।

37. 

Observe the map of Jaipur city placed on a Cartesian plane. Taking Rambagh Palace as origin, the location of some places are given below :

Point A : (–4, 2) Rajasthan High Court

Point B : (4, –4) Birla Mandir

Point C : (4, 3) Heera Bagh

Point D : (–5, –2) Amar Jawan Jyoti

Based on the above, answer the following questions :

(i) Advocate Rehana stays at Heera Bagh. How much distance she has to cover daily to go to the court and coming back home ? **1**

(ii) There is a crossing on X-axis which divides AD in a certain ratio. Find the ratio. **1**

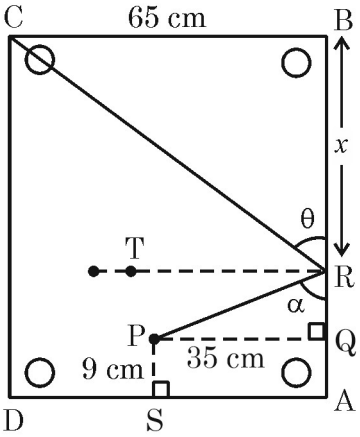
(iii) (a) Is Birla Mandir equidistant from Heera Bagh and Amar Jawan Jyoti ? Justify your answer. **2**

OR

(b) Using section formula, show that points A, O and B are not collinear.

38.





कैरम बोर्ड एक लोकप्रिय खेल है । बोर्ड वर्गाकार है जिसकी भुजा की लम्बाई 65 cm है । इसके प्रत्येक कोने में एक वृत्ताकार छेद है ।

अंश, बिन्दु P पर रखी गोटी पर स्ट्राइकर से निशाना लगाता है । गोटी बोर्ड की R दीवार से टकराती हुई सीधे कोने C पर बने छेद में गिर जाती है । दिया गया है कि PS = 9 cm, PQ = 35 cm, BR = x, $\angle PRQ = \alpha$ तथा $\angle CRB = \theta$ है ।

उपरोक्त जानकारी के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i) परावर्तन के नियम (i.e. $\angle PRT = \angle CRT$) का प्रयोग करते हुए सिद्ध कीजिये कि $\theta = \alpha$ । **1**

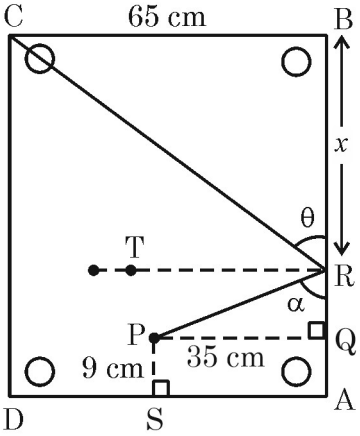
(ii) सिद्ध कीजिये कि $\Delta PQR \sim \Delta CBR$ है जहाँ PQ, भुजा AB पर लम्ब है । **1**

(iii) (a) त्रिभुजों की समरूपता का प्रयोग करते हुये x का मान ज्ञात कीजिये । **2**

अथवा

(b) यदि $\frac{\Delta PQR \text{ का क्षेत्रफल}}{\Delta CBR \text{ का क्षेत्रफल}} = \frac{PQ^2}{CB^2}$ है, तो x का मान ज्ञात कीजिए ।

38. 



Carom board is a very popular game. The board is a square of side length 65 cm. It has circular pockets in each corner.

Ansh strikes a disc, kept at position P with a striker. The disc, hits the boundary of the board at R and goes straight to pocket at corner C. It is given that PS = 9 cm, PQ = 35 cm, BR = x, $\angle PRQ = \alpha$ and $\angle CRB = \theta$.

Based on the above information, answer the following questions :

(i) Using law of reflection i.e. $\angle PRT = \angle CRT$, prove that $\theta = \alpha$. **1**

(ii) Prove that $\Delta PQR \sim \Delta CBR$ given that PQ is perpendicular to AB. **1**

(iii) (a) Find the value of x using similarity of triangles. **2**

OR

(b) If $\frac{\text{Area } \Delta PQR}{\text{Area } \Delta CBR} = \frac{PQ^2}{CB^2}$, then find the value of x.



Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2026
MATHEMATICS (STANDARD) (041) (PAPER CODE 30/4/3)

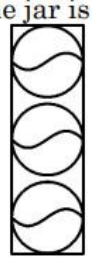
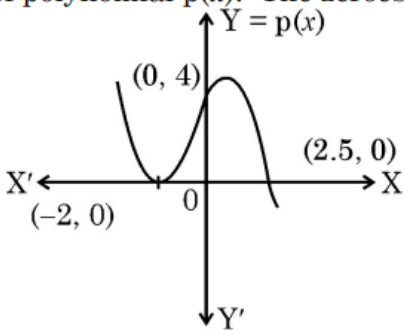
General Instructions: -

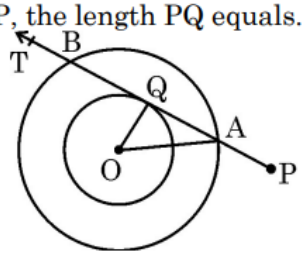
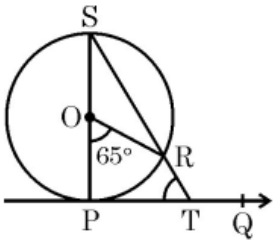
1.	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested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

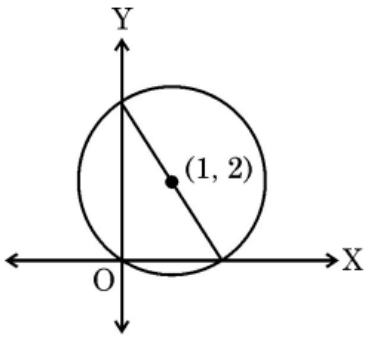
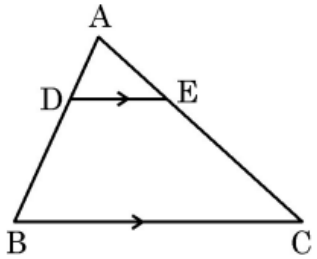
9.	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note **"Extra Question"**.
10.	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11.	A full scale of marks 0 to 80 (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12.	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
13.	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong totalling of marks awarded to an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. ● Wrong question wise totalling on the title page. ● Wrong totalling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to Online Award List. ● Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) ● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14.	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15.	Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16.	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for Spot Evaluation**" before starting the actual evaluation.
17.	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
18.	The candidates are entitled to obtain Photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/4/3)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Step	Marks
	SECTION – A **Q. Number 1 to 20 are multiple choice questions of 1 mark each.**		
1.	The distance between the points $(a\cos\theta + b\sin\theta, 0)$ and $(0, a\sin\theta - b\cos\theta)$ is (A) $\sqrt{a^2+b^2}$ (B) a^2-b^2 (C) $\sqrt{a^2-b^2}$ (D) a^2+b^2		
Sol.	(A) $\sqrt{a^2+b^2}$		**1**
2.	An ice-cream cone of radius r and height h is completely filled by two spherical scoopes of ice-cream. If radius of each spherical scoop is $\frac{r}{2}$, then h : 2r equals (A) 1 : 8 (B) 1 : 2 (C) 1 : 1 (D) 2 : 1		
Sol.	(B) 1 : 2		**1**
3.	The value of k for which the system of linear equations $kx - y - 2 = 0$ and $6x - 2y - 3 = 0$ has infinitely many solutions, is (does) (A) $\frac{1}{2}$ (B) 3 (C) 4 (D) Not exist		
Sol.	(D) Not exist		**1**
4.	A circle is divided into 16 identical sectors. If radius of the circle is 7 cm, area of each sector is (A) $\frac{77}{4}$ cm^2 (B) 77 cm^2 (C) 154 cm^2 (D) $\frac{77}{8}$ cm^2		

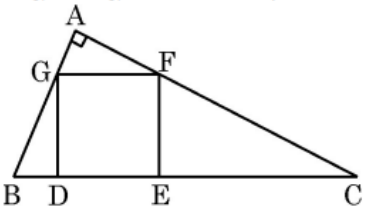
Sol.	(D) $\frac{77}{8}$ cm^2		**1**
5.	Mean and Median of a frequency distribution are 43 and 40 respectively. The value of mode is (A) 34 (B) 43 (C) 38.5 (D) 41.5		
Sol.	(A) 34		**1**
6.	Three tennis balls are just packed in a cylindrical jar. If radius of each ball is r, volume of air inside the jar is  (A) $2\pi r^3$ (B) $3\pi r^3$ (C) $5\pi r^3$ (D) $4\pi r^3$		
Sol.	(A) $2\pi r^3$		**1**
7.	Observe the graph of polynomial p(x). The zeroes of the polynomial are  (A) –2, 0, 2.5 (B) –2, 2.5 (C) 0, 4 (D) –2, 0		
Sol.	(B) –2, 2.5		**1**

8.	From an external point P, a tangent PT has been drawn to a circle with centre at O and radius 3 cm, intersecting its concentric circle at A and B. If AB = 8 cm and OA = AP, the length PQ equals.  (A) 8 cm (B) 10 cm (C) 9 cm (D) 12 cm		
Sol.	(C) 9 cm		**1**
9.	$\frac{\sec^2 A - 1}{\sin^2 A}$ is same as (A) $\cos^2 A$ (B) $\sec^2 A$ (C) $-\sec^2 A$ (D) $\cot^2 A$		
Sol.	(B) $\sec^2 A$		**1**
10.	PQ is tangent to a circle with centre O. If $\angle POR = 65^\circ$, then $m\angle PTR$ is  (A) 65° (B) 58.5° (C) 57.5° (D) 45°		
Sol.	(C) 57.5°		**1**

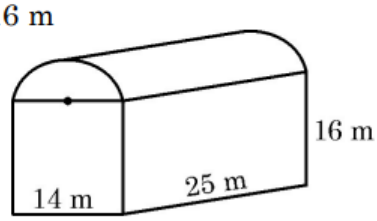
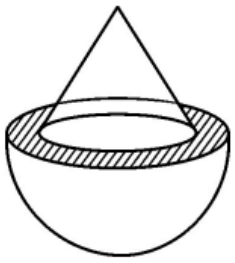
11.	In the given figure, a circle is centred at (1, 2). The diameter of the circle is  (A) 4 (B) $2\sqrt{2}$ (C) $\sqrt{5}$ (D) $2\sqrt{5}$		
Sol.	(D) $2\sqrt{5}$		**1**
12.	In the given figure, DE $\parallel$ BC. If $\frac{AD}{DB} = \frac{1}{3}$ and AC = 6 cm, then length AE is  (A) 1.5 cm (B) 1 cm (C) 2 cm (D) 3 cm		
Sol.	(A) 1.5 cm		**1**
13.	It is given that $\Delta ABC \sim \Delta EDF$. Which of the following is not true ? (A) $\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta EDF} = \frac{AB}{ED}$ (B) $\frac{AB}{ED} = \frac{AC}{EF}$ (C) $\angle A = \angle D, \angle C = \angle F$ (D) $\frac{AB + BC}{AC} = \frac{DE + DF}{EF}$		
Sol.	(C) $\angle A = \angle D, \angle C = \angle F$		**1**
14.	If the quadratic equation $9x^2 + 8kx + 16 = 0$ has real and equal roots, then the value of k is (A) 3 (B) –3 (C) –4 (D) $\frac{3}{2}$		

Sol.	(A) 3 **OR** (B) −3		**1**
15.	$\frac{1+\tan^2 A}{1+\cot^2 A}$ equals to : (A) $\tan^2 A$ (B) -1 (C) $-\tan^2 A$ (D) $\cot^2 A$		
Sol.	(A) $\tan^2 A$		**1**
16.	If sum of first ten terms of an A.P. is zero with a as the first term and d, the common difference, which of the following relation is true ? (A) $10a + 9d = 0$ (B) $2a = 9d$ (C) $a_{10} = -a$ (D) $a_{10} = a$		
Sol.	(C) $a_{10} = -a$		**1**
17.	Two dice are rolled together. The probability that sum of the numbers obtained is atmost 12, is (A) 1 (B) 0 (C) $\frac{1}{2}$ (D) $\frac{35}{36}$		
Sol.	(A) 1		**1**
18.	Arc PQ subtends an angle θ at the centre of the circle with radius 6.3 cm. If $\overset{\frown}{PQ} = 11$ cm, then the value of θ is (A) 10° (B) 60° (C) 45° (D) 100°		
Sol.	(D) 100°		**1**

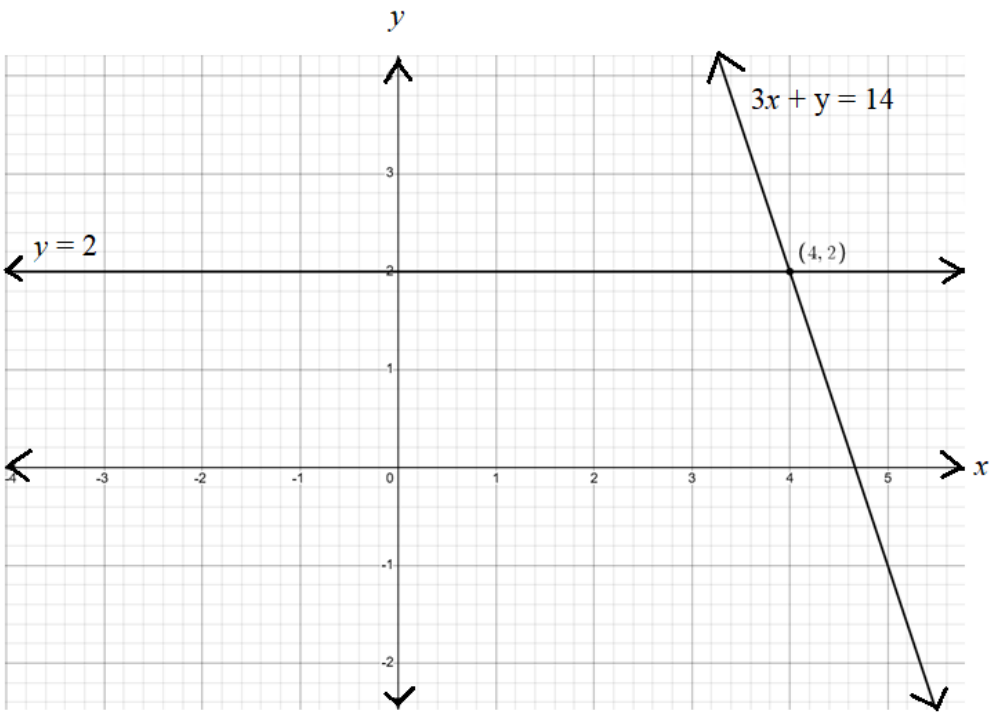
	*Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.* (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.		
19.	**Assertion (A) :** If probability of happening of an event is 0.2p, p > 0, then p can't be more than 5. **Reason (R) :** $P(\overline{E}) = 1 - P(E)$ for an event E.		
Sol.	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).		**1**
20.	**Assertion (A) :** $(\sqrt{3} + \sqrt{5})$ is an irrational number. **Reason (R) :** Sum of the any two irrational numbers is always irrational.		
Sol.	(C) Assertion (A) is true, but Reason (R) is false.		**1**
	SECTION – B **Q. Numbers 21 to 25 are very short answer type questions of 2 marks each.**		
21 (a)	Prove that : $\frac{\tan\theta}{1+\tan^2\theta} + \frac{\cot\theta}{1+\cot^2\theta} = 2\sin\theta\cos\theta$.		
Sol.	L.H.S. $= \frac{\tan\theta}{\sec^2\theta} + \frac{\cot\theta}{\text{cosec}^2\theta}$ $= \frac{\sin\theta}{\cos\theta} \times \cos^2\theta + \frac{\cos\theta}{\sin\theta} \times \sin^2\theta$ $= 2\sin\theta\cos\theta$ = R.H.S.	**I** **II** **III**	**1** **½** **½**
	OR		

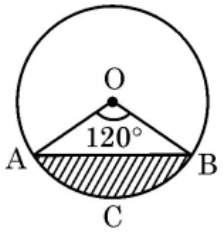
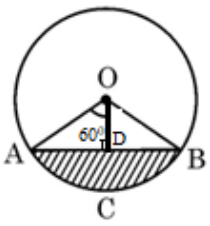
21 (b)	Evaluate : $\dfrac{1-2\tan^2 30^\circ - \sec^2 45^\circ}{\sin^2 60^\circ}$		
Sol.	$= \dfrac{1-2\times\left(\frac{1}{\sqrt{3}}\right)^2-\left(\sqrt{2}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2}$	**I**	**1½**
	$= \dfrac{-20}{9}$	**II**	**½**
22.	α and β are the zeroes of the polynomial $5x^2 - 16x - 10$. Find the value of $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$.		
Sol.	$\alpha+\beta = \frac{16}{5}$, $\alpha\beta = -2$	**I**	**1**
	$\therefore \frac{\alpha}{\beta}+\frac{\beta}{\alpha} = \frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta} = \frac{\left(\frac{16}{5}\right)^2+4}{-2}$	**II**	**½**
	$= -\frac{356}{50}$ or $-\frac{178}{25}$	**III**	**½**
23.	In the given figure, DEFG is a square. ΔABC is right angle triangle with $\angle A = 90^\circ$. Prove that AG × DG = AF × DB. 		
Sol.	DEFG is a square. ∴ GF ∥ BE	**I**	**½**
	$\Rightarrow \angle$ GBD = $\angle$ AGF	**II**	**½**
	∴ ΔGAF ~ ΔBDG	**III**	**½**
	$\Rightarrow \frac{AG}{DB} = \frac{AF}{DG}$		
	$\Rightarrow$ AG × DG = AF × DB	**IV**	**½**

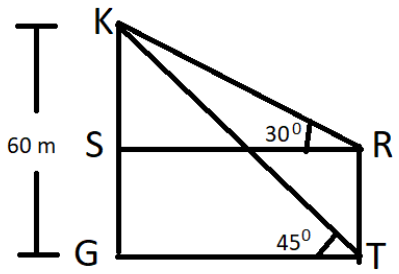
24.	Verify that roots of the quadratic equation $(p - q)x^2 + (q - r)x + (r - p) = 0$ are equal when $q + r = 2p$.		
Sol.	Discriminant (D) $= (q - r)^2 - 4(p - q)(r - p)$ $= (q + r - 2p)^2$ Substituting, $q + r = 2p$ $\Rightarrow D = (2p - 2p)^2 = 0$ $\therefore$ Roots of the given equation are equal.	**I** **II** **III** **IV**	½ ½ ½ ½
25 (a)	Prove that $2 + 3\sqrt{5}$ is an irrational number given that $\sqrt{5}$ is irrational number.		
Sol.	Let $2 + 3\sqrt{5}$ be a rational number. $\therefore 2 + 3\sqrt{5} = \frac{p}{q}$, where $q \neq 0$ and p and q are integers. $\Rightarrow \sqrt{5} = \frac{p-2q}{3q}$ As $\frac{p-2q}{3q}$ is a rational number, so $\sqrt{5}$ is rational. But we know that $\sqrt{5}$ is irrational. $\therefore$ Our assumption is wrong. Hence, $2 + 3\sqrt{5}$ is an irrational number.	**I** **II** **III**	½ ½ **1**
	OR		
25 (b)	If the HCF of 210 and 55 is expressed as $210 \times 5 + 55m$, then find the value of m.		
Sol.	$210 = 2 \times 3 \times 5 \times 7$ $55 = 5 \times 11$ H.C.F. $(210, 55) = 5$ $\therefore 5 = 210 \times 5 + 55m$	**I** **II**	**1** ½

	$\Rightarrow m = -19$	**III**	**½**
	SECTION – C **Q. Numbers 26 to 31 are short answer type questions of 3 marks each.**		
26 (a)	To protect plants from heat, a shed of iron rods covered with green cloth is made. The lower part of the shed is a cuboid mounted by semi-cylinder as shown in the figure. Find the area of the cloth required to make this shed, if dimensions of the cuboid are 14 m × 25 m × 16 m  		
Sol.	Area of cloth required to cover four walls = $2(14 \times 16 + 25 \times 16)$ $= 1248\ m^2$	**I**	**1**
	Radius = $\frac{14}{2} = 7$ m		
	Area of cloth required to cover cylindrical part = $\frac{22}{7} \times 7 \times 25 + \frac{22}{7} \times 7^2$	**II**	**1**
	$= 704\ m^2$	**III**	**½**
	∴ Area of total cloth required = 1248 + 704 = 1952 m^2	**IV**	**½**
	OR		
26 (b)	The internal and external radii of a hollow hemisphere are $5\sqrt{2}$ cm and 10 cm respectively. A cone of height $5\sqrt{7}$ cm and radius $5\sqrt{2}$ cm is surmounted on the hemisphere as shown in the figure. Find the total surface area of the object in terms of π. (Use $\sqrt{2} = 1.4$) 		

Sol.	Let internal and external radii be $r_1 = 5\sqrt{2}$ cm and $r_2 = 10$ cm respectively.		
	$\therefore$ Slant height (l) of the cone = $\sqrt{(5\sqrt{2})^2 + (5\sqrt{7})^2} = 15$ cm	**I**	**1**
	Now, the total surface area of the object = $2\pi r_2^2 + \pi r_1 l + \pi(r_2^2 - r_1^2)$		
	$= \pi (2\times 10^2 + 5\sqrt{2} \times 15 + 10^2 - (5\sqrt{2})^2)$	**II**	**1**
	$= 355\ \pi$ cm^2	**III**	**1**
27.	A bag contains 30 balls out of which 'm' number of balls are blue in colour. (i) Find the probability that a ball drawn at random from the bag is not blue. (ii) If 6 more blue balls are added in the bag, then the probability of drawing a blue ball will be $\frac{5}{4}$ times the probability of drawing a blue ball in the first case. Find the value of m.		
Sol.	(i) P(ball drawn is not blue) = $\frac{30-m}{30}$ or $1 - \frac{m}{30}$	**I**	**1**
	(ii) Total number of balls now = 36		
	Number of blue balls now = m + 6		
	P(ball drawn is blue) = $\frac{m+6}{36}$	**II**	**1**
	According to question, $\frac{m+6}{36} = \frac{5}{4} \times \frac{m}{30}$	**III**	**½**
	$\Rightarrow$ m = 12	**IV**	**½**
28.	Find the greatest number which divides 764 and 1198, leaving remainders 8 and 10 respectively.		
Sol.	764 – 8 = 756 and 1198 – 10 = 1188	**I**	**1**
	$756 = 2^2 \times 3^3 \times 7$	**II**	**½**
	$1188 = 2^2 \times 3^3 \times 11$	**III**	**½**
	H.C.F. (756, 1188) = $2^2 \times 3^3 = 108$	**IV**	**1**

	∴ Required greatest number is 108.		
29 (a)	In a class test, Veer scored 6 more than twice as many marks as Kevin scored. If one of them had scored 4 more marks, their total score would have been 40. Find the marks obtained by Veer and Kevin.		
Sol.	Let the marks obtained by Veer and Kevin be V and K respectively. According to the question, V = 2K + 6 …. (i) V + K + 4 = 40 …. (ii) Solving (i) and (ii) we get, V = 26 and K = 10 ∴ Veer obtained 26 marks and Kevin obtained 10 marks.	**I** **II** **III**	**1** **1** **½+ ½**
	OR		
29 (b)	Solve the linear equations $3x + y = 14$ and $y = 2$ graphically.		
Sol.	 Correct graph of 3x + y = 14	**I**	**1½**

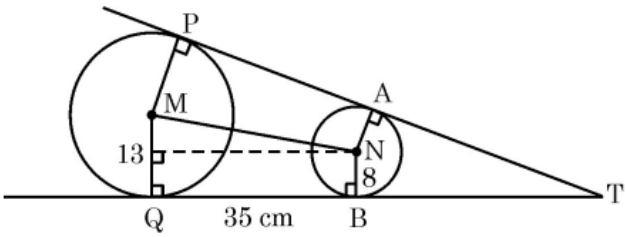
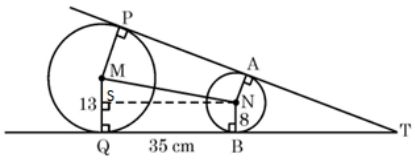
	Correct graph of y = 2 Correct solution: x = 4, y = 2	**II** **III**	**½** **1**
30.	Chord AB subtends an angle of 120° at the centre O of the circle with radius $\frac{21}{2}$ cm. Find the perimeter of shaded segment ACB. (Use $\sqrt{3}$ = 1.7)  		
Sol.	 Draw OD ⊥ AB ∴ ∠ AOD = 60^0 $\Rightarrow \sin 60^0 = \frac{\sqrt{3}}{2} = \frac{AD}{\frac{21}{2}}$ $\Rightarrow AD = \frac{21\sqrt{3}}{4}$ cm $\Rightarrow AB = 2 \times AD = \frac{21\sqrt{3}}{2}$ cm Also, length of minor arc AB = $\frac{120}{360} \times 2 \times \frac{22}{7} \times \frac{21}{2}$ = 22 cm ∴ Perimeter of shaded region = $\left(22 + \frac{21\sqrt{3}}{2}\right)$ = 39.85 cm	**I** **II** **III** **IV**	**1** **½** **1** **½**
31.	If sec θ + tan θ = m, show that $\frac{m^2 - 1}{m^2 + 1} = \sin \theta$.		
Sol.	L.H.S. = $\frac{m^2 - 1}{m^2 + 1}$		

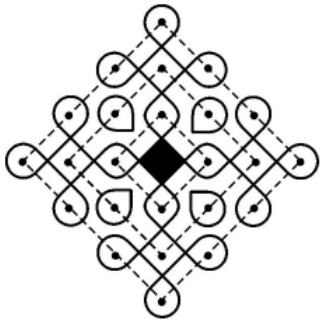
	$= \frac{(\sec\theta+\tan\theta)^2 - (\sec^2\theta - \tan^2\theta)}{(\sec\theta+\tan\theta)^2 + (\sec^2\theta - \tan^2\theta)}$ $= \frac{(\sec\theta+\tan\theta)\,(\sec\theta+\tan\theta - \sec\theta+\tan\theta)}{(\sec\theta+\tan\theta)\,(\sec\theta+\tan\theta + \sec\theta - \tan\theta)}$ $= \frac{\tan\theta}{\sec\theta}$ $= \sin\theta$ = R.H.S.	**I** **II** **III** **IV**	**1** **1** **½** **½**
	SECTION – D **Q. Numbers 32 to 35 are long answer type questions of 5 marks each.**		
32.	A kite is flying at a height of 60 m above the ground level. Ravi, standing at the roof of the house is holding the string straight and observes the angle of elevation of kite as 30°. From the bottom of the same building, the angle of elevation of kite is 45°. Find the length of the string and height of roof from the ground. (Use $\sqrt{3}$ = 1.73)		
Sol.	 Let K be the position of kite and TR is the height of building. Correct figure $\therefore \tan 45^0 = 1 = \frac{60}{GT}$ $\Rightarrow$ GT = 60 m Also, $\tan 30^0 = \frac{1}{\sqrt{3}} = \frac{KS}{SR}$ $\Rightarrow$ KS = $20\sqrt{3}$ m or 34.6 m Hence, TR = $(60 - 20\sqrt{3})$ m = 60 – 34.6 = 25.4 m Also, $\sin 30^0 = \frac{1}{2} = \frac{KS}{KR} = \frac{20\sqrt{3}}{KR}$ $\Rightarrow$ KR = $40\sqrt{3}$ = 69.2 m $\therefore$ The length of the string = 69.2 m and height of roof from the ground = 25.4 m	**I** **II** **III** **IV** **V** **VI** **VII**	**1** **1** **1** **½** **½** **½** **½**

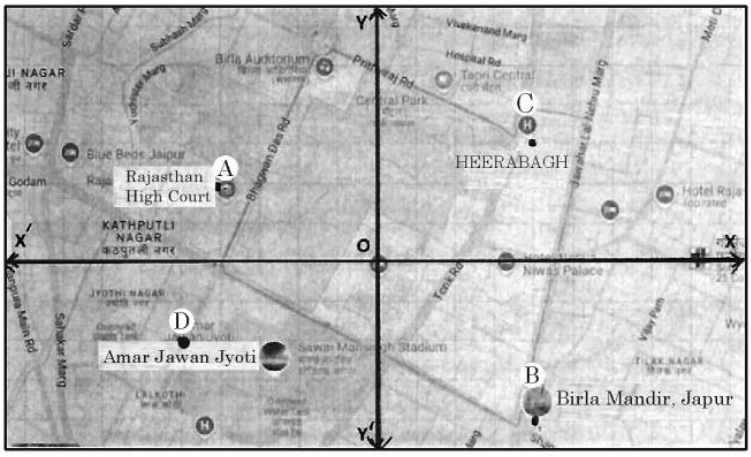
33 (a)	A person on tour has ₹ 5,400 for his expenses. If he extends his tour by 5 days, he has to cut down his daily expenses by ₹ 180. Find the original duration of the tour and daily expense.		
Sol.	Let original duration of the tour be x days. $\therefore$ Daily expense is ₹ $\frac{5400}{x}$ According to the question, $\frac{5400}{x} - \frac{5400}{x+5} = 180$ $\Rightarrow x^2 + 5x - 150 = 0$ $\Rightarrow (x + 15)\,(x - 10) = 0$ $\Rightarrow x = -15, 10$ $\because x \neq -15$ $\therefore x = 10$ $\therefore$ Original duration of tour is 10 days and daily expense is ₹ 540.	**I** **II** **III** **IV** **V**	**2** **1** **1** **½** **½**
	OR		
33 (b)	The total cost of certain piece of cloth was ₹ 2,100. During special sale time, the shopkeeper offered 2 m extra cloth for free thus reducing the price of cloth per metre by ₹ 120. What was the original per metre price of cloth and its length ?		
Sol.	Let the original length of cloth be x metre. $\therefore$ Original cost is ₹ $\frac{2100}{x}$ per metre. According to the question, $\frac{2100}{x} - \frac{2100}{x+2} = 120$ $\Rightarrow x^2 + 2x - 35 = 0$ $\Rightarrow (x + 7)\,(x - 5) = 0$	**I** **II** **III**	**2** **1** **1**

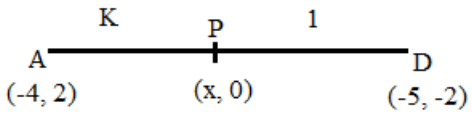
	$\Longrightarrow x = -7, 5$ $\because x \neq -7$ $\therefore x = 5$ $\therefore$ The original price of cloth per metre is ₹420 and original length is 5 m.	**IV** **V**	½ ½
34 (a)	Find mean and mode of the following frequency distribution : **Class :** 10–30 | 30–50 | 50–70 | 70–90 | 90–110 | 110–130 | 130–150 **Frequency :** 6 | 8 | 12 | 10 | 14 | 11 | 9		
Sol.	Class | Frequency | x_i | $f_i x_i$ 10 – 30 | 6 | 20 | 120 30 – 50 | 8 | 40 | 320 50 – 70 | 12 | 60 | 720 70 – 90 | 10 | 80 | 800 90 – 110 | 14 | 100 | 1400 110 – 130 | 11 | 120 | 1320 130 – 150 | 9 | 140 | 1260 Total | 70 | | 5940 Correct table $\therefore$ Mean = $\bar{x} = \frac{5940}{70}$ = 84.8 (approx.) Modal Class = 90 – 110 $\therefore$ Mode = $90 + \frac{14-10}{28-10-11} \times 20$	**I** **II** **III** **IV** **V**	**2** ½ ½ ½ **1**

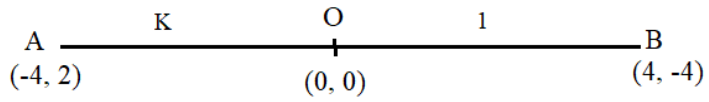
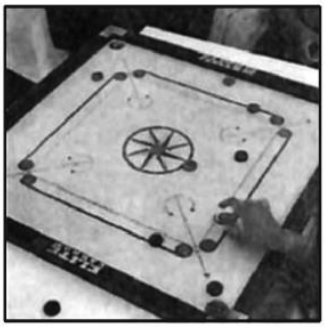
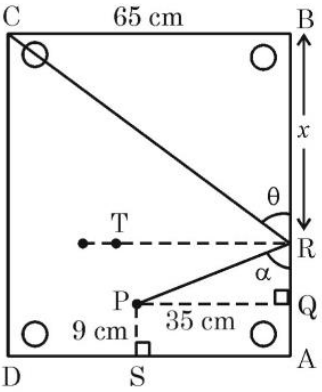
	$= 90 + \frac{4 \times 20}{7}$ $= 101.4$ (approx.)	**VI**	**½**
	OR		
34 (b)	If the median of the distribution given below is 28.5, find the values of x and y. **Class :** | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 | **Total** **Frequency :** | 5 | x | 20 | 15 | y | 5 | **60**		
Sol.	Class | Frequency | cf 0 – 10 | 5 | 5 10 – 20 | x | $x + 5$ 20 – 30 | 20 | $x + 25$ 30 – 40 | 15 | $x + 40$ 40 – 50 | y | $x + y + 40$ 50 – 60 | 5 | $x + y + 45$ Total | 60 |		
	Correct table	**I**	**1½**
	Median Class = 20 – 30	**II**	**½**
	$\therefore 28.5 = 20 + \frac{10}{20}\left(\frac{60}{2} - x - 5\right)$	**III**	**1**
	$\Rightarrow x = 8$	**IV**	**½**
	As, $x + y + 45 = 60$		
	$\Rightarrow 8 + y = 15$	**V**	**1**
	$\therefore y = 7$	**VI**	**½**

35.	 In the given figure, TP and TQ are tangents to a circle with centre M, touching another circle with centre N at A and B respectively. It is given that MQ = 13 cm, NB = 8 cm, BQ = 35 cm and TP = 80 cm. (i) Name the quadrilateral MQBN. (ii) Is MN parallel to PA ? Justify your answer. (iii) Find length TB. (iv) Find length MN.		
Sol.	(i) BN ∥ QM and QB ∦ MN The quadrilateral MQBN is a trapezium. 	**I**	**1**
	(ii) No, as AN ≠ PM	**II**	**1**
	(iii) TQ = TP = 80 cm ∴ TB = 80 − 35 = 45 cm	**III**	**1**
	Note: If MNT is considered a straight line and similarity of triangles is used to find TB then TB = 56 cm may be considered as correct answer.		
	(iv) $MN^2 = NS^2 + MS^2$		
	$= 35^2 + (13 - 8)^2$	**IV**	**1**
	$= 1225 + 25$		
	$= 1250$	**V**	**½**
	∴ MN = $25\sqrt{2}$ cm	**VI**	**½**
	SECTION – E **Q. Numbers 36 to 38 are case based questions of 4 marks each.**		

36.	'Kolam' is a decorative art which is made with rice flour in South Indian States. It is drawn on grid pattern of dots. One such art work is shown below.  Observe the given figure carefully. There are 4 dots in first square, 8 dots in second square, 12 dots in third square and so on. Based on the above, answer the following questions : (i) Show that number of dots given above form an A.P. Write the first term and common difference. (ii) Write n^{th} term of the A.P. formed. (iii) (a) The pattern is expanded on a large ground. If total 220 dots are used, then find the number of squares formed. **OR** (b) Is it possible to complete n number of squares using 100 dots ? If yes, then find the value of n.		
Sol.	(i) Number of dots formed in each square are 4, 8, 12, … $\because 12 - 8 = 8 - 4 = 4$ $\therefore$ Numbers of dots form an A.P. Here, $a = 4, d = 4$ (ii) $a_n = 4 + (n - 1)\,4 = 4n$ (iii) (a) Here, $a = 4, d = 4, S_n = 220$ $\therefore 220 = \frac{n}{2}(2 \times 4 + (n-1)4)$ $\Rightarrow (n + 1)\,n = 110$ $\Rightarrow n^2 + n - 110 = 0$ $\Rightarrow (n + 11)(n - 10) = 0$ $\Rightarrow n = -11, 10$ $n \neq -11$ $\Rightarrow n = 10$	**I** **II** **I** **I** **II** **III**	½ ½ **1** ½ ½ **1**

	∴ The number of squares formed = 10 **OR** (b) Here $S_n = 100$, $a = 4$, $d = 4$ $\therefore 100 = \frac{n}{2}(2 \times 4 + (n-1)4)$ $\Rightarrow 100 = \frac{4n}{2}(n+1)$ $\Rightarrow n(n+1) = 50$ $\Rightarrow n^2 + n - 50 = 0$ $\Rightarrow n = \frac{-1 \pm \sqrt{1+200}}{2} = \frac{-1 \pm \sqrt{201}}{2}$ ∵ n is not a natural number. ∴ It is not possible to draw complete squares using 100 dots.	**I** **II** **III**	½ ½ **1**
37.	 Observe the map of Jaipur city placed on a Cartesian plane. Taking Rambagh Palace as origin, the location of some places are given below : Point A : (–4, 2) Rajasthan High Court Point B : (4, –4) Birla Mandir Point C : (4, 3) Heera Bagh Point D : (–5, –2) Amar Jawan Jyoti		

	Based on the above, answer the following questions : (i) Advocate Rehana stays at Heera Bagh. How much distance she has to cover daily to go to the court and coming back home ? (ii) There is a crossing on X-axis which divides AD in a certain ratio. Find the ratio. (iii) (a) Is Birla Mandir equidistant from Heera Bagh and Amar Jawan Jyoti ? Justify your answer. **OR** (b) Using section formula, show that points A, O and B are not collinear.		
Sol.	(i) Distance travelled = 2 AC $= 2\sqrt{(-4-4)^2 + (2-3)^2}$ $= 2\sqrt{64+1}$ $= 2\sqrt{65}$ Hence, required distance is $2\sqrt{65}$ units. (ii) Let the point P(x, 0) divides AD in the ratio K : 1 ∴ AP : PD = K : 1  Here, $0 = \frac{-2K+2}{K+1}$ $\Rightarrow$ K = 1 ∴ The required ratio is 1 : 1 (iii) (a) BC = $\sqrt{(4-4)^2 + (-4-3)^2}$ = 7 units BD = $\sqrt{(4+5)^2 + (-4+2)^2} = \sqrt{85}$ units ∴ BC ≠ BD $\Rightarrow$ Birla Mandir is not equidistant from Heera Bagh and Amar Jawan	**I** **II** **I** **II** **I** **II**	½ ½ ½ ½ **1** **1**

	Jyoti. **OR** (b) Let us assume that points A, O, B are collinear and AO : OB = K : 1  Here, $0 = \frac{4K-4}{K+1}$ $\Rightarrow$ K = 1 Also, $0 = \frac{-4K+2}{K+1}$ $\Rightarrow$ $K = \frac{1}{2}$ Since the value of K is different in the above two cases, so points A, O and B are not collinear.	**I** **II** **III** **IV**	½ ½ ½ ½
38.	  Carom board is a very popular game. The board is a square of side length 65 cm. It has circular pockets in each corner. Ansh strikes a disc, kept at position P with a striker. The disc, hits the boundary of the board at R and goes straight to pocket at corner C. It is given that PS = 9 cm, PQ = 35 cm, BR = x, $\angle PRQ = \alpha$ and $\angle CRB = \theta$.		

	Based on the above information, answer the following questions : (i) Using law of reflection i.e. $\angle PRT = \angle CRT$, prove that $\theta = \alpha$. (ii) Prove that $\Delta PQR \sim \Delta CBR$ given that PQ is perpendicular to AB. (iii) (a) Find the value of x using similarity of triangles. **OR** (b) If $\frac{\text{Area } \Delta PQR}{\text{Area } \Delta CBR} = \frac{PQ^2}{CB^2}$, then find the value of x.		
Sol.	(i) $TR \perp AB$ $\therefore \alpha + \angle PRT = \theta + \angle TRC$ As $\angle PRT = \angle TRC$, so $\alpha = \theta$	**I**	**1**
	(ii) As $\theta = \alpha$, so $\angle PRQ = \angle CRB$ and $\angle PQR = \angle CBR = 90^0$ $\therefore \Delta PQR \sim \Delta CBR$	**I**	**1**
	(iii) (a) $\Delta PQR \sim \Delta CBR$ $\therefore \frac{PQ}{CB} = \frac{QR}{BR}$	**I**	**½**
	$\Rightarrow \frac{35}{65} = \frac{65 - 9 - x}{x}$	**II**	**1**
	$\Rightarrow 35x = 65\,(56 - x)$ $\Rightarrow x = 36.4$ cm	**III**	**½**
	OR		
	(b) $\frac{\text{Ar. } \Delta PQR}{\text{Ar. } \Delta CBR} = \frac{PQ^2}{BC^2}$		
	$\Rightarrow \frac{\frac{1}{2} \times 35 \times (65 - x - 9)}{\frac{1}{2} \times 65 \times x} = \frac{35 \times 35}{65 \times 65}$	**I**	**1**
	$\Rightarrow \frac{56 - x}{x} = \frac{35}{65}$	**II**	**½**
	$\Rightarrow x = 36.4$ cm	**III**	**½**