Series : EF8GD

SET-2

प्रश्न-पत्र कोड
Q.P. Code **30/8/2**

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 : **11**

(I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **31** हैं ।

Please check that this question paper contains **31** 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 (MCQ) तथा प्रश्न संख्या* **19** *एवं* **20** *अभिकथन एवं तर्क आधारित* **1** *अंक के प्रश्न हैं ।*

(iv) ***खण्ड – ख*** *में प्रश्न संख्या* **21** *से* **25** *तक अति लघु-उत्तरीय (VSA) प्रकार के* **2** *अंकों के प्रश्न हैं ।*

(v) ***खण्ड – ग*** *में प्रश्न संख्या* **26** *से* **31** *तक लघु-उत्तरीय (SA) प्रकार के* **3** *अंकों के प्रश्न हैं ।*

(vi) ***खण्ड – घ*** *में प्रश्न संख्या* **32** *से* **35** *तक दीर्घ-उत्तरीय (LA) प्रकार के* **5** *अंकों के प्रश्न हैं ।*

(vii) ***खण्ड – ङ*** *में प्रश्न संख्या* **36** *से* **38** *तक प्रकरण अध्ययन आधारित* **4** *अंकों के प्रश्न हैं । प्रत्येक प्रकरण अध्ययन में आंतरिक विकल्प* **2** *अंकों के प्रश्न में दिया गया है ।*

(viii) *प्रश्न-पत्र में समग्र विकल्प नहीं दिया गया है । यद्यपि, खण्ड –* ***ख*** *के* **2** *प्रश्नों में, खण्ड –* ***ग*** *के 2 प्रश्नों में, खण्ड –* ***घ*** *के 2 प्रश्नों में तथा खण्ड-****ङ*** *के 3 प्रश्नों में आंतरिक विकल्प का प्रावधान दिया गया है ।*

(ix) *जहाँ आवश्यक हो, स्वच्छ आकृतियाँ बनाइए । जहाँ आवश्यक हो* $\pi = \frac{22}{7}$ *लीजिए, यदि अन्यथा न दिया गया हो ।*

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

General Instructions :

Read the following instructions very carefully and strictly follow them :

(i) *This question paper contains* ***38*** *questions.* ***All*** *questions are* ***compulsory****.*

(ii) *This question paper is divided into* ***FIVE*** *Sections –* ***A, B, C, D*** *and* ***E****.*

(iii) *In* ***Section–A****, Questions number* ***1*** *to* ***18*** *are Multiple Choice Questions (MCQs) and 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 questions in each case-study.*

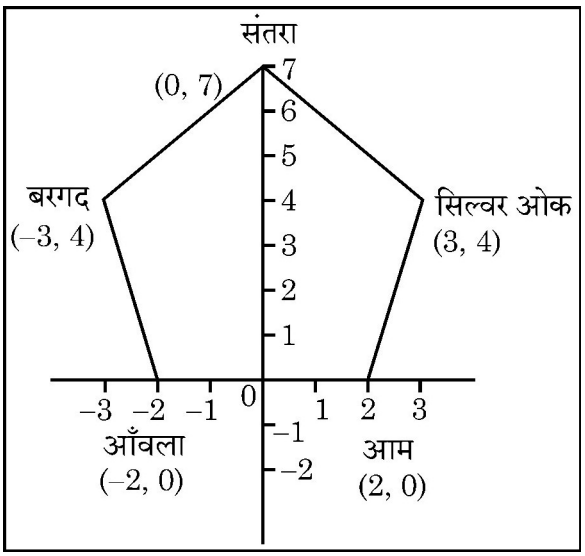
(viii) *There is no overall choice. However, an internal choice has been provided in* ***2*** *questions in Section–****B****,* ***2*** *questions in Section–****C****,* ***2*** *questions in Section–****D*** *and* ***3*** *questions in Section–****E****.*

(ix) *Draw neat diagrams wherever required. Take* $\pi = \frac{22}{7}$ *wherever required, if not stated.*

(x) *Use of calculator is* ***NOT*** *allowed.*

खण्ड – क

इस खण्ड में बहुविकल्पीय प्रश्न हैं । प्रत्येक प्रश्न 1 अंक का है ।

1. 

बगीचे में बरगद, सिल्वर ओक, संतरा, आँवला और आम के 5 पेड़ लगाए गए थे, जैसा आकृति में दिखाया गया है । यदि आकृति में, 1 इकाई = 1 m है, तो निम्न में से कौन कौन से पेड़ों की दूरी 4 मीटर है ? **1**

(A) आँवला और आम (B) आम और सिल्वर ओक

(C) सिल्वर ओक और संतरा (D) संतरा और आम

2. सानिया और योगेश की आयुओं का योग 50 वर्ष है । यदि सानिया की अब की आयु, योगेश की 5 वर्ष पहले की आयु की दुगुनी है, तो सानिया की वर्तमान आयु है : **1**

(A) 40 वर्ष (B) 35 वर्ष

(C) 20 वर्ष (D) 30 वर्ष

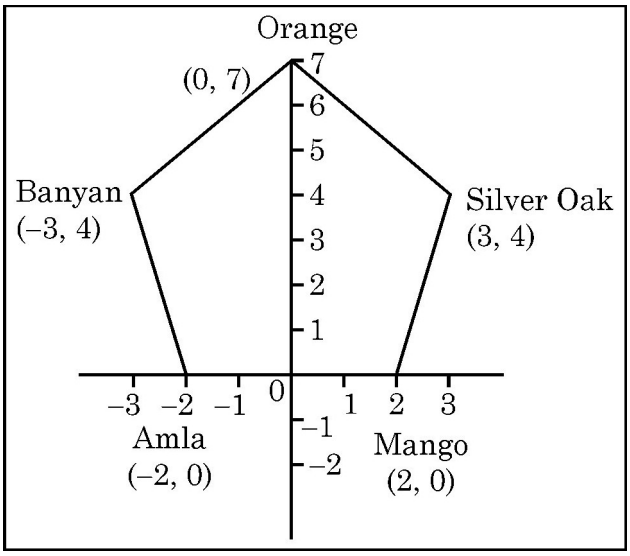
3. यदि एक बारंबारता बंटन का माध्य 7.5 है, $\Sigma f_i x_i = 120 + 3k$ तथा $\Sigma f_i = 30$ है, तो k का मान है **1**

(A) 45 (B) 50

(C) 35 (D) 40

SECTION – A

This section consists of multiple choice questions of 1 mark each.

1. 

5 trees Banyan, Silver Oak, Orange, Amla and Mango were planted in the garden as shown in the figure. If 1 unit = 1 m in the figure, which of the following trees are at a distance of 4 metres ? **1**

(A) Amla and Mango
(B) Mango and Silver Oak
(C) Silver Oak and Orange
(D) Orange and Mango

2. The sum of ages of Sania and Yogesh is 50 years. If now Sania is twice as old as Yogesh was 5 years ago, then present age of Sania is : **1**

(A) 40 years
(B) 35 years
(C) 20 years
(D) 30 years

3. If mean of a frequency distribution is 7.5, $\Sigma f_i x_i = 120 + 3k$ and $\Sigma f_i = 30$, then value of k is **1**

(A) 45
(B) 50
(C) 35
(D) 40

4. यदि एक शंकु और एक बेलन की आधार त्रिज्याएँ बराबर हैं और उनके वक्र-पृष्ठीय क्षेत्रफल भी बराबर हैं, तो शंकु की तिर्यक ऊँचाई का बेलन की ऊँचाई से अनुपात है : **1**

(A) 2 : 1 (B) 1 : 3

(C) 1 : 2 (D) 3 : 1

5. एक जार में कुछ लाल, काले और हरे रंग के पत्थर हैं । यदि जार से एक लाल पत्थर निकालने की प्रायिकता $\frac{1}{5}$ और एक काला पत्थर निकालने की प्रायिकता $\frac{1}{4}$ तथा जार में कुल 11 हरे पत्थर हैं, तो जार में कुल पत्थरों की संख्या है **1**

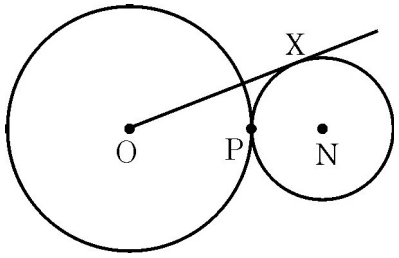
(A) 20 (B) 40

(C) 11 (D) 9

6. व्यास 'd' की एक अर्ध-वृत्तीय डिस्क का क्षेत्रफल होता है **1**

(A) πd^2 (B) $\frac{\pi d^2}{2}$

(C) $\frac{\pi d^2}{8}$ (D) $\frac{\pi d^2}{4}$

7. 

O तथा N केन्द्रों वाले दो वृत्त एक-दूसरे को बिंदु P पर स्पर्श करते हैं, जैसा कि आकृति में दिखाया गया है । O, P और N संरेख हैं । केन्द्र O वाले वृत्त की त्रिज्या, केन्द्र N वाले वृत्त की त्रिज्या की दुगुनी है । OX केंद्र N वाले वृत्त की एक स्पर्श रेखा है और OX = 18 सेमी है । केन्द्र N वाले वृत्त की त्रिज्या है : **1**

(A) $\frac{18}{\sqrt{2}}$ सेमी (B) 9 सेमी

(C) $\frac{9}{\sqrt{2}}$ सेमी (D) $\frac{18}{\sqrt{10}}$ सेमी

4. If the base radius of a cone and a cylinder are equal and their curved surface areas are also equal, then ratio of the slant height of cone to that of the height of cylinder is : **1**

(A) 2 : 1 (B) 1 : 3

(C) 1 : 2 (D) 3 : 1

5. A jar contains some red, black and green marbles. If probability of getting a red marble is $\frac{1}{5}$ and probability of getting a black marble is $\frac{1}{4}$ and jar contains total 11 green marbles, then total number of marbles that were there in the jar is **1**

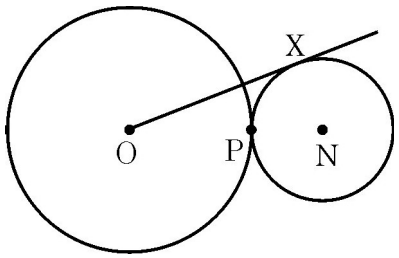
(A) 20 (B) 40

(C) 11 (D) 9

6. The area of a semi-circular disc whose diameter is 'd', is **1**

(A) πd^2 (B) $\frac{\pi d^2}{2}$

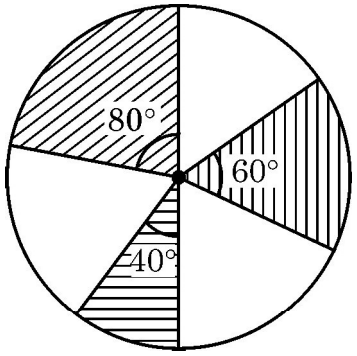
(C) $\frac{\pi d^2}{8}$ (D) $\frac{\pi d^2}{4}$

7. 

Two circles with centres O and N touch each other at the point P as shown in the figure. O, P and N are collinear. Radius of the circle with centre O is twice that of the circle with centre N. OX is tangent to the circle with centre N and OX = 18 cm. The radius of the circle with centre N is : **1**

(A) $\frac{18}{\sqrt{2}}$ cm (B) 9 cm

(C) $\frac{9}{\sqrt{2}}$ cm (D) $\frac{18}{\sqrt{10}}$ cm

8. 

आकृति में, 7 सेमी त्रिज्या वाले एक वृत्त में तीन त्रिज्यखंड जिनके केन्द्रीय कोण 60°, 80° और 40° हैं, दिखाए गए हैं । छायांकित भाग का क्षेत्रफल है : **1**

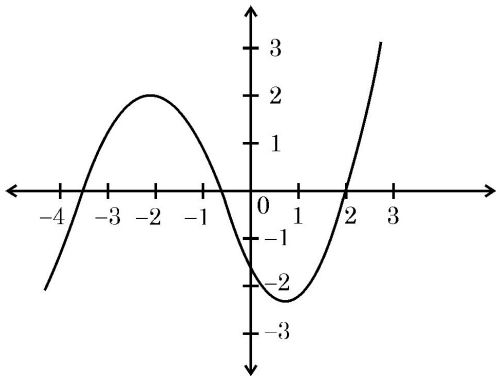
(A) 77 सेमी^{2} (B) 22 सेमी^{2}

(C) 154 सेमी^{2} (D) 0 सेमी^{2}

9. यदि एक द्विघात समीकरण $ax^2 + bx + c = 0$ के मूल बराबर हैं पर चिह्न विपरीत हैं, तो : **1**

(A) $a = 0$ (B) $b = 0$

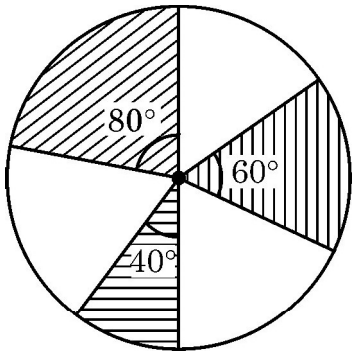
(C) $b \neq 0$ (D) $a < b$

10. 

यह एक बहुपद का ज्यामितीय प्रतिनिधित्व है । इस बहुपद के कितने शून्यक हैं ? **1**

(A) 3 (B) 1

(C) 2 (D) 4

8. 

In the figure, three sectors of a circle of radius 7 cm making central angles 60°, 80° and 40° are shown. The area of the shaded region is : **1**

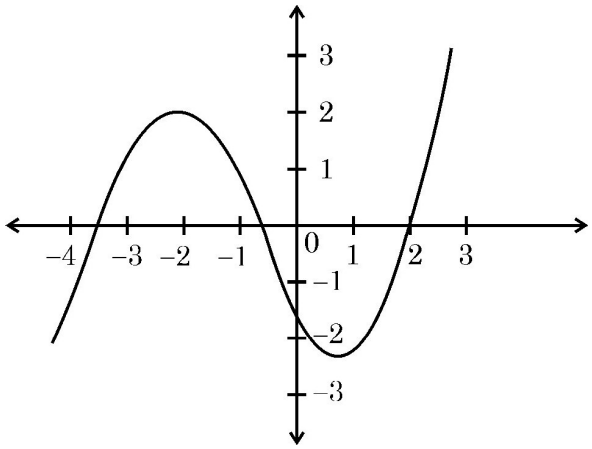
(A) 77 cm^2 (B) 22 cm^2

(C) 154 cm^2 (D) 0 cm^2

9. If the roots of a quadratic equation $ax^2 + bx + c = 0$ are equal but opposite in sign, then : **1**

(A) $a = 0$ (B) $b = 0$

(C) $b \neq 0$ (D) $a < b$

10. 

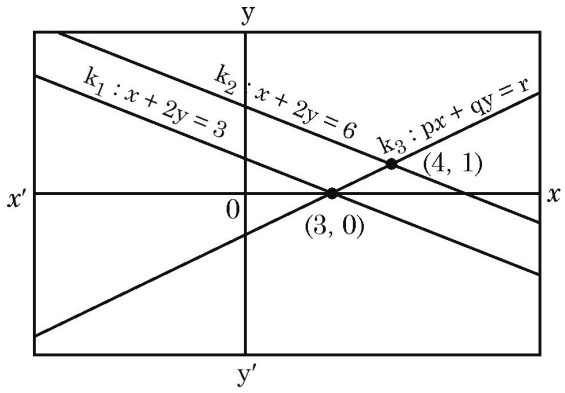
Here is the geometrical representation of a polynomial. How many zeroes does it have ? **1**

(A) 3 (B) 1

(C) 2 (D) 4

11. तीन रेखाएँ k_1, k_2, k_3 तीन विभिन्न समीकरणों को निरूपित करती हैं जैसा नीचे आकृति में दिखाया गया है । रेखाओं k_1 और k_3 द्वारा दर्शाये गये समीकरणों का हल $x = 3$, $y = 0$ है, जबकि रेखाओं k_2 और k_3 द्वारा दर्शाए गए समीकरणों का हल $x = 4$, $y = 1$ है ।

निम्न में से कौन सा समीकरण, रेखा k_3 को निरूपित करता है ? **1**



(A) $x - y = 3$ (B) $x - y = -3$

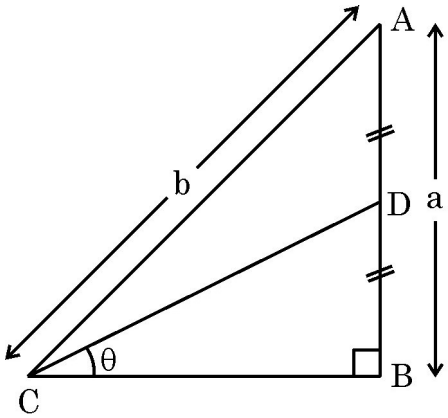
(C) $x + y = 3$ (D) $x + y = 1$

12. समांतर श्रेढी 21, 18, 15, ... का कौन सा पद शून्य (0) है ? **1**

(A) नौवाँ (B) पाँचवाँ

(C) आठवाँ (D) दसवाँ

13.



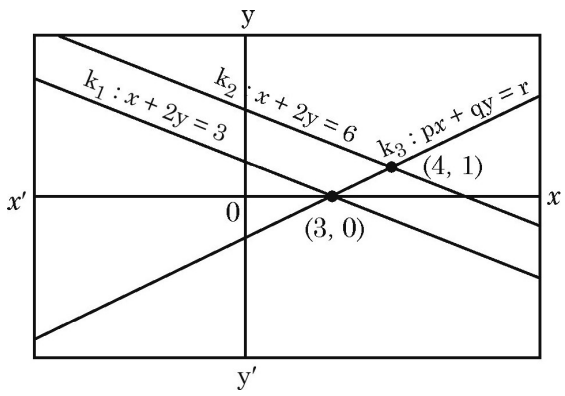
आकृति में, AD = DB है, $\angle B$ एक समकोण है तथा $\angle BCD = \theta$, AC = b और AB = a है । तो $\tan\theta$ बराबर है : **1**

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

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

11. Three lines k_1, k_2, k_3 represent three different equations as shown in the figure below. Solution of the equations represented by lines k_1 and k_3 is $x = 3$, $y = 0$, while solution of equations represented by lines k_2 and k_3 is $x = 4$, $y = 1$.

Which of the following is the equation of line k_3 ? **1**



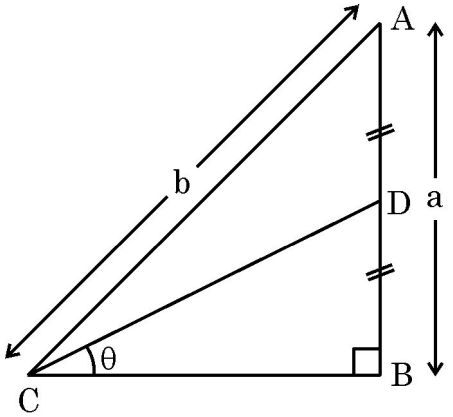
(A) $x - y = 3$ (B) $x - y = -3$

(C) $x + y = 3$ (D) $x + y = 1$

12. Which term of A.P. 21, 18, 15, ... is zero ? **1**

(A) 9^{th} (B) 5^{th}

(C) 8^{th} (D) 10^{th}

13. 

In the figure, AD = DB, $\angle B$ is a right angle and $\angle BCD = \theta$, AC = b and AB = a. Then, $\tan\theta$ is equal to **1**

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

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

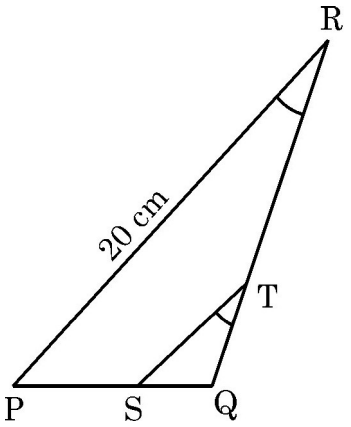
14. 'p' के किस मान के लिए निम्न रैखिक समीकरण युग्म द्वारा निरूपित रेखाएँ समांतर हैं ? **1**

$3x - y - 5 = 0$ तथा $6x - 2y - p = 0$

(A) $\frac{1}{2}$ (B) 10

(C) $\frac{5}{2}$ (D) 10 के अलावा सभी वास्तविक मान

15. PQR एक त्रिभुज जिसमें PR = 20 cm है, जैसा आकृति में दिखाया गया है । रेखा ST इस प्रकार खींची है कि $\angle PRQ = \angle STQ$ है । यदि रेखा ST, भुजा QR को 2 : 3 में विभाजित करे, तो ST की लम्बाई है : **1**



(A) $\frac{10}{3}$ cm (B) 8 cm

(C) 12 cm (D) $\frac{40}{3}$ cm

16. माना बॉक्स A में 4 हरी और 5 काली गेंदें रखी हैं । बॉक्स B में 7 हरी और 8 लाल गेंदें रखी हैं तथा बॉक्स C में 8 हरी और 10 पीली गेंदें हैं । किस बॉक्स से एक हरी गेंद निकालने की प्रायिकता अधिकतम है ? **1**

(A) बॉक्स A से (B) बॉक्स B से

(C) बॉक्स C से (D) कुछ भी नहीं कह सकते हैं ।

17. एक प्रेक्षक और एक मीनार के बीच की दूरी को दुगुना करने पर मीनार के शिखर का उन्नयन कोण **1**

(A) बढ़ जाता है । (B) कम हो जाता है ।

(C) $0°$ हो जाता है । (D) समान रहता है ।

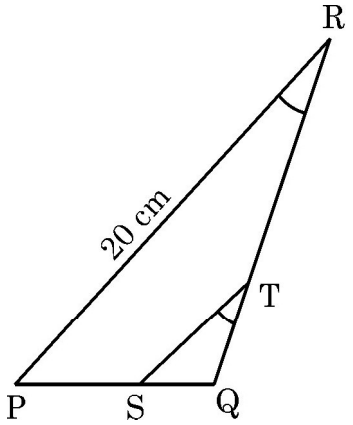
14. For which value(s) of 'p' will the lines represented by the following pair of linear equations be parallel ? **1**

$3x - y - 5 = 0$ and $6x - 2y - p = 0$

(A) $\frac{1}{2}$ (B) 10

(C) $\frac{5}{2}$ (D) All real values except 10

15. PQR is a triangle in which PR = 20 cm as shown in the figure. Line ST is drawn such that $\angle PRQ = \angle STQ$. If ST divides side QR in ratio 2 : 3, then the length of ST is : **1**



(A) $\frac{10}{3}$ cm (B) 8 cm

(C) 12 cm (D) $\frac{40}{3}$ cm

16. Suppose box A has 4 green and 5 black balls. Box B has 7 green and 8 red balls and box C has 8 green and 10 yellow balls. Which box has greatest probability of getting a green ball ? **1**

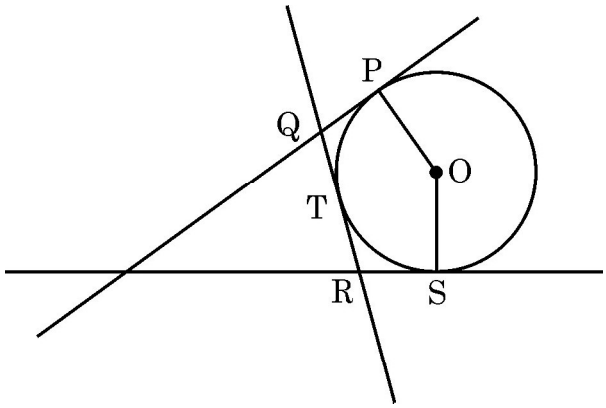
(A) Box A (B) Box B

(C) Box C (D) Can't say

17. What happens to the angle of elevation of the top of a tower, if distance between tower and observer is doubled ? **1**

(A) Increases (B) Decreases

(C) Becomes 0° (D) Remains the same

18. 

आकृति में, केन्द्र 'O' वाले एक वृत्त पर तीन स्पर्श रेखाएँ बिन्दु P, T और S पर हैं । यदि QR = 12 सेमी तथा वृत्त की त्रिज्या 7 सेमी है, तो बहुभुज PQRSO का परिमाप है : **1**

(A) 26 सेमी (B) 31 सेमी

(C) 38 सेमी (D) 33 सेमी

(अभिकथन एवं तर्क आधारित प्रश्न)

निर्देश : प्रश्न संख्या **19** और **20** अभिकथन (A) और 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 विकल्पों (A), (B), (C) और (D) में से चुनकर दीजिए :

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

(B) अभिकथन (A) तथा 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 ।

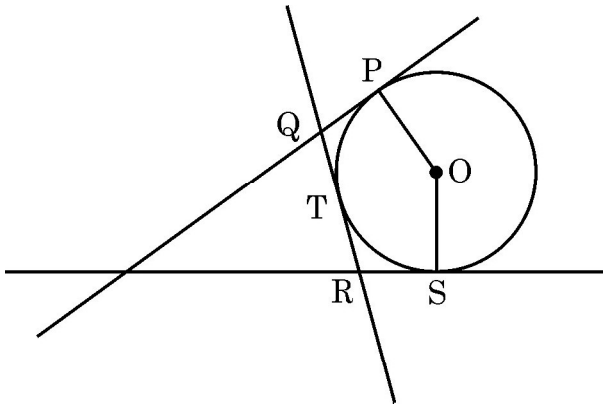
(D) अभिकथन (A) गलत है, परन्तु तर्क (R) सही है ।

19. **अभिकथन (A)** : संख्या 12^n अंक 0 पर समाप्त होती है, जब 'n' एक प्राकृत संख्या है । **1**

तर्क (R) : एक संख्या अंक 0 पर समाप्त होगी, यदि इस संख्या का अभाज्य गुणनखंड का रूप $2^m \times 5^n$ है, जहाँ 'm' और 'n' प्राकृत संख्याएँ हैं ।

20. **अभिकथन (A)** : यदि किन्हीं आँकड़ों के बहुलक और माध्य मान क्रमश: 60 और 66 हैं, तो उनका माध्यक मान 64 होगा । **1**

तर्क (R) : सभी आँकड़ों के लिए 2 माध्य = बहुलक + 3 माध्यक होता है ।

18. 

In the given figure, there is a circle with centre 'O' having three tangents at points P, T and S. If QR = 12 cm and radius of a circle is 7 cm, then perimeter of polygon PQRSO is : **1**

(A) 26 cm (B) 31 cm

(C) 38 cm (D) 33 cm

(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 as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions 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 Assertion (A).

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

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

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

19. **Assertion (A) :** The number 12^n ends with digit 0 where 'n' is a natural number. **1**

Reason (R) : Any number ends with digit 0 if its prime factor is of the form $2^m \times 5^n$, where 'm' and 'n' are natural numbers.

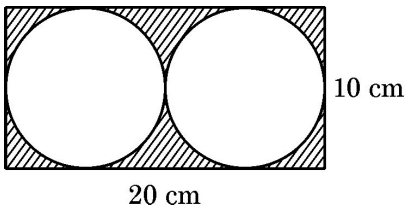
20. **Assertion (A) :** If values of Mode and Mean of a data are 60 and 66 respectively, then the value of Median is 64. **1**

Reason (R) : For any data, 2 Mean = Mode + 3 Median.

खण्ड – ख

इस खण्ड में अति लघु-उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न 2 अंकों का है ।

21. (a) आकृति में, छायांकित क्षेत्र का क्षेत्रफल ज्ञात कीजिए । **2**



($\pi = 3.14$ का प्रयोग कीजिए)

अथवा

(b) एक वृत्त की त्रिज्या ज्ञात कीजिए, जिसमें एक त्रिज्यखंड का क्षेत्रफल 66 व.सेमी और इसकी चाप की लम्बाई 22 cm है ।

22. (a) वह बड़ी-से-बड़ी संख्या ज्ञात कीजिए जिससे 37, 66, 89 को भाग करने पर शेषफल क्रमश: 2, 3, 5 प्राप्त होते हैं । **2**

अथवा

(b) दो संख्याओं का योग और अन्तर क्रमश: 256 तथा 224 है । इन संख्याओं का HCF और LCM ज्ञात कीजिए ।

23. यदि द्विघात समीकरण $x^2 + (k^2 - 1)x - 20 = 0$ के मूल 'α' और 'β' हैं, जिनके लिए $\alpha^2 - \beta^2 - \alpha\beta = 29$ तथा $\alpha - \beta = 9$ है, तो k का मान ज्ञात कीजिए । **2**

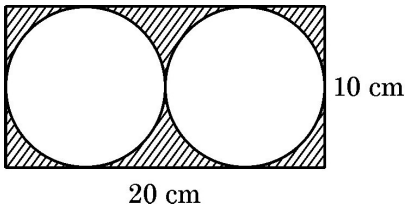
24. एक वृत्त का व्यास AB तथा उसकी जीवा AC इस प्रकार है कि $\angle BAC = 30^\circ$ । यदि C पर खींची गई स्पर्श रेखा AB को बढ़ाने पर D पर काटती है, तो सिद्ध कीजिए कि BC = BD. **2**

25. यदि बिंदु A(1, 2), B(4, y), C(x, 6) और D(3, 5) एक समांतर चतुर्भुज ABCD के शीर्ष हों, तो x और y के मान ज्ञात कीजिए । **2**

SECTION – B

This section consists of Very Short Answer (VSA) type questions of 2 marks each.

21. (a) In the figure, find the area of the shaded region. **2**



(Take $\pi = 3.14$)

OR

(b) Find the radius of the circle whose one sector has area of 66 sq. cm. and the length of its arc is 22 cm.

22. (a) Find the greatest number which divides 37, 66, 89, leaving remainder 2, 3, 5 respectively. **2**

OR

(b) Sum and difference of two numbers is 256 and 224 respectively. Find their HCF and LCM.

23. If 'α' and 'β' are the roots of quadratic equation $x^2 + (k^2 - 1)x - 20 = 0$ such that $\alpha^2 - \beta^2 - \alpha\beta = 29$ and $\alpha - \beta = 9$, then find the value of k. **2**

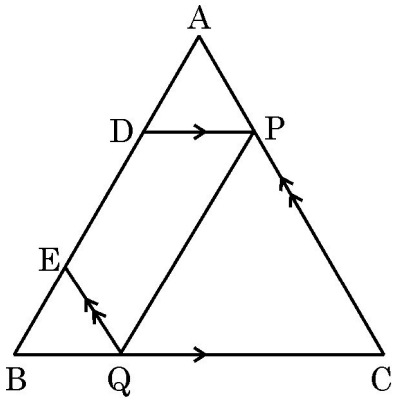
24. AB is diameter of a circle and AC is its chord such that $\angle BAC = 30^\circ$. If the tangent at C intersects AB extended at D, then prove that BC = BD. **2**

25. If points A(1, 2), B(4, y), C(x, 6) and D(3, 5) are the vertices of a parallelogram ABCD, then find values of x and y. **2**

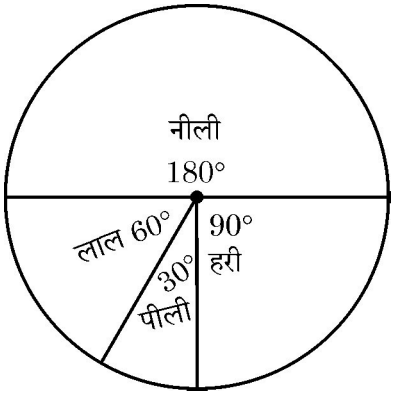
खण्ड – ग

इस खण्ड में लघु–उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न 3 अंकों का है ।

26. दी गई आकृति में, ABC एक त्रिभुज है । D, E भुजा AB पर स्थित दो बिंदु हैं जहाँ AD = BE है । यदि DP || BC और EQ || AC हो, तो सिद्ध कीजिए कि PQ || AB. **3**



27. (a) एक कार्टन में 240 गेंदें हैं, जिसमें कुछ नीली, लाल, हरी और पीली गेंदें हैं । प्रत्येक रंग की गेंदों की संख्या पाई चार्ट पर दर्शाई गयी है । यदि श्रेया कार्टन से एक गेंद यादृच्छया निकाले, तो निकाली गई गेंद पीली होने की प्रायिकता क्या है ? यदि कार्टन में 20 पीली गेंदें और डाल दी जाएँ, तो अब निकाली गई एक गेंद के पीले या हरे रंग के होने की प्रायिकता क्या होगी ? **3**



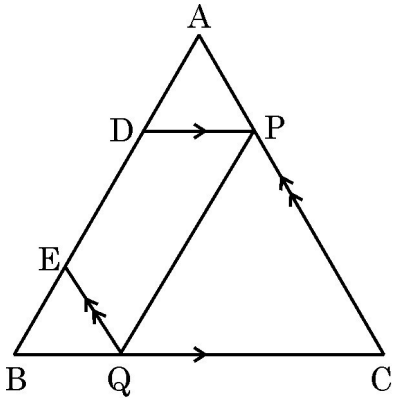
अथवा

(b) दिल्ली में दफ्तर सप्ताह में केवल 5 दिन सोमवार से शुक्रवार ही खुले रहते हैं । एक दफ्तर के दो कर्मचारी एक विशेष सप्ताह में एक दिन के लिए दफ्तर से गैर–हाज़िर रहते हैं । प्रायिकता ज्ञात कीजिए कि ये दोनों कर्मचारी एक ही दिन दफ्तर से गैर–हाज़िर रहते हैं । साथ ही प्रायिकता ज्ञात कीजिए कि यह दिन शुक्रवार का था ।

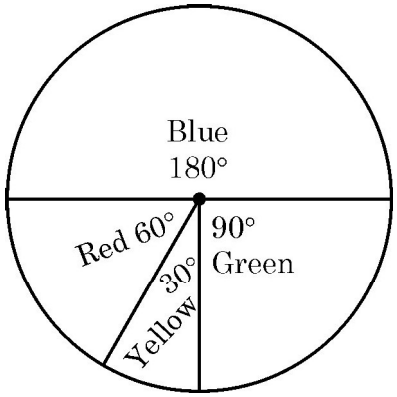
SECTION – C

This section consists of Short Answer (SA) type questions of 3 marks each.

26. In the given figure, ABC is a triangle in which D, E are two points on the side AB such that AD = BE. If DP || BC and EQ || AC, then prove that PQ || AB. **3**



27. (a) In a Carton, there were blue, red, green and yellow balls. There were 240 balls. The number of balls of each colour is represented in the following pie chart. If Shreya picked a ball at random, then what is the probability that she picked a yellow ball ? If 20 more yellow balls were added to the carton, what is the probability that now she picked a ball which is yellow or green ? **3**



OR

(b) Offices in Delhi are open for 5 days a week Monday to Friday. Two employees of an office remain absent for one day in the same particular week. Find the probability that they remain absent on the same day. Also, find the probability that it was a Friday.

28. x के लिए हल कीजिए, $\frac{4}{x} - 3 = \frac{5}{2x+3}, x \neq 0, \frac{-3}{2}$. **3**

29. (a) दर्शाइए कि $\frac{3+\sqrt{3}}{5}$ एक अपरिमेय संख्या है, यदि दिया हुआ है कि $\sqrt{3}$ एक अपरिमेय संख्या है । साथ ही, एक अपरिमेय संख्या ज्ञात कीजिए जिसका दी गई संख्या से योगफल एक अपरिमेय संख्या हो । **3**

अथवा

(b) संध्या के पास कपड़े के दो टुकड़े हैं जिनमें एक 144 सेमी चौड़ा और दूसरा 96 सेमी चौड़ा है । वह इन दोनों कपड़े के टुकड़ों को बराबर साइज की पट्टियों में काटना चाहती है जो ज्यादा से ज्यादा चौड़ी हो और कोई भी हिस्सा न बचे । वह कितनी चौड़ाई की पट्टियाँ काट सकती है ? उसे कुल कितनी पट्टियाँ प्राप्त होंगी ?

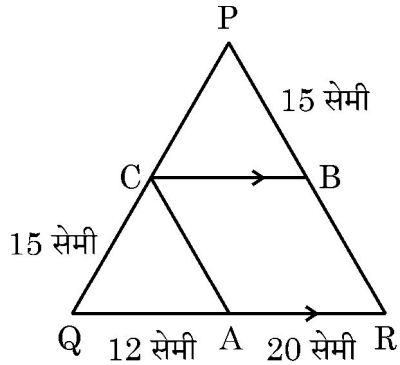
30. यदि बिंदु P(x, y), बिंदुओं Q(a + b, b – a) और R(a – b, a + b) से एक समान दूरी पर है, तो सिद्ध कीजिए कि $bx = ay$ है । **3**

31. सिद्ध कीजिए : $(\text{cosec } A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$ **3**

खण्ड – घ

इस खण्ड में दीर्घ-उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न 5 अंकों का है ।

32. सिद्ध कीजिए कि 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 ये अन्य दो भुजाएँ एक ही अनुपात में विभाजित हो जाती हैं । **5**



दी गई आकृति में यदि CB || QR, CA || PR, AQ = 12 सेमी, AR = 20 सेमी तथा PB = CQ = 15 सेमी है, तो PC और BR की लम्बाइयाँ ज्ञात कीजिए ।

28. Solve for x : $\frac{4}{x} - 3 = \frac{5}{2x+3}$, $x \neq 0, \frac{-3}{2}$. **3**

29. (a) Show that $\frac{3+\sqrt{3}}{5}$ is an irrational number, given $\sqrt{3}$ is an irrational number. Also, find an irrational number whose sum with given number is an irrational number. **3**

OR

(b) Sandhya has two pieces of cloth – one 144 cm wide and the other 96 cm wide. She wants to cut both the cloth pieces into equal sized strips such that one is as wide as possible with none left over. What is the width she can cut ? How many pieces will she get in all ?

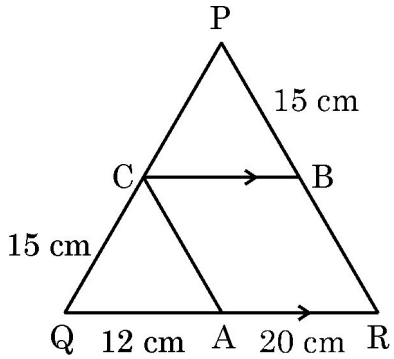
30. If point P(x, y) is equidistant from points Q(a + b, b – a) and R(a – b, a + b), then prove that bx = ay. **3**

31. Prove that : (cosec A – sin A) (sec A – cos A) = $\frac{1}{\tan A + \cot A}$ **3**

SECTION – D

This section consists of Long Answer (LA) type questions of 5 marks each.

32. Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides at distinct points, then the other two sides are divided in the same ratio. **5**

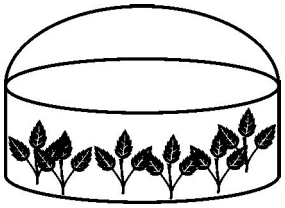


If CB || QR, CA || PR, AQ = 12 cm, AR = 20 cm and PB = CQ = 15 cm, calculate the lengths PC and BR.

33. समान ऊँचाई 1.2 मी के दो लड़के एक ही स्थान से पतंग उड़ा रहे हैं । एक लड़का 25 मी. लम्बी डोरी से पतंग उड़ा रहा है और वह क्षैतिज रेखा से 45° का उन्नयन कोण बनाता है । जबकि दूसरा लड़का 35 मी. लम्बी डोरी से पतंग उड़ा रहा है और वह समान क्षैतिज रेखा से 60° का उन्नयन कोण बनाता है । यदि इन दोनों की पतंग एक ही ऊर्ध्वाधर रेखा में हों, तो ज्ञात कीजिए दूसरे लड़के की पतंग पहले लड़के की पतंग से कितनी ऊँचाई पर है ।

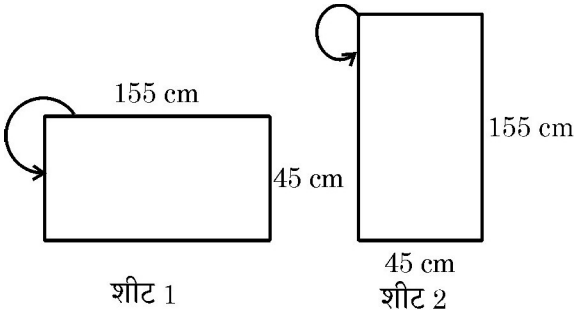
($\sqrt{3} = 1.73$ तथा $\sqrt{2} = 1.41$ लीजिए ।) **5**

34. (a) सारांश अपने फार्म पर एक ग्रीन हाउस बना रहा है, जैसा कि आकृति में दिखाया गया है । ग्रीन हाउस का आधार वृत्ताकार है जिसका व्यास 12 m है और इस पर एक बेलनाकार आधार जिसकी ऊँचाई 2 m है, के ऊपर एक अर्ध-गोलाकार डोम है । यदि वह ग्रीन हाउस के बेलनाकार तथा अर्ध-गोलाकार दोनों भागों को पारदर्शी प्लास्टिक शीट से ढँकना चाहता है, तो उसका कितना खर्च आएगा जबकि प्लास्टिक शीट ₹ 70 प्रति वर्ग मीटर है ? इस ग्रीन हाउस के अन्दर की वायु का आयतन भी ज्ञात कीजिए । **5**



अथवा

(b)

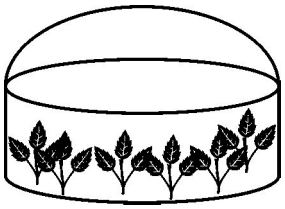


विमाओं 155 cm × 45 cm वाली दो बराबर आयताकार शीटों को चित्र में दिखाए अनुसार खोखले लंबवृत्तीय बेलन बनाने के लिए इस तरह मोड़ा गया कि शीट के सिरों को चिपकाने पर ठीक 1 cm का ओवरलैप हो । शीट 1 को मोड़कर 45 cm ऊँचाई वाला तथा शीट 2 को मोड़कर 155 cm ऊँचाई वाला बेलन बनाया गया । दोनों बेलनों की त्रिज्याओं में अंतर ज्ञात कीजिए और इन बेलनों के आयतनों में अनुपात ज्ञात कीजिए ।

33. Two boys of same height 1.2 m are flying kite at the same place. One of them takes 25 m long thread which makes an angle of elevation 45° with horizontal line whereas the other boy takes 35 m long thread which makes an angle of elevation 60° with the same horizontal line. If both kites are in the same vertical line, find how high the kite of the second boy is to the first boy.

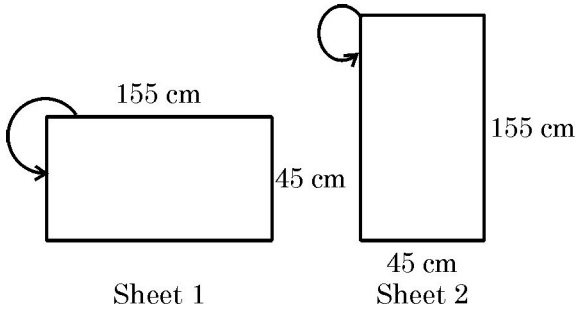
(Take $\sqrt{3} = 1.73$, $\sqrt{2} = 1.41$) **5**

34. (a) Saransh is building a green house in his farm as shown. The base of the green house is circular having a diameter of 12 m and it has a hemispherical dome on the top of a cylindrical base of height 2 m. How much will it cost him to cover the green house with transparent plastic both the cylindrical and hemispherical part if the plastic sheet costs ₹ 70 per sq. metre ? Also, find the volume of air inside. **5**



OR

(b)



Two equal rectangular sheets of dimensions 155 cm × 45 cm as shown in the figure are folded to make hollow right circular cylinders in such a way that there is exactly 1 cm overlap when sticking the ends of the sheet. Sheet 1 is folded to form a cylinder of height 45 cm while sheet 2 is folded to get a cylinder of height 155 cm. Find the difference in the radii of the two cylinders and hence find the ratio of their volumes.

35. (a) एक समांतर श्रेढी के पहले 22 पदों का योगफल ज्ञात कीजिए, जिसमें d = 7 तथा 22वाँ पद 149 है । **5**

अथवा

(b) 207 के तीन भाग करिए जिसके ये तीनों भाग एक समांतर श्रेढी में हों और दो छोटे भागों का गुणनफल 4623 हो ।

खण्ड – ङ

इस खण्ड में प्रकरण अध्ययन आधारित प्रश्न हैं । प्रत्येक प्रश्न 4 अंकों का है ।

36. सल्फर डाइऑक्साइड (SO_2) एक बड़ी वायु प्रदूषक है, और इसका इंसानी सेहत पर बहुत असर पड़ता है । यह पौधों और जानवरों के जीवन पर भी प्रभाव डालती है ।

वायु में SO_2 की सांद्रता (प्रति मिलियन अर्थात् पी पी एम में) पता लगाने के लिए दिल्ली में 30 इलाकों से आँकड़े एकत्र किए गए जिन्हें नीचे दिया गया है :

SO_2 की सांद्रता (ppm में)	बारंबारता
0.00 – 0.04	4
0.04 – 0.08	8
0.08 – 0.12	10
0.12 – 0.16	2
0.16 – 0.20	4
0.20 – 0.24	2

उपरोक्त के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i) माध्यक वर्ग की निचली सीमा क्या है ? **1**

(ii) उपरोक्त आँकड़ों का बहुलक वर्ग क्या है ? **1**

(iii) (a) वायु में SO_2 की सांद्रता का माध्य ज्ञात कीजिए । **2**

अथवा

(b) उपरोक्त आँकड़ों का माध्यक ज्ञात कीजिए ।

35. (a) Find the sum of first 22 terms of an A.P. in which d = 7 and 22^{nd} term is 149. **5**

OR

(b) Split 207 into three parts such that these three parts are in A.P. and the product of the two smaller parts is 4623.

SECTION – E

This section consists of Case Study based questions of 4 marks each.

36. Sulphur dioxide (SO_2) is a major air pollutant, and has significant impact upon human health. It influences the plants communities as well as animal life.

To find out concentration of SO_2 in the air (in parts per million i.e. ppm), the data was collected from 30 localities in Delhi and is presented below :

Concentration of SO_2 (in ppm)	**Frequency**
0.00 – 0.04	4
0.04 – 0.08	8
0.08 – 0.12	10
0.12 – 0.16	2
0.16 – 0.20	4
0.20 – 0.24	2

Based on the above, answer the following questions :

(i) What is the lower limit of median class ? **1**

(ii) What is the modal class of the above data ? **1**

(iii) (a) What is the mean concentration of SO_2 in air ? **2**

OR

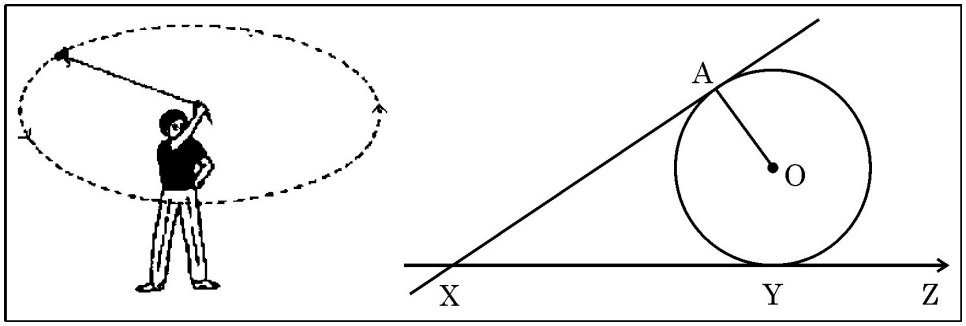
(b) Find the median of the above data.

37. रमेश एक बॉल को 2 m लंबी रस्सी से बाँधकर घुमा रहा था । इस खेल में बॉल रस्सी से छूटकर कुछ दूरी पर खड़े उसके भाई सुरेश के पास आ पहुँची । सुरेश ने इस बॉल को वापिस रमेश की तरफ फेंका तो यह रेखा AX से 60° का कोण बनाते हुए XYZ की दिशा में गई जो उस कल्पित वृत्त की स्पर्श रेखा है जिसमें रमेश बॉल को घुमा रहा था । (देखें आकृति 1) अर्थात् $\angle AXZ = 60^{\circ}$.

उपरोक्त के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

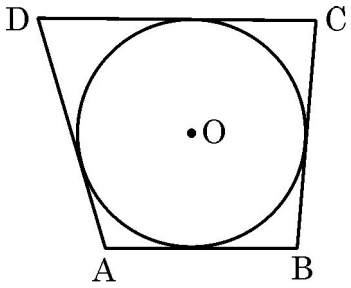
(i) यदि रमेश द्वारा प्रयोग की गई रस्सी की लंबाई 2 m है, तो उसके द्वारा बनाए गए वृत्त का व्यास कितना है ? **1**

(ii) आकृति में दर्शाई गई दूरी XY ज्ञात कीजिए । **1**



(आकृति 1)

(iii) (a) चित्र में दर्शाए अनुसार, रमेश ने उसी रस्सी से भूमि पर वही वृत्त बनाया तथा इसे स्पर्श करती हुई चार छड़ें रखीं, जहाँ AB = 3 m, AD = BC = 5 m है । CD की लंबाई ज्ञात कीजिए और अपने उत्तर की पुष्टि कीजिए । **2**



(आकृति 2)

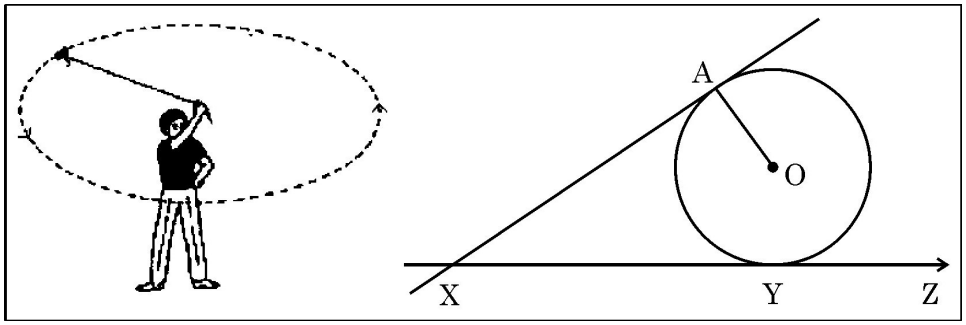
अथवा

37. Ramesh was fond of spinning/revolving a ball tied with a rope of length 2 m. While playing, the ball slipped from the rope and hit his brother Suresh lightly. Suresh threw the ball back to Ramesh that made an angle of 60° with AX along the path XYZ which is a tangent to the imaginary circle as shown in fig. 1. i.e. $\angle AXZ = 60^{\circ}$.

Based on the above, answer the following questions :

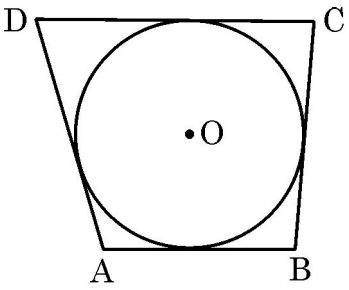
(i) If the length of rope used by Ramesh is 2 m, what is the diameter of the circle ? **1**

(ii) Find the length XY shown in figure. **1**



(Fig. 1)

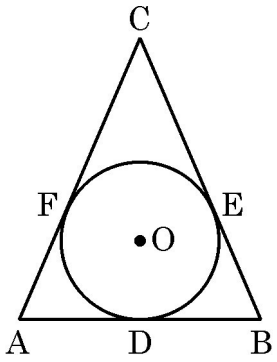
(iii) (a) Ramesh made the same circle on the ground using the rope he had and placed 4 sticks around it as shown in the figure with AB = 3 m, AD = BC = 5 m. Find length of CD. Justify your answer. **2**



(Fig. 2)

OR

(b) चित्र में दर्शाए अनुसार, सुरेश ने 4 m त्रिज्या का एक अन्य वृत्त बनाया तथा उसको स्पर्श करती हुई तीन छड़ें रखीं । यदि AD = 6 m, BD = 8 m तथा ΔABC का क्षेत्रफल 84 sq. m. है, तो AC तथा BC की लंबाइयाँ ज्ञात कीजिए ।



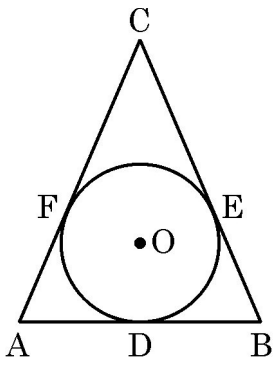
(आकृति 3)

38. 

एस्सेल वर्ल्ड भारत के सबसे बड़े अम्यूज़मेंट पार्क में से एक है जो हर उम्र के विज़िटर्स के लिए कई तरह की रोमांचक राइड्स और वॉटर अट्रैक्शन देता है । पार्क में प्रवेश करने के लिए टिकट ₹ 150 प्रति बच्चा तथा ₹ 250 प्रति वयस्क है ।

एक दिन पार्क के कैशियर ने पाया कि 300 टिकट बिके थे और ₹ 55,000 जमा हुए थे ।

(b) Suresh made another circle with radius 4 m and placed 3 sticks as shown in the figure. If AD = 6 m, BD = 8 m and area of triangle ABC is 84 sq. m., find the lengths of AC and BC.



(Fig. 3)

38. 

Essel World is one of India's largest amusement park that offers a diverse range of thrilling rides and water attractions for visitors of all ages. The entry ticket charges for the park is ₹ 150 per child and ₹ 250 per adult.

On a day cashier of park found that 300 tickets were sold and an amount of ₹ 55,000 was collected.

उपरोक्त के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i) यदि विज़िट करने वाले बच्चों की संख्या x तथा वयस्कों की संख्या y है, तो उपरोक्त सूचना को बीजगणितीय रूप में व्यक्त कीजिए । **1**

(ii) उस दिन कितने बच्चों ने पार्क में प्रवेश किया ? **1**

(iii) (a) उस दिन कितने वयस्कों ने पार्क में प्रवेश किया ? यदि उस दिन 50 वयस्क और आते, तो वयस्कों से कुल कितना धन एकत्र होता ? **2**

अथवा

(b) उस दिन कितने वयस्कों ने पार्क में प्रवेश किया ? यदि उस दिन एक विशेष शो के कारण वयस्कों की प्रति टिकट में ₹ 100 की वृद्धि कर दी गई थी, तो उस दिन की एकत्रित कुल राशि ज्ञात कीजिए ।

Based on the above, answer the following questions :

(i) If number of children visited be x, the number of adults visited be y, write the given situation algebraically. **1**

(ii) How many children visited the park that day ? **1**

(iii) (a) How many adults visited the park that day ? If there were 50 more adults that day, how much money would have been collected from adults ? **2**

OR

(b) How many adults visited the park that day ? If a special show was arranged and hence the per ticket rate for adults was increased by ₹ 100, totally how much money will be collected ?

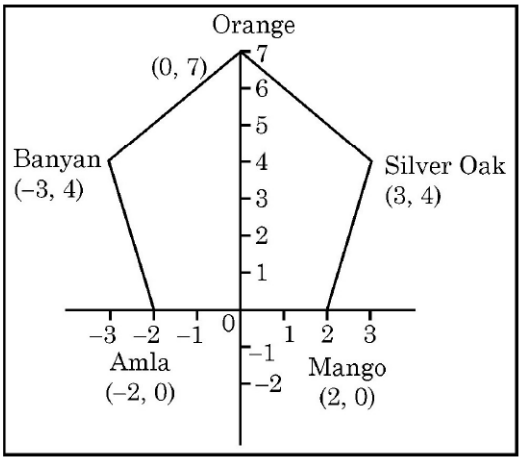
Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2026 (2nd Board Examination)
MATHEMATICS (STANDARD) (041) (PAPER CODE 30/8/2)

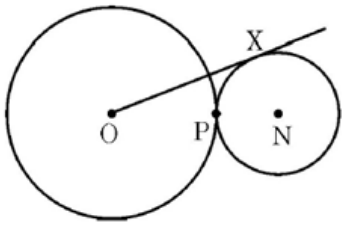
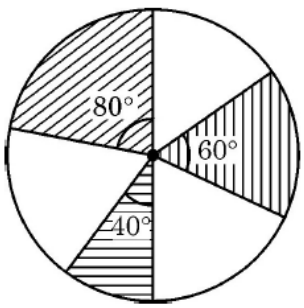
General Instructions: -

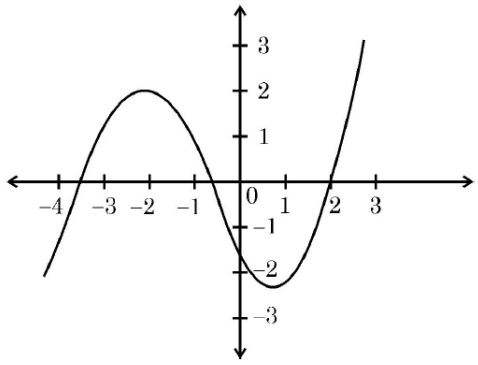
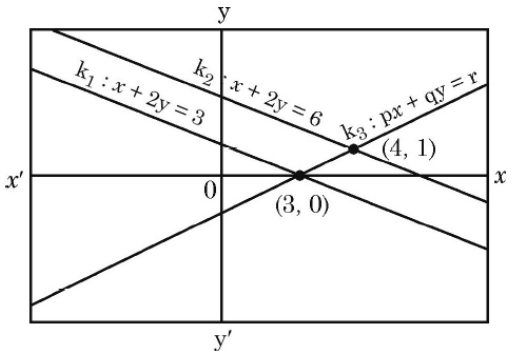
1.	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the Spot Evaluation Guidelines carefully.
2.	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. It's leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc. may invite action under various rules of the Board and 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.

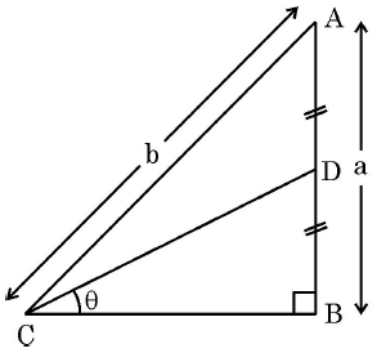
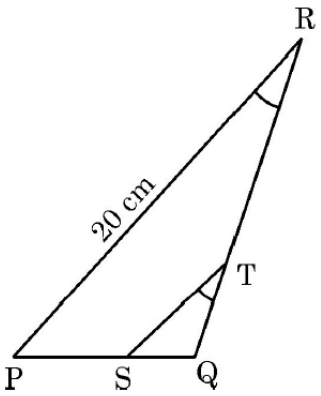
9.	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note **"Extra Question"**.
10.	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11.	A full scale of 0 to 80 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.

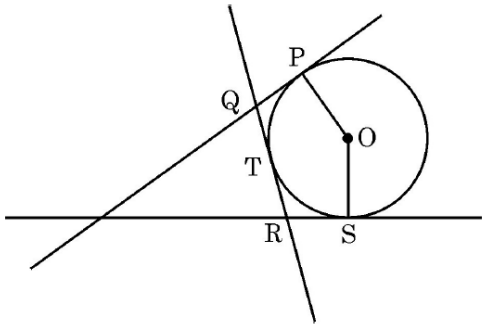
MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/8/2)

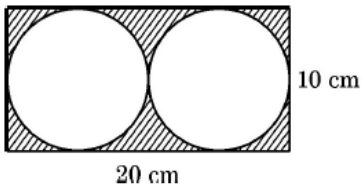
Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION – A This section consists of multiple choice questions of 1 mark each.	
1.	 5 trees Banyan, Silver Oak, Orange, Amla and Mango were planted in the garden as shown in the figure. If 1 unit = 1 m in the figure, which of the following trees are at a distance of 4 metres ? (A) Amla and Mango (B) Mango and Silver Oak (C) Silver Oak and Orange (D) Orange and Mango	
Sol.	(A) Amla and Mango	**1**
2.	The sum of ages of Sania and Yogesh is 50 years. If now Sania is twice as old as Yogesh was 5 years ago, then present age of Sania is : (A) 40 years (B) 35 years (C) 20 years (D) 30 years	
Sol.	(D) 30 years	**1**
3.	If mean of a frequency distribution is 7.5, $\Sigma f_i x_i = 120 + 3k$ and $\Sigma f_i = 30$, then value of k is (A) 45 (B) 50 (C) 35 (D) 40	
Sol.	(C) 35	**1**
4.	If the base radius of a cone and a cylinder are equal and their curved surface areas are also equal, then ratio of the slant height of cone to that of the height of cylinder is : (A) 2 : 1 (B) 1 : 3 (C) 1 : 2 (D) 3 : 1	
Sol.	(A) 2 : 1	**1**

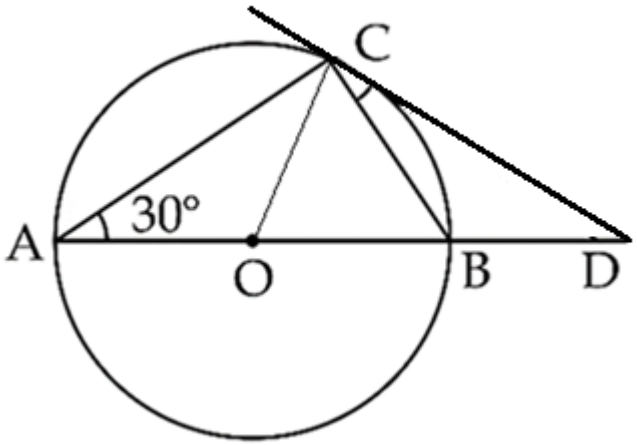
5.	A jar contains some red, black and green marbles. If probability of getting a red marble is $\frac{1}{5}$ and probability of getting a black marble is $\frac{1}{4}$ and jar contains total 11 green marbles, then total number of marbles that were there in the jar is (A) 20 (B) 40 (C) 11 (D) 9	
Sol.	(A) 20	**1**
6.	The area of a semi-circular disc whose diameter is 'd', is (A) πd^2 (B) $\frac{\pi d^2}{2}$ (C) $\frac{\pi d^2}{8}$ (D) $\frac{\pi d^2}{4}$	
Sol.	(C) $\frac{\pi d^2}{8}$	**1**
7.	 Two circles with centres O and N touch each other at the point P as shown in the figure. O, P and N are collinear. Radius of the circle with centre O is twice that of the circle with centre N. OX is tangent to the circle with centre N and OX = 18 cm. The radius of the circle with centre N is : (A) $\frac{18}{\sqrt{2}}$ cm (B) 9 cm (C) $\frac{9}{\sqrt{2}}$ cm (D) $\frac{18}{\sqrt{10}}$ cm	
Sol.	(C) $\frac{9}{\sqrt{2}}$ cm	**1**
8.	 In the figure, three sectors of a circle of radius 7 cm making central angles 60°, 80° and 40° are shown. The area of the shaded region is : (A) 77 cm^2 (B) 22 cm^2 (C) 154 cm^2 (D) 0 cm^2	
Sol.	(A) 77 cm^2	**1**

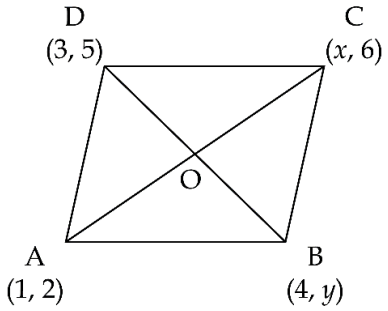
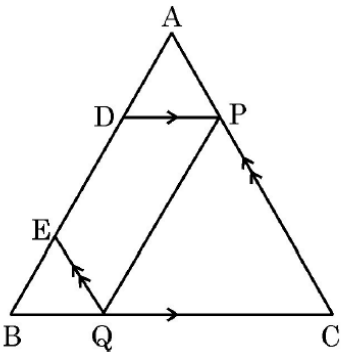
9.	If the roots of a quadratic equation $ax^2 + bx + c = 0$ are equal but opposite in sign, then : (A) $a = 0$ (B) $b = 0$ (C) $b \neq 0$ (D) $a < b$	
Sol.	(B) $b = 0$	**1**
10.	 Here is the geometrical representation of a polynomial. How many zeroes does it have ? (A) 3 (B) 1 (C) 2 (D) 4	
Sol.	(A) 3	**1**
11.	Three lines k_1, k_2, k_3 represent three different equations as shown in the figure below. Solution of the equations represented by lines k_1 and k_3 is $x = 3$, $y = 0$, while solution of equations represented by lines k_2 and k_3 is $x = 4$, $y = 1$. Which of the following is the equation of line k_3 ?  (A) $x - y = 3$ (B) $x - y = -3$ (C) $x + y = 3$ (D) $x + y = 1$	
Sol.	(A) $x - y = 3$	**1**
12.	Which term of A.P. 21, 18, 15, ... is zero ? (A) 9^{th} (B) 5^{th} (C) 8^{th} (D) 10^{th}	
Sol.	(C) 8^{th}	**1**

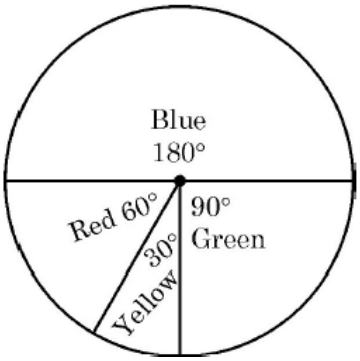
13.	 In the figure, AD = DB, ∠B is a right angle and ∠BCD = θ, AC = b and AB = a. Then, tan θ is equal to (A) $\frac{2a}{\sqrt{b^2-a^2}}$ (B) $\frac{a}{2\sqrt{b^2-a^2}}$ (C) $\frac{a}{2\sqrt{b^2+a^2}}$ (D) $\frac{a}{2(b^2-a^2)}$	
Sol.	(B) $\frac{a}{2\sqrt{b^2-a^2}}$	**1**
14.	For which value(s) of 'p' will the lines represented by the following pair of linear equations be parallel ? $3x - y - 5 = 0$ and $6x - 2y - p = 0$ (A) $\frac{1}{2}$ (B) 10 (C) $\frac{5}{2}$ (D) All real values except 10	
Sol.	(D) All real values except 10	**1**
15.	PQR is a triangle in which PR = 20 cm as shown in the figure. Line ST is drawn such that ∠PRQ = ∠STQ. If ST divides side QR in ratio 2 : 3, then the length of ST is :  (A) $\frac{10}{3}$ cm (B) 8 cm (C) 12 cm (D) $\frac{40}{3}$ cm	
Sol.	(B) 8 cm	**1**

16.	Suppose box A has 4 green and 5 black balls. Box B has 7 green and 8 red balls and box C has 8 green and 10 yellow balls. Which box has greatest probability of getting a green ball ? (A) Box A (B) Box B (C) Box C (D) Can't say	
Sol.	(B) Box B	**1**
17.	What happens to the angle of elevation of the top of a tower, if distance between tower and observer is doubled ? (A) Increases (B) Decreases (C) Becomes 0° (D) Remains the same	
Sol.	(B) Decreases	**1**
18.	 In the given figure, there is a circle with centre 'O' having three tangents at points P, T and S. If QR = 12 cm and radius of a circle is 7 cm, then perimeter of polygon PQRSO is : (A) 26 cm (B) 31 cm (C) 38 cm (D) 33 cm	
Sol.	(C) 38 cm	**1**
	(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 as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions 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 Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.	
19.	**Assertion (A) :** The number 12^n ends with digit 0 where 'n' is a natural number. **Reason (R) :** Any number ends with digit 0 if its prime factor is of the form $2^m \times 5^n$, where 'm' and 'n' are natural numbers.	
Sol.	(D) Assertion (A) is false, but Reason (R) is true.	**1**

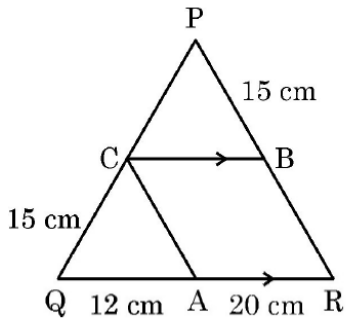
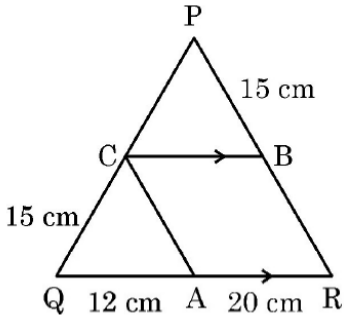
20.	**Assertion (A) :** If values of Mode and Mean of a data are 60 and 66 respectively, then the value of Median is 64. **Reason (R) :** For any data, 2 Mean = Mode + 3 Median.	
Sol.	(C) Assertion (A) is true, but Reason (R) is false.	**1**
	SECTION – B This section consists of Very Short Answer (VSA) type questions of 2 marks each.	
21 (a)	In the figure, find the area of the shaded region.  (Take $\pi = 3.14$)	
Sol.	Radius of the circle = 5 cm Area of shaded region = Area of rectangle – 2 × area of circle $= 20 \times 10 - 2 \times 3.14 \times (5)^2 = 43 \text{ cm}^2$	½ ½ **1**
	OR	
21 (b)	Find the radius of the circle whose one sector has area of 66 sq. cm. and the length of its arc is 22 cm.	
Sol.	Let the radius of the circle be 'r' cm Area of sector = $\frac{\theta}{360} \times \pi r^2 = 66$ --- (i) Length of arc = $\frac{\theta}{360} \times 2\pi r = 22$ --- (ii) Dividing (i) by (ii), we get $r = 6$ So, the radius of the circle is 6 cm.	 ½ ½ **1**
22 (a)	Find the greatest number which divides 37, 66, 89, leaving remainder 2, 3, 5 respectively.	
Sol.	$37 - 2 = 35 = 5 \times 7$ $66 - 3 = 63 = 3^2 \times 7$ $89 - 5 = 84 = 2^2 \times 3 \times 7$ HCF (35, 63 , 84) = 7 ∴ required number is 7.	½ ½ ½ ½
	OR	
22 (b)	Sum and difference of two numbers is 256 and 224 respectively. Find their HCF and LCM.	
Sol.	Let two numbers be 'x' and 'y' where x > y	

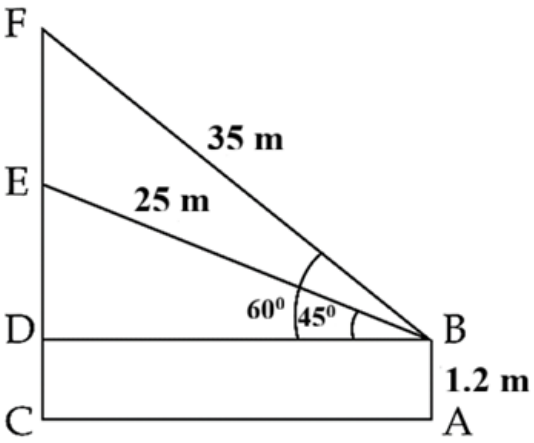
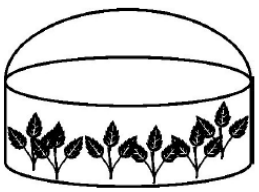
	According to Question $x + y = 256$ --- (i) $x - y = 224$ --- (ii)	½
	Solving (i) and (ii), we get $x = 240$ and $y = 16$	½
	HCF (240, 16) = 16	½
	and LCM (240, 16) = 240	½
23.	If 'α' and 'β' are the roots of quadratic equation $x^2 + (k^2 - 1)x - 20 = 0$ such that $\alpha^2 - \beta^2 - \alpha\beta = 29$ and $\alpha - \beta = 9$, then find the value of k.	
Sol.	Here, $(\alpha + \beta) = -k^2 + 1$ and $\alpha\beta = -20$	½
	$(\alpha - \beta)(\alpha + \beta) - \alpha\beta = 29$	½
	$\Rightarrow 9 \times (-k^2 + 1) + 20 = 29$	½
	$\Rightarrow k^2 = 0 \Rightarrow k = 0$	½
24.	AB is diameter of a circle and AC is its chord such that $\angle BAC = 30^\circ$. If the tangent at C intersects AB extended at D, then prove that BC = BD.	
Sol.	 Correct figure.	½
	Join OC.	
	$\angle ACB = 90^\circ \therefore \angle ABC = 60^\circ$	½
	In Δ BOC, OB = OC $\Rightarrow \angle OCB = \angle OBC = 60^\circ$	½
	$\angle BCD = 90^\circ - 60^\circ = 30^\circ$ and $\angle BDC = 60^\circ - 30^\circ = 30^\circ$	
	$\therefore \angle BCD = \angle BDC \Rightarrow BC = BD$	½

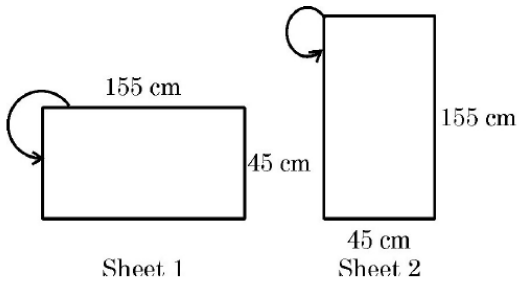
25.	If points A(1, 2), B(4, y), C(x, 6) and D(3, 5) are the vertices of a parallelogram ABCD, then find values of x and y.	
Sol.	 Co-ordinates of midpoint of AC = Co-ordinates of midpoint of BD $\left(\frac{1+x}{2}, \frac{2+6}{2}\right) = \left(\frac{3+4}{2}, \frac{5+y}{2}\right)$ $\Rightarrow \frac{1+x}{2} = \frac{7}{2} \Rightarrow x = 6$ and $\frac{5+y}{2} = \frac{8}{2} \Rightarrow y = 3$	 **1** ½ + ½
	SECTION – C This section consists of Short Answer (SA) type questions of 3 marks each.	
26	In the given figure, ABC is a triangle in which D, E are two points on the side AB such that AD = BE. If DP ‖ BC and EQ ‖ AC, then prove that PQ ‖ AB. 	
Sol.	Given DP ‖ BC, $\frac{AD}{DB} = \frac{AP}{PC}$ --- (i) Similarly, $\frac{BE}{EA} = \frac{BQ}{QC}$ --- (ii) Since given AD = BE add DE to both sides AD + DE = BE + DE $\therefore$ AE = BD --- (iii) From (i), (ii) and (iii), we get $\frac{AP}{PC} = \frac{BQ}{QC}$ $\therefore$ PQ ‖ AB	 ½ ½ **1** ½ ½

27 (a)	In a Carton, there were blue, red, green and yellow balls. There were 240 balls. The number of balls of each colour is represented in the following pie chart. If Shreya picked a ball at random, then what is the probability that she picked a yellow ball ? If 20 more yellow balls were added to the carton, what is the probability that now she picked a ball which is yellow or green ?  	
Sol.	Total balls = 240	
	P (yellow ball) = $\frac{30}{360}$ or $\frac{1}{12}$	**1**
	Number of yellow balls = $\frac{30}{360} \times 240 = 20$ Number of green balls = $\frac{90}{360} \times 240 = 60$	**½**
	Number of yellow balls after adding 20 more yellow balls = 40 Total number of balls after adding 20 more yellow balls = 260	**½**
	P (yellow or green ball) = $\frac{40+60}{260} = \frac{100}{260}$ or $\frac{5}{13}$	**1**
	OR	
27 (b)	Offices in Delhi are open for 5 days a week Monday to Friday. Two employees of an office remain absent for one day in the same particular week. Find the probability that they remain absent on the same day. Also, find the probability that it was a Friday.	
Sol.	Possible outcomes are: (Mon, Mon), (Mon, Tue), (Mon, Wed), (Mon, Thu), (Mon, Fri) (Tue, Mon), (Tue, Tue), (Tue, Wed), (Tue, Thu), (Tue, Fri) (Wed, Mon), (Wed, Tue), (Wed, Wed), (Wed, Thu), (Wed, Fri) (Thu, Mon), (Thu, Tue), (Thu, Wed), (Thu, Thu), (Thu, Fri) (Fri, Mon), (Fri, Tue), (Fri, Wed), (Fri, Thu), (Fri, Fri)	
	∴ Total number of outcomes = 25	**1**
	P (Absent on the same day) = $\frac{5}{25}$ or $\frac{1}{5}$	**1**
	P (Absent on Friday) = $\frac{1}{25}$	**1**

28.	Solve for x : $\frac{4}{x} - 3 = \frac{5}{2x+3}$, $x \neq 0, \frac{-3}{2}$.	
Sol.	$\frac{4}{x} - \frac{5}{2x+3} = 3$ $\Rightarrow 6x^2 + 6x - 12 = 0$ or $x^2 + x - 2 = 0$ $\Rightarrow (x + 2)(x - 1) = 0$ $\therefore x = -2, 1$	 **1** **1** **1**
29 (a)	Show that $\frac{3+\sqrt{3}}{5}$ is an irrational number, given $\sqrt{3}$ is an irrational number. Also, find an irrational number whose sum with given number is an irrational number.	
Sol.	Let us assume that $\frac{3+\sqrt{3}}{5}$ be a rational number. $\therefore \frac{3+\sqrt{3}}{5} = \frac{p}{q}$, where p and q are integers and $q \neq 0$ $\Rightarrow \sqrt{3} = \frac{5p-3q}{q}$ RHS is a rational number. So, LHS is also a rational number i.e. $\sqrt{3}$ is a rational number but this contradicts the fact that $\sqrt{3}$ is an irrational number. $\therefore$ our assumption is wrong. Hence, $\frac{3+\sqrt{3}}{5}$ be an irrational number. Any number except $\frac{-\sqrt{3}}{5}$	 **½** **1** **1** **½**
	OR	
29 (b)	Sandhya has two pieces of cloth – one 144 cm wide and the other 96 cm wide. She wants to cut both the cloth pieces into equal sized strips such that one is as wide as possible with none left over. What is the width she can cut ? How many pieces will she get in all ?	
Sol.	$144 = 2^4 \times 3^2$ $96 = 2^5 \times 3$ $\therefore$ HCF $= 2^4 \times 3 = 48$ $\therefore$ required width of cloth piece is 48 cm Number of pieces $= \frac{144}{48} + \frac{96}{48} = 5$	**½** **½** **1** **1**
30.	If point P(x, y) is equidistant from points Q(a + b, b – a) and R(a – b, a + b), then prove that $bx = ay$.	
Sol.	Given PQ = PR $\therefore$ $PQ^2 = PR^2$ $\Rightarrow [x - (a + b)]^2 + [y - (b - a)]^2 = [x - (a - b)]^2 + [y - (a + b)]^2$	 **1½**

	$\Rightarrow 4bx = 4ay \Rightarrow bx = ay$	1½
31.	Prove that : $(\text{cosec } A - \sin A)(\sec A - \cos A) = \dfrac{1}{\tan A + \cot A}$	
Sol.	LHS $= \left(\dfrac{1}{\sin A} - \sin A\right)\left(\dfrac{1}{\cos A} - \cos A\right)$ $= \left(\dfrac{1-\sin^2 A}{\sin A}\right)\left(\dfrac{1-\cos^2 A}{\cos A}\right) = \sin A \cos A$ RHS $= \dfrac{1}{\frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}}$ $= \dfrac{\sin A \cos A}{\sin^2 A + \cos^2 A} = = \sin A \cos A$ $\therefore$ LHS = RHS	1½ 1½
	SECTION – D This section consists of Long Answer (LA) type questions of 5 marks each.	
32.	Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides at distinct points, then the other two sides are divided in the same ratio.  If CB ‖ QR, CA ‖ PR, AQ = 12 cm, AR = 20 cm and PB = CQ = 15 cm, calculate the lengths PC and BR.	
Sol.	Correct figure, given, to prove, construction Correct proof  CA ‖ PR $\Rightarrow \frac{12}{20} = \frac{15}{PC} \Rightarrow$ PC = 25 cm CB ‖ QR $\Rightarrow \frac{25}{15} = \frac{15}{BR} \Rightarrow$ BR = 9 cm	2 2 ½ ½

33.	Two boys of same height 1.2 m are flying kite at the same place. One of them takes 25 m long thread which makes an angle of elevation 45° with horizontal line whereas the other boy takes 35 m long thread which makes an angle of elevation 60° with the same horizontal line. If both kites are in the same vertical line, find how high the kite of the second boy is to the first boy. (Take $\sqrt{3}$ = 1.73, $\sqrt{2}$ = 1.41)	
Sol.	 Correct figure	**1**
	In Δ BDE, $\frac{DE}{25} = \sin 45° = \frac{1}{\sqrt{2}}$	½
	$\Rightarrow DE = \frac{25 \times 1.41}{2} = 17.625$ m	**1**
	In Δ BDE, $\frac{DF}{35} = \sin 60° = \frac{\sqrt{3}}{2}$	½
	$\Rightarrow DF = \frac{35 \times 1.73}{2} = 30.275$ m	**1**
	EF = 30.275 – 17.625 = 12.65 m	**1**
34 (a)	Saransh is building a green house in his farm as shown. The base of the green house is circular having a diameter of 12 m and it has a hemispherical dome on the top of a cylindrical base of height 2 m. How much will it cost him to cover the green house with transparent plastic both the cylindrical and hemispherical part if the plastic sheet costs ₹ 70 per sq. metre ? Also, find the volume of air inside. 	
Sol.	Radius = 6 m	½
	Area of plastic sheet required = CSA of cylinder + CSA of hemisphere	
	$= 2 \times \frac{22}{7} \times 6 \times 2 + 2 \times \frac{22}{7} \times (6)^2$	**1**
	$= \frac{2112}{7}$ m^2	½

	Cost of plastic sheet @ ₹ 70/m^2 = $\frac{2112}{7} \times 70$ = ₹ 21120	**1**
	Volume of air = $\frac{22}{7} \times (6)^2 \times 2 + \frac{2}{3} \times \frac{22}{7} \times (6)^3$	**1**
	= $\frac{4752}{7}$ m^3 or 678.85 m^3	**1**
	OR	
34 (b)	 Two equal rectangular sheets of dimensions 155 cm × 45 cm as shown in the figure are folded to make hollow right circular cylinders in such a way that there is exactly 1 cm overlap when sticking the ends of the sheet. Sheet 1 is folded to form a cylinder of height 45 cm while sheet 2 is folded to get a cylinder of height 155 cm. Find the difference in the radii of the two cylinders and hence find the ratio of their volumes.	
Sol.	Circumference of sheet 1 = 155 – 1 = 154 cm	**½**
	$2 \times \frac{22}{7} \times r_1 = 154 \Rightarrow r_1 = \frac{49}{2} = 24.5$ cm	**1**
	Circumference of sheet 2 = 45 – 1 = 44 cm	**½**
	$2 \times \frac{22}{7} \times r_2 = 44 \Rightarrow r_2 = 7$ cm	**1**
	Difference in radii = 24.5 – 7 = 17.5 cm	**½**
	Ratio of volumes = $\frac{\pi \times (7)^2 \times 155}{\pi \times (24.5)^2 \times 45}$	**1**
	= $\frac{124}{441}$ or 124 : 441 or 441 : 241	**½**
35 (a)	Find the sum of first 22 terms of an A.P. in which d = 7 and 22nd term is 149.	
Sol.	$a_{22} = 149 \Rightarrow a + 21 \times 7 = 149$	**1½**
	$\Rightarrow a = 2$	**1**
	$S_{22} = \frac{22}{2} \times (2 + 149)$	**1½**
	= 1661	**1**
	OR	

35 (b)	Split 207 into three parts such that these three parts are in A.P. and the product of the two smaller parts is 4623.	
Sol.	Let three parts be (a – d), a and (a + d). According the statement (a – d) + a + (a + d) = 207 ⇒ a = 69 Also a × (a – d) = 4623 ⇒ 69 × (69 – d) = 4623 ⇒ d = 2 Therefore, required three parts are 67, 69 and 71	½ **1** ½ ½ **1** ½ **1**
	SECTION - E This section consists of Case Study based questions of 4 marks each.	
36.	Sulphur dioxide (SO_2) is a major air pollutant, and has significant impact upon human health. It influences the plants communities as well as animal life. To find out concentration of SO_2 in the air (in parts per million i.e. ppm), the data was collected from 30 localities in Delhi and is presented below :	

Concentration of SO_2 (in ppm)	**Frequency**
0.00 – 0.04	4
0.04 – 0.08	8
0.08 – 0.12	10
0.12 – 0.16	2
0.16 – 0.20	4
0.20 – 0.24	2

Based on the above, answer the following questions :

(i) What is the lower limit of median class ?

(ii) What is the modal class of the above data ?

(iii) (a) What is the mean concentration of SO_2 in air ?

OR

(b) Find the median of the above data.

Sol.

(i)

Concentration of SO_2 (in ppm)	Frequency	*cf*
0.00 – 0.04	4	4
0.04 – 0.08	8	12
0.08 – 0.12	10	22
0.12 – 0.16	2	24
0.16 – 0.20	4	28
0.20 – 0.24	2	30

Median class is 0.08 – 0.12

∴ lower limit of median class is 0.08 **1**

(ii) Modal class is 0.08 – 0.12 **1**

(iii) (a)

Concentration of SO_2 (in ppm)	f_i	x_i	$u_i = \frac{x_i - 0.10}{0.04}$	$f_i u_i$
0.00 – 0.04	4	0.02	– 2	– 8
0.04 – 0.08	8	0.06	– 1	– 8
0.08 – 0.12	10	0.10 = a	0	0
0.12 – 0.16	2	0.14	1	2
0.16 – 0.20	4	0.18	2	8
0.20 – 0.24	2	0.22	3	6
Total	30			0

Correct table **1**

Mean = $0.10 + \frac{0}{30} \times 0.04 = 0.10$ **1**

Therefore, mean concentration of SO_2 in air is 0.10 ppm

OR

(iii) (b)

Concentration of SO_2 (in ppm)	Frequency	*cf*
0.00 – 0.04	4	4
0.04 – 0.08	8	12
0.08 – 0.12	10	22
0.12 – 0.16	2	24
0.16 – 0.20	4	28
0.20 – 0.24	2	30

Correct table **½**

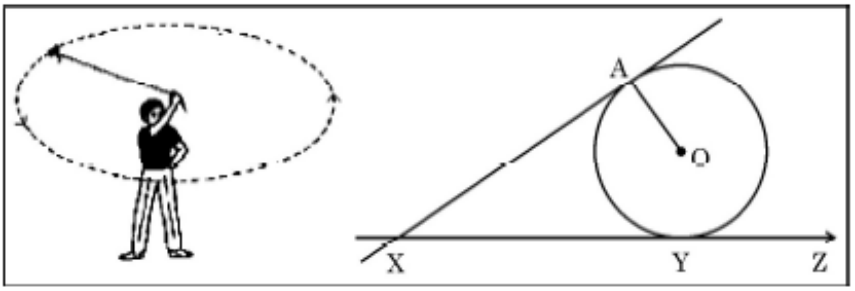
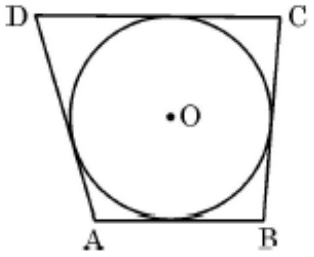
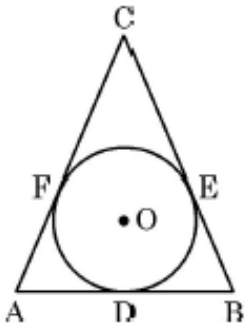
Median class is 0.08 – 0.12 **½**

Median = $0.08 + \frac{15-12}{10} \times 0.04$ **½**

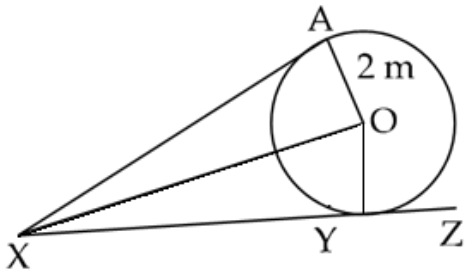
= 0.092 **½**

Therefore, median concentration of SO_2 in air is 0.092 ppm

37. Ramesh was fond of spinning/revolving a ball tied with a rope of length 2 m. While playing, the ball slipped from the rope and hit his brother Suresh lightly. Suresh threw the ball back to Ramesh that made an angle of 60° with AX along the path XYZ which is a tangent to the imaginary circle as shown in fig. 1. i.e. ∠AXZ = 60°.

	Based on the above, answer the following questions : (i) If the length of rope used by Ramesh is 2 m, what is the diameter of the circle ? (ii) Find the length XY shown in figure.  **(Fig. 1)** (iii) (a) Ramesh made the same circle on the ground using the rope he had and placed 4 sticks around it as shown in the figure with AB = 3 m, AD = BC = 5 m. Find length of CD. Justify your answer.  **(Fig. 2)** **OR** (b) Suresh made another circle with radius 4 m and placed 3 sticks as shown in the figure. If AD = 6 m, BD = 8 m and area of triangle ABC is 84 sq. m., find the lengths of AC and BC.  **(Fig. 3)**	
Sol.	(i) 4 m	**1**

(ii)



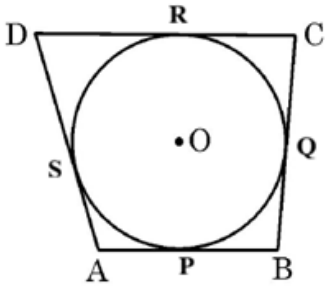
Join OY and OX.

Δ OAX $\cong \Delta$ OYX $\therefore \angle$OXY = 30°

In ΔOYX, $\frac{2}{XY} = \tan 30° = \frac{1}{\sqrt{3}}$ ½

$\Rightarrow$ XY = $2\sqrt{3}$ m ½

(iii) (a)



AS = AP --- (i)

BQ = BP --- (ii)

CQ = CR --- (iii)

DR = DS --- (iv)

Adding and rearranging (i), (ii), (iii) and (iv), we get

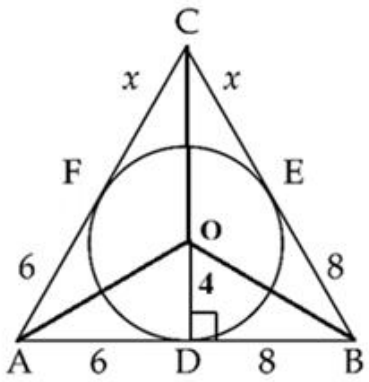
AB + CD = AD + BC **1**

3 + CD = 5 + 5

CD = 10 – 3 = 7 m **1**

OR

(iii) (b)



	Let CF = CE = x m AD = AF = 6 m BD = BE = 8 m Area of triangle = $84 = \frac{1}{2} \times (6+8) \times 4 + \frac{1}{2} \times (6+x) \times 4 + \frac{1}{2} \times (8+x) \times 4$ $\Rightarrow x = 7$ So, AC = 6 + 7 = 13 cm and BC = 8 + 7 = 15 cm	**1** ½ ½
38.	 Essel World is one of India's largest amusement park that offers a diverse range of thrilling rides and water attractions for visitors of all ages. The entry ticket charges for the park is ₹ 150 per child and ₹ 250 per adult. On a day cashier of park found that 300 tickets were sold and an amount of ₹ 55,000 was collected. Based on the above, answer the following questions : (i) If number of children visited be x, the number of adults visited be y, write the given situation algebraically. (ii) How many children visited the park that day ? (iii) (a) How many adults visited the park that day ? If there were 50 more adults that day, how much money would have been collected from adults ? **OR** (b) How many adults visited the park that day ? If a special show was arranged and hence the per ticket rate for adults was increased by ₹ 100, totally how much money will be collected ?	
Sol.	(i) $x + y = 300$ --- (I) $150x + 250y = 55000$ --- (II) (ii) Solving (I) & (II), we get $x = 200$	½ ½ **1**

	(iii) (a) from (I), $y = 100$	**1**
	Money collected from adults = $(100 + 50) \times 250$ = ₹ 37500	**1**
	OR	
	(iii) (b) from (I), we get $y = 100$	**1**
	Total money collected = $100 \times (250 + 100) + 200 \times 150$	
	= ₹ 65000	**1**