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

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

(II) कृपया जाँच कर लें कि इस प्रश्न-पत्र में **38** प्रश्न हैं ।

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

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

(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 ।

NOTE

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

(II) Please check that this question paper contains **38** questions.

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

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

(V) 15 minutes 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 (बुनियादी)

MATHEMATICS (BASIC)

निर्धारित समय : *3 घण्टे*
Time allowed : 3 hours

अधिकतम अंक : *80*
Maximum Marks : 80

• • •

General Instructions :

Read the following instructions carefully and follow them :

(i)   *This Question Paper contains **38** questions. **All** questions are compulsory.*

(ii)   *Question Paper is divided into **FIVE** Sections – **SECTION A, B, C, D** and **E**.*

(iii) *In Section–**A**, question numbers **1** to **18** are Multiple Choice Questions (MCQs) and question numbers **19** & **20** are Assertion-Reason based questions of **1** mark each.*

(iv)   *In Section–**B**, question numbers **21** to **25** are Very Short Answer (VSA) type questions of **2** marks each.*

(v)   *In Section–**C**, question numbers **26** to **31** are Short Answer (SA) type questions carrying **3** marks each.*

(vi)   *In Section–**D**, question numbers **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.*

(vii) *In Section–**E**, question numbers **36** to **38** are **case-based integrated units** of assessment 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 figures wherever required. Take $\pi = 22/7$ wherever required if not stated.*

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

• • •

(Multiple Choice Questions)

Section-A consists of **20** Multiple Choice Questions of **1** mark each.

1. PQ is tangent to the circle centred at O. If OQ = 3 cm, PQ = 5 cm, then OP is equal to

(A)   5 cm   (B)   4 cm

(C) $\sqrt{15}$ cm   (D) $\sqrt{34}$ cm

2. Which of the following depends on all observations of a given data ?

(A)   Median   (B)   Mean

(C)   Range   (D)   Mode

3. A quadratic polynomial having only zero (–2) is

(A) $(x - 2)^2$ (B) $x^2 - 2$

(C) $x^2 + 2x$ (D) $(x + 2)^2$

4. If sin A = cos A, then $\dfrac{1 - \tan A}{1 + \tan A}$ is equal to

(A)   1   (B)   –1

(C)   0   (D)   not defined

. . .

5. A black card is lost from a deck of 52 playing cards. Rest of the cards are shuffled and one card is drawn at random from the available cards. The probability that drawn card is 'king of hearts', is

(A) $\dfrac{1}{52}$

(B) $\dfrac{1}{4}$

(C) $\dfrac{1}{51}$

(D) $\dfrac{1}{26}$

6. The point $(x, 0)$ divides the line segment joining the points $(-4, 5)$ and $(0, -10)$ in the ratio

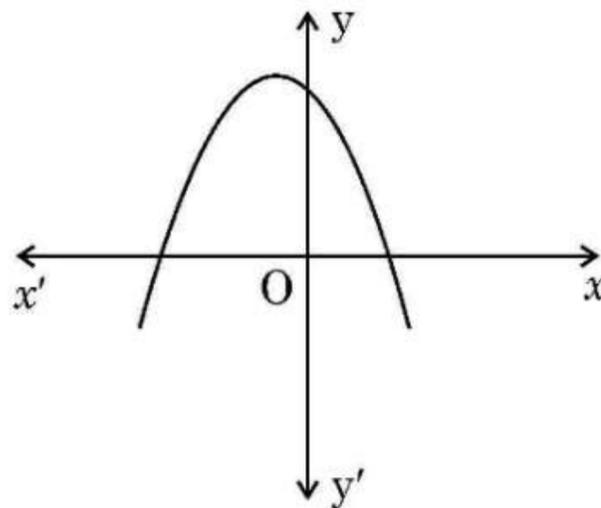(A) $1 : 3$

(B) $2 : 1$

(C) $1 : 1$

(D) $1 : 2$

7. In the given figure, AB is diameter of the circle with centre O. CD is tangent to the circle so that $\angle ACD = 40°$. The value of $\angle CBA$ is

(A) $50°$

(B) $40°$
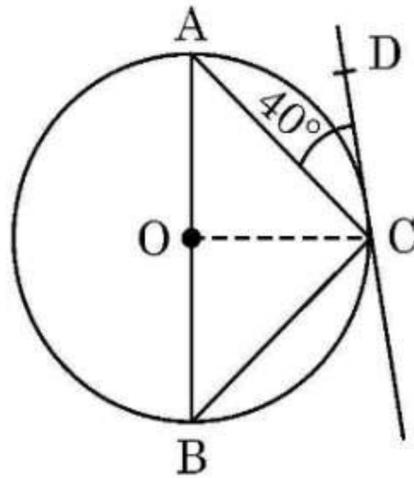
(C) $80°$

(D) $45°$

8. Observe the given graph of polynomial p(x). The number of zeroes of p(x) is

(A) 0

(B) 1

(C) 3

(D) 2

• • •

9. Two dice are rolled together. The probability that only one die shows number 4, is

(A) $\dfrac{11}{36}$

(B) $\dfrac{1}{3}$

(C) $\dfrac{5}{18}$

(D) $\dfrac{1}{4}$

10. If the distance between the points (3, 0) and (2, y) is $\sqrt{5}$, then the value(s) of y is :

(A) 2, –2

(B) 2, 0

(C) 2, 1

(D) –2, 0

11. PQ and PR are tangents to a circle with centre O such that OQ = QP. The value of $\angle$OPQ is equal to
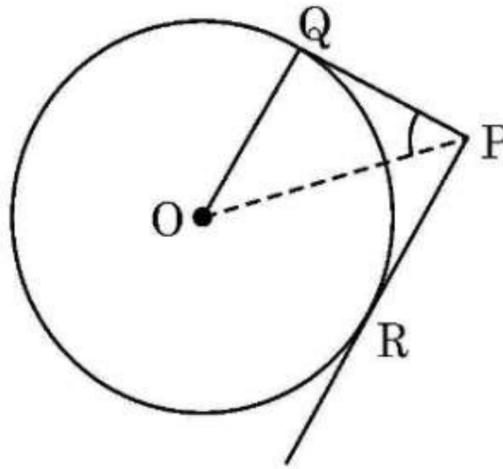
(A) 45°

(B) 30°

(C) 60°

(D) 90°

12. The roots of the equation $x^2 - 8 = 0$ are

(A) rational and distinct

(B) irrational and distinct

(C) real and equal

(D) not real

13. 10th term of the A.P. : –12, –19, –26, ... is

(A) –75

(B) –65

(C) 51

(D) –82

14. If E is an event such that P(E) = 0.1, then P($\overline{E}$) is equal to

(A) 0.9

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

(C) 0.99

(D) –1

• • •

15. The largest possible cone is just fitted inside a hollow cube of edge 25 cm. The radius of the base of the cone is

(A) 5 cm   (B) 12.5 cm

(C) 25 cm   (D) 10 cm

16. An arc of length 'l' subtends an angle of 15° at the centre of a circle of radius 8.4 cm. The value of l is

(A) 22 cm   (B) 2.2 cm

(C) 9.24 cm   (D) 4.2 cm

17. The value of k for which the roots of the quadratic equation $6x^2 + 4kx + k = 0$ are real and equal, is

(A) 0   (B) $\dfrac{3}{4}$

(C) $\dfrac{-3}{2}$ (D) $\dfrac{2}{3}$

18. $\sqrt{2}\,(\sqrt{2} - 1)$ is

(A) an integer   (B) a rational number

(C) an irrational number   (D) equal to 1

(Assertion – Reason based questions)

Directions : Question numbers **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) :** In a right angle triangle ABC, $\angle B = 90^\circ$. Therefore the value of $\cos (A + C)$ is equal to 0.

   Reason (R) : $A + B + C = 180^\circ$ and $\cos 90^\circ = 0$.

20. **Assertion (A) :** When a hemisphere of same radius (r) is carved out from one side of a solid wooden cylinder, the total surface area of remaining solid is increased by $2\pi r^2$.

   Reason (R) : Curved surface area of hemisphere is $2\pi r^2$.

Section – B
(Very Short Answer Type Questions) $5 \times 2 = 10$

Q. Nos. **21** to **25** are Very Short Answer type questions of **2** marks each.

21. (a)   A bag contains 40 marbles out of which some are white and others are black. If the probability of drawing a black marble is $\dfrac{3}{5}$, then find the number of white marbles.

OR

   (b)   In a pre-primary class, a teacher put cards numbered 20 to 59 in a bowl. A student picked up a card at random and read the number. Find the probability that the number read was (i) a prime number (ii) a perfect square.

22. Find the coordinates of the points of trisection of line segment joining the points $(-4, 1)$ and $(6, 5)$.

23. Using distance formula, show that the points $(-1, 3)$, $(6, 2)$ and $(3, -1)$ are vertices of a right-angled triangle.

24. Check whether $15^n \times 2^n$, n being a natural number, ends with the digit zero.

25. (a)   If $\sec A = \dfrac{25}{7}$, then find the value of cosec A and tan A.

OR

   (b)   Verify that $\sin (A + B) = \sin A \cos B + \cos A \sin B$ for $A = 60^\circ$ and $B = 30^\circ$.

• • •

Section – C

(Short Answer Type Questions)   6 × 3 = 18

Q. Nos. **26** to **31** are Short Answer type questions of **3** marks each.

26. Prove that : $(\sin \theta + \sec \theta)^2 + (\cos \theta + \text{cosec } \theta)^2 = (1 + \sec \theta \text{ cosec } \theta)^2$.

27. The traffic lights at three different road crossings change after every 45 seconds, 75 seconds and 60 seconds respectively. If they change together at 5.00 a.m., then at what time they will change together next ?

28. (a) If α, β are zeroes of the polynomial $3x^2 - 8x + 4$, then form a quadratic polynomial in x whose zeroes are $\dfrac{1}{\alpha}$ and $\dfrac{1}{\beta}$.

OR

   (b) Find zeroes of the polynomial $6x^2 - 7x - 3$ and verify the relationship between zeroes and its coefficients.

29. It is given that ΔACD ≅ ΔABE. Prove that ΔADE ~ ΔABC.
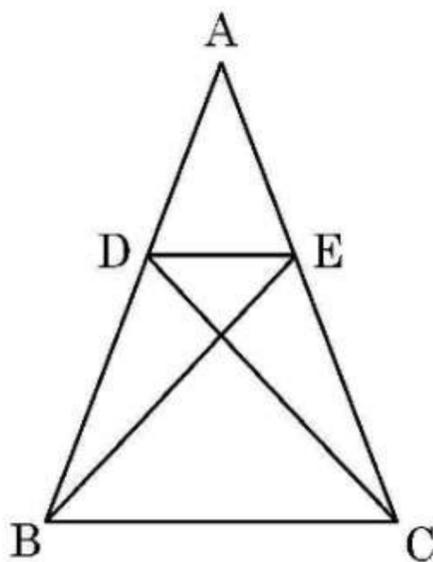
30. The sum of the squares of two consecutive odd numbers is 514. Find the numbers.

• • •

31. (a) A spherical glass vessel has a cylindrical neck 7 cm long and 8 cm in diameter. The radius of spherical part is 10 cm. Find the volume of the vessel.

OR

(b) From each end of a solid cylinder of height 20 cm and base radius 7 cm, a cone of base radius 2.1 cm and height 5 cm is scooped out. Find the volume of the remaining solid.

Section – D

(Long Answer Type Questions) $4 \times 5 = 20$

Q. Nos. **32** to **35** are Long Answer type questions of **5** marks each.

32. (a) Find 'mean' and 'mode' of the following data :

Class	10-25	25-40	40-55	55-70	70-85	85-100
Number of Students	12	10	15	13	8	12

OR

(b) The following table shows the ages of patients admitted in a hospital during a year :

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
Number of Patients	7	10	21	22	15	5

Find 'mode' and 'median' of the above data.

33. A statue 3 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 30°. Find the height of the pedestal and its distance from the point of observation on ground. (Use $\sqrt{3}$ = 1.73)

• • •

34. Solve the following pair of equations using graphical method :

$3x - 4y + 3 = 0$ and $-2x + 5y = 9$

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

OR

(b) It is given that sides AB and AC and median AD of ΔABC are respectively proportional to sides PQ and PR and median PM of another ΔPQR. Show that ΔABC ~ ΔPQR.
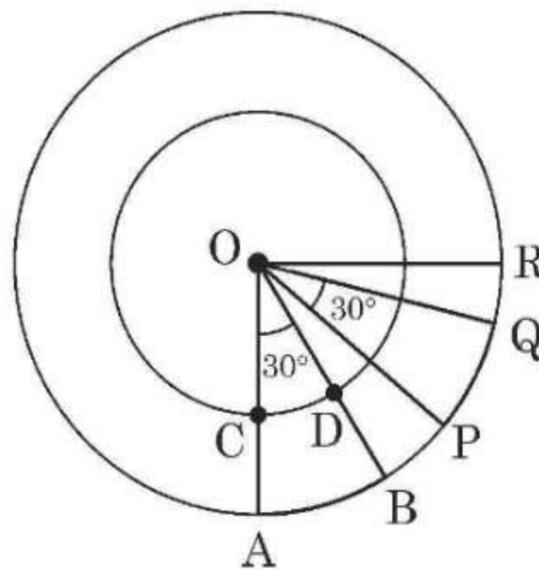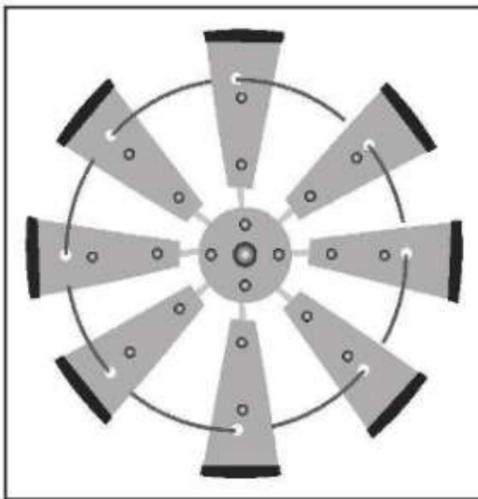
Section – E

(Case-study based Questions) $3 \times 4 = 12$

Q. Nos. **36** to **38** are Case-study based Questions of **4** marks each.

36.

A farmer has put up a decorative windmill in his farm in which there are eight blades of equal width and equally placed in a circular arrangement. A circular wire goes through them.

• • •

The diagram shows two blades OAB and OPQ in a quarter circle with centre O. ∠AOB = ∠POQ = 30°, OA = 28 cm, OC = 21 cm.

O is the centre of both the circles.

(i) Determine the measure of ∠BOP.   1

(ii) Find length of arc CD.   1

(iii) (a) Find the area of region CABD.   2

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

(iii) (b) Find perimeter of region CABD.

37. A tent house owner provides furniture on rent. He stacks chairs in his shop to save space.
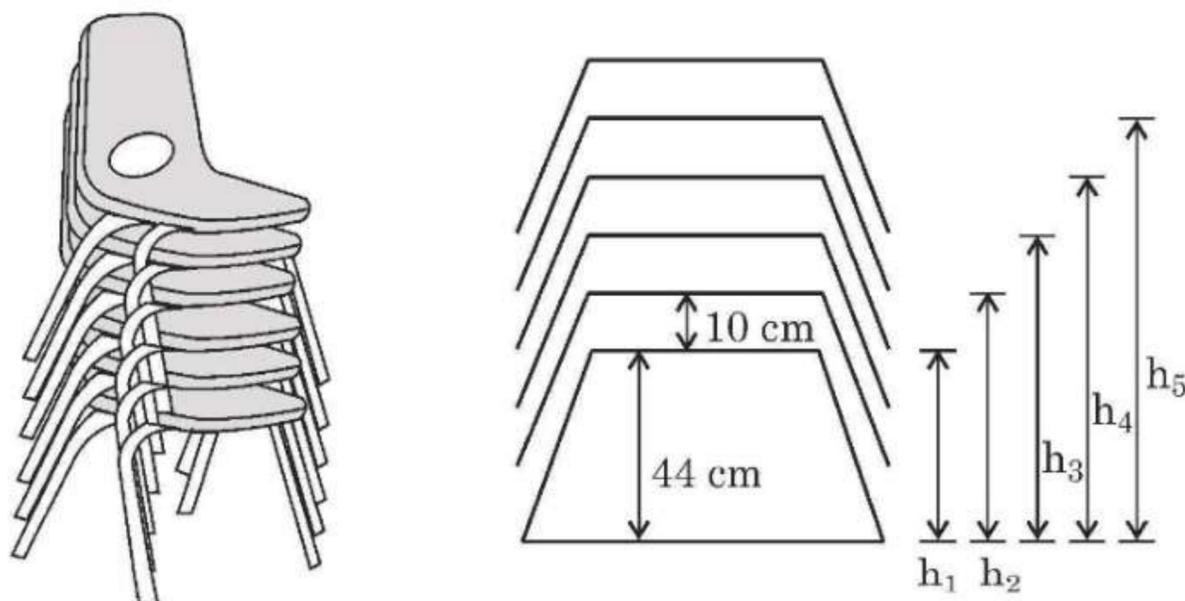
In the diagram, the height of seat of chair from ground is represented by h_1, h_2, h_3, ... The height of first seat is 44 cm from ground level and gap between every two seats is 10 cm.

(i) Write the values of h_1, h_2, h_3, h_4 and h_5 in this order only.   1

(ii) Show that the above values form an A.P. Write its first term and common difference.   1

(iii) (a) If chairs can be stacked up to the maximum height of 160 cm, then find the maximum number of chairs in a stack.   2

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

(iii) (b) Is it possible to stack 15 chairs if maximum height of the stack can not be more than 180 cm ? Justify your answer.

38.
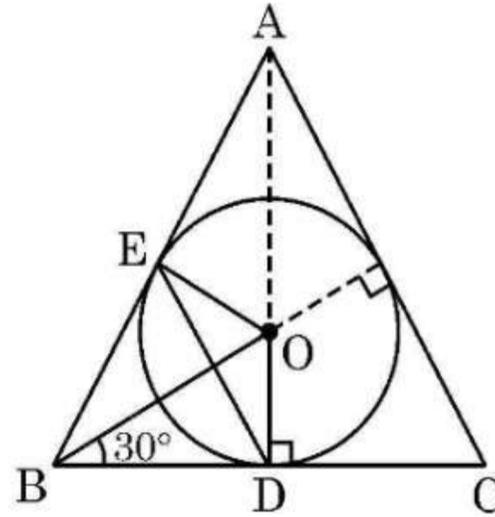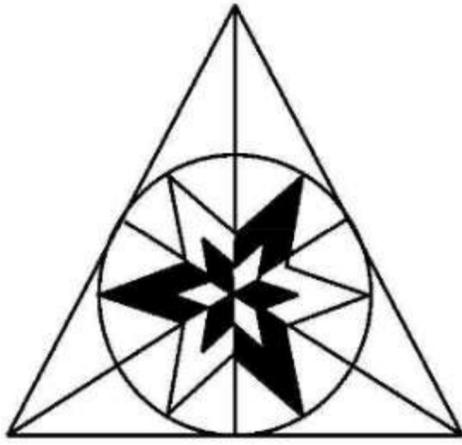
In a Fine Arts class, students were asked to design triangular tiles in geometric pattern.

Neelima made a circular design inside an equilateral triangle ABC. The radius of the circle is 4 cm. Observe the diagram and answer the following questions :

(i) Determine the length OB.   **1**

(ii) Is DE || CA ? Give reason for your answer.   **1**

(iii) (a) Write all angles of quadrilateral OEBD and show that it is a cyclic quadrilateral.   **2**

OR

(iii) (b) Find the perimeter of △ABC. (Use $\sqrt{3} = 1.73$)

———————

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

(I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 15 हैं।

(II) कृपया जाँच कर लें कि इस प्रश्न-पत्र में 38 प्रश्न हैं।

(III) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।

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

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

∧
• • •

NOTE

(I) Please check that this question paper contains **15** printed pages.

(II) Please check that this question paper contains **38** questions.

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

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

(V) 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित (बुनियादी)
MATHEMATICS (BASIC)

निर्धारित समय : 3 घण्टे
Time allowed : 3 hours

अधिकतम अंक : 80
*Maximum Marks : 80*

• • •

SECTION – A

20×1 = 20

Question Nos. 1 to 20 are multiple choice questions of 1 mark each.

1. If $\sin A = \dfrac{2}{3}$, then cos A is equal to : 1

    (a) $\dfrac{3}{2}$ (b) $\dfrac{\sqrt{5}}{3}$ (c) $\dfrac{1}{3}$ (d) $\dfrac{1}{\sqrt{3}}$

2. The curved surface area of a cone with base radius 7 cm, is 550 cm². The slant height of the cone is : 1
    (a) 25 cm   (b) 14 cm   (c) 20 cm   (d) 24 cm

3. The value of *m* for which lines $14x + my = 20$ and $-3x + 2y = 16$ are parallel, is : 1

    (a) $-\dfrac{3}{14}$ (b) $-\dfrac{7}{3}$ (c) $-\dfrac{28}{3}$ (d) $-\dfrac{3}{28}$

4. If α, β are zeroes of the polynomial $3x^2 + 14x - 5$, then the value of $3\left(\dfrac{\alpha + \beta}{\alpha\beta}\right)$ is : 1

    (a) $\dfrac{14}{5}$ (b) $\dfrac{42}{5}$ (c) $-\dfrac{14}{5}$ (d) $-\dfrac{42}{5}$

• • •

5. PQ and PR are tangents to the circle of radius 3 cm and centre O. If length of each tangent is 4 cm, then perimeter of $\triangle$ OQP is :
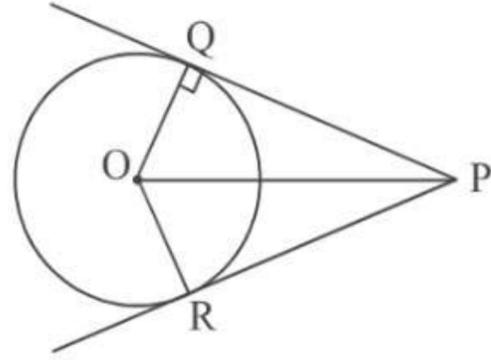
(a) 5 cm   (b) 12 cm

(c) 9 cm   (d) 8 cm   1

6. The LCM of two numbers is 3600. Which of the following can not be their HCF ?   1

(a) 600   (b) 400   (c) 500   (d) 150

7. The distance between the points $(-6, 9)$ and $(2, 7)$ is :   1

(a) $2\sqrt{17}$ (b) $4\sqrt{17}$ (c) $2\sqrt{5}$ (d) $2\sqrt{15}$

8. If $\sec\theta - \tan\theta = 2,$ then $\sec\theta + \tan\theta$ is equal to :   1

(a) $\dfrac{1}{2}$ (b) $\sqrt{2}$ (c) $\dfrac{1}{\sqrt{2}}$ (d) 2

9. Three coins are tossed together. The probability that only one coin shows tail, is :   1

(a) $\dfrac{1}{2}$ (b) $\dfrac{3}{8}$ (c) $\dfrac{7}{8}$ (d) 1

10. One of the zeroes of the polynomial $p(x) = kx^2 - 9x + 3$ is $\left(-\dfrac{3}{2}\right)$. The value of k is :   1

(a) $\dfrac{22}{3}$ (b) $-\dfrac{14}{3}$ (c) $\dfrac{14}{3}$ (d) $-\dfrac{22}{3}$

11. Two right circular cylinders of equal volumes have their heights in the ratio $1:2$. The ratio of their radii is :   1

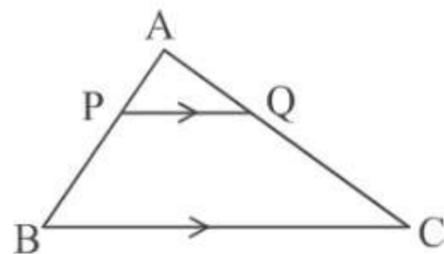(a) $\sqrt{2}:1$ (b) $1:2$ (c) $1:4$ (d) $1:\sqrt{2}$

12. If $\sqrt{2}\sin\theta = 1$, then $\cot\theta \times \mathrm{cosec}\,\theta$ is equal to :   1

(a) $\dfrac{1}{\sqrt{2}}$ (b) $\dfrac{1}{2\sqrt{2}}$ (c) $\sqrt{2}$ (d) $\dfrac{1}{2}$

13. In $\triangle$ ABC, PQ $\parallel$ BC. It is given that AP = 2.4 cm, PB = 3.6 cm and BC = 5.4 cm. PQ is equal to :

(a) 2.7 cm   (b) 1.8 cm
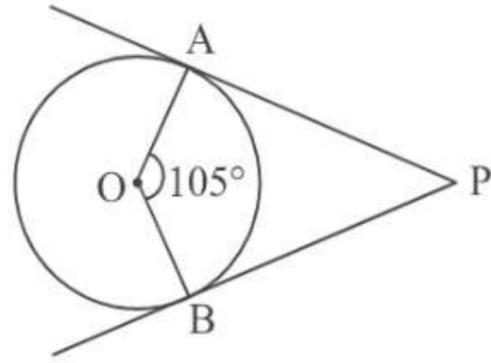
(c) 3.6 cm   (d) 2.16 cm   1

14. PA and PB are tangents to a circle with centre O. If $\angle AOB = 105°$ then $\angle OAP + \angle APB$ is equal to :

(a) 75°   (b) 175°

(c) 180°   (d) 165°

1

15. In an A.P., $a_n - a_{n-4} = 32$. Its common difference is :

(a) -8 (b) 8   (c) $4n$ (d) 4

1

16. The perimeter of a quadrant of a circle of radius 7 cm, is :

(a) 18 cm   (b) 11 cm   (c) 22 cm   (d) 25 cm

1

17. A card is drawn at random from a well shuffled deck of 52 playing cards. The probability that drawn card shows number '9' is :

(a) $\dfrac{1}{26}$ (b) $\dfrac{4}{13}$ (c) $\dfrac{1}{52}$ (d) $\dfrac{1}{13}$

1

18. The 20th term of the A.P. : $10\sqrt{2}, 6\sqrt{2}, 2\sqrt{2},....$ is :

(a) $-76 + 10\sqrt{2}$ (b) $-62\sqrt{2}$ (c) $-66\sqrt{2}$ (d) $86\sqrt{2}$

1

Directions :

Question numbers **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

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

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

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

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

19. Assertion (A) : Median marks of students in a class test is 16. It means half of the class got marks less than 16.

Reason (R) : Median divides the distribution in two equal parts.

1

20. Assertion (A) : If E is an event such that $P(E) = \dfrac{1}{999}$,

then $P(\overline{E}) = 0.001$.

Reason (R) : $P(E) + P(\overline{E}) = 1$

1

SECTION – B

Question Nos. 21 to 25 are very short answer questions of 2 marks each.

21. **(A)** Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre. 2

OR

(B) Prove that the tangents drawn at the ends of a diameter of a circle are parallel. 2

22. Find the ratio in which the segment joining the points $(2, -5)$ and $(5, 3)$ is divided by x-axis. Also, find coordinates of the point on x-axis. 2

23. Show that 45^n can not end with the digit 0, n being a natural number. Write the prime number 'a' which on multiplying with 45^n makes the product end with the digit 0. 2

24. The diagonal BD of parallelogram ABCD is divided by segment AE in the ratio $1 : 2$. If BE = 1.8 cm, find the length of AD. 2
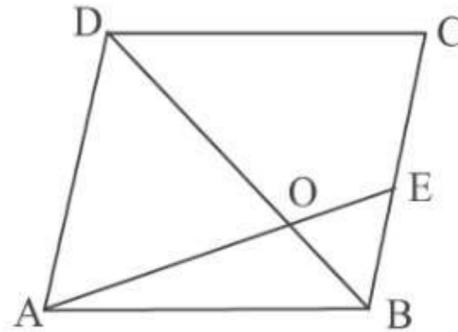
25. **(A)** A coin is dropped at random on the rectangular region shown in the figure. What is the probability that it will land inside the circle with radius 0.7 m ? 2
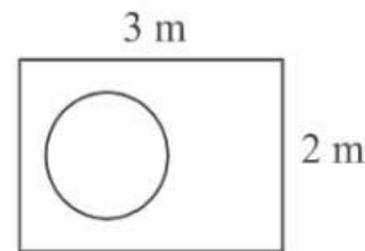
OR

(B) A die is thrown twice. What is the probability that (i) difference between two numbers obtained is 3 ? (ii) sum of the numbers obtained is 8 ? 2

SECTION – C

Question Nos. 26 to 31 are short answer questions of 3 marks each.

26. Prove that the opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle. 3

• • •

27. (A) If points A($-5, y$), B($2, -2$), C($8, 4$) and D($x, 5$) taken in order, form a parallelogram ABCD, then find the values of x and y. Hence, find lengths of sides of the parallelogram. 　　3

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

(B) A($6, -3$), B($0, 5$) and C($-2, 1$) are vertices of $\triangle$ABC. Points P($3, 1$) and Q($2, -1$) lie on sides AB and AC respectively. Check whether $\dfrac{AP}{PB} = \dfrac{AQ}{QC}$. 　　3

28. Find the zeroes of the polynomial $p(x) = 9x^2 - 6x - 35$ and verify the relationship between zeroes and its coefficients. 　　3
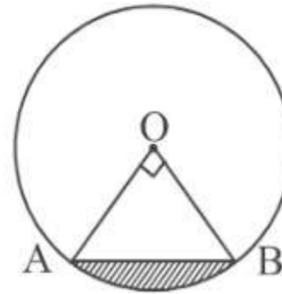
29. Prove that $\sqrt{2}$ is an irrational number. 　　3

30. (A) Find the sum of the A.P. $7, 10\frac{1}{2}, 14, \ldots\ldots 84$. 　　3

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

(B) If the sum of first n terms of an A.P. is given by $S_n = \dfrac{n}{2}(2n + 8)$. Then, find its first term and common difference. Hence, find its 15th term. 　　3

31. A chord of a circle of radius 14 cm subtends an angle of 90° at the centre. Find perimeter of shaded region. (Use $\sqrt{2} = 1.41$) 　　3

<div align="center">SECTION – D</div>

Question Nos. 32 to 35 are long answer questions of 5 marks each.

32. The angle of elevation of the top of a tower, 300 m high, from a point on the ground is observed as 30°. At an instant a hot air balloon passes vertically above the tower and at that instant its angle of elevation from same point on the ground is 60°. Find height of the balloon from the ground and distance of tower from point of observation. (Use $\sqrt{3} = 1.73$) 　　5

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

. . .

<center>OR</center>

(B) In a △ ABC, P and Q are points on AB and AC respectively such that PQ ∥ BC. Prove that the median AD, drawn from A to BC, bisects PQ.   **5**

34. (A) It is given that $p^2x^2 + (p^2 - q^2)x - q^2 = 0$; $(p \neq 0)$

    (i) Show that the discriminant (D) of above equation is a perfect square.

    (ii) Find the roots of the equation.   **5**

<center>OR</center>

(B) Three consecutive positive integers are such that the sum of the square of smallest and product of other two is 67. Find the numbers, using quadratic equation.   **5**

35. Find 'mean' and 'mode' of the following data :   **5**

Class	20-25	25-30	30-35	35-40	40-45	45-50
Frequency	9	8	11	13	4	5

<center>SECTION – E</center>

Question Nos. 36 to 38 are case-based questions of 4 marks each.

36. Playing in a ball pool is good entertainment for kids. Suhana bought 600 new balls of diameter 7 cm to fill in the pool for her kids. The cuboidal box containing 600 balls has dimensions 42 cm × 91 cm × 50 cm ($l \times b \times h$).

Based on above information, answer the following questions :

(i) Find the volume of one ball.   **1**

(ii) 10 balls are painted with neon colours. Determine the area of painted surface.   **1**

(iii) (a) Find the volume of empty space in the box.   **2**

<center>OR</center>

(iii) (b) The lowermost layer of the balls covers the base of the box edge to edge when balls are placed evenly adjacent to each other. (A) How much area is covered by one ball? (B) How many balls are there in lowermost layer?   **2**

37. Rahim and Nadeem are two friends whose plots are adjacent to each other. Rahim's son made a drawing of the plots with necessary details.

It is decided that Rahim will fence the triangular plot ABC and Nadeem will fence along the sides AF, FE and BE.

Observe the diagram carefully and answer the following questions :

(Use $\sqrt{2} = 1.41$ and $\sqrt{3} = 1.73$)

BH = 40m
HD = 10m
DG = 40m
GF = 38m
FE = 53m
AF = 53.58m
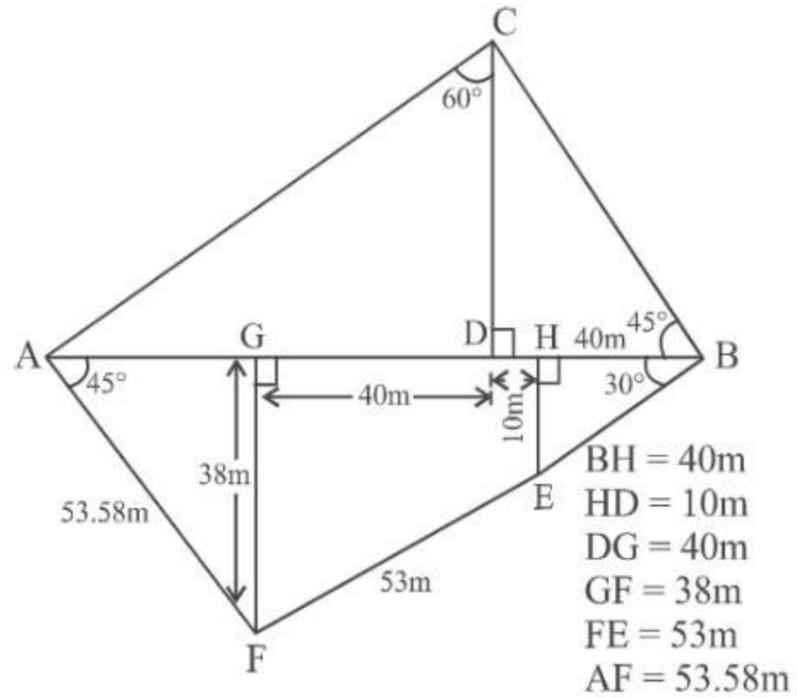
(i) Find length BC. 1

(ii) Find length AG. 1

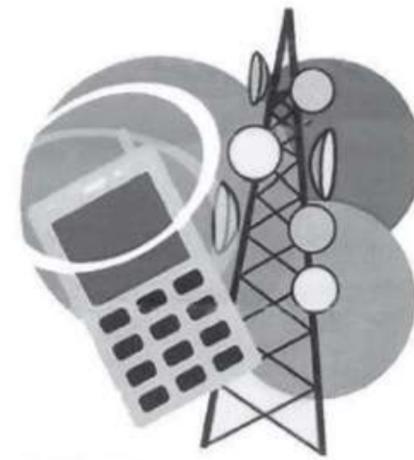(iii) (a) Calculate perimeter of $\triangle ABC$. 2

OR

(iii) (b) Calculate length of (AF + FE + EB). 2

38. A telecommunication company came up with two plans– plan A and plan B for its customers. The plans are represented by linear equations where 't' represents the time (in minutes) bought and 'C' represents the cost. The equations are :

Plan A : $3C = 20t$

Plan B : $3C = 10t + 300$

Based on above information, answer the following questions :

(i) If you purchase plan B, how much initial amount you have to pay ? 1

(ii) Charu purchased plan A. How many minutes she bought for ₹ 250 ? 1

(iii) (a) At how many minutes, do both the plans charge the same amount? What is that amount? 2

OR

(iii) (b) Which plan is better if you want to buy 60 minutes? Give reason for your answer. 2

रोल नं.

Roll No.

नोट

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

(II) कृपया जाँच कर लें कि इस प्रश्न-पत्र में 38 प्रश्न हैं ।

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

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

(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 ।

NOTE

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

(II) Please check that this question paper contains **38** questions.

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

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

(V) 15 minutes 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 (बुनियादी)

MATHEMATICS (BASIC)

निर्धारित समय : *3 घण्टे*
Time allowed : 3 hours

अधिकतम अंक : *80*
Maximum Marks : 80

General Instructions :

**Read the following instructions carefully and follow them :**

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

(ii)   *Question Paper is divided into **FIVE** Sections – **SECTION A, B, C, D** and **E**.*

(iii) *In Section–**A**, question numbers **1** to **18** are Multiple Choice Questions (MCQs) and question numbers **19 & 20** are Assertion-Reason based questions of **1** mark each.*

(iv)   *In Section–**B**, question numbers **21** to **25** are Very Short Answer (VSA) type questions of **2** marks each.*

(v)   *In Section–**C**, question numbers **26** to **31** are Short Answer (SA) type questions carrying **3** marks each.*

(vi)   *In Section–**D**, question numbers **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.*

(vii) *In Section–**E**, question numbers **36** to **38** are **case-based integrated units** of assessment 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 figures wherever required. Take $\pi = 22/7$ wherever required if not stated.*

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

• • •

(Multiple Choice Questions)

Section-A consists of **20** Multiple Choice Questions of **1** mark each.

1. In two concentric circles centred at O, a chord AB of the larger circle touches the smaller circle at C. If OA = 3.5 cm, OC = 2.1 cm, then AB is equal to
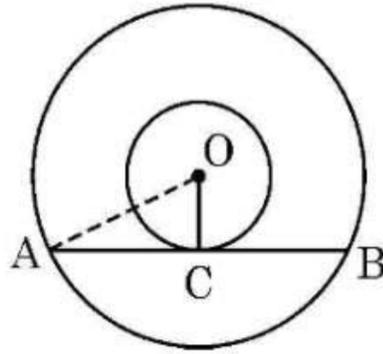
(A) 5.6 cm   (B) 2.8 cm
(C) 3.5 cm   (D) 4.2 cm

2. Three coins are tossed together. The probability that at least one head comes up, is

(A) $\dfrac{3}{8}$ (B) $\dfrac{7}{8}$

(C) $\dfrac{1}{8}$ (D) $\dfrac{3}{4}$

3. The volume of air in a hollow cylinder is 450 cm^3. A cone of same height and radius as that of cylinder is kept inside it. The volume of empty space in the cylinder is
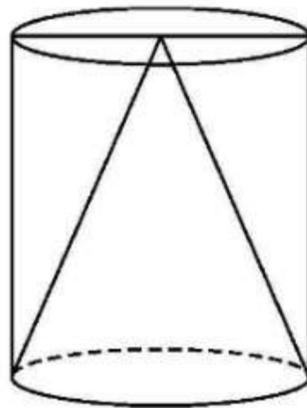
(A) 225 cm^3 (B) 150 cm^3
(C) 250 cm^3 (D) 300 cm^3

4. If the length of the shadow of a tower is $\sqrt{3}$ times its height, then the angle of elevation of the sun is

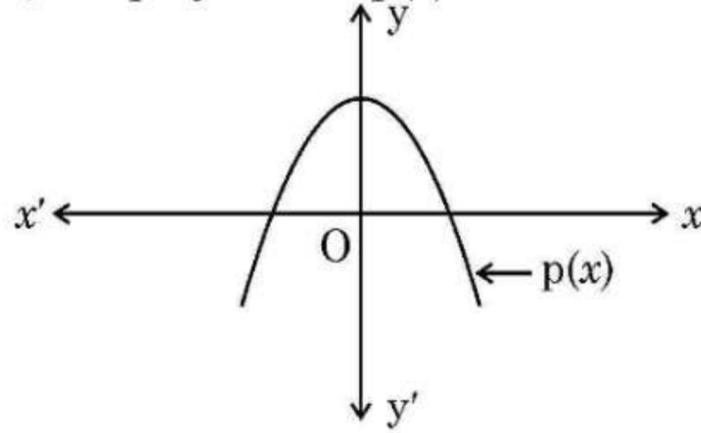(A) 45°   (B) 30°
(C) 60°   (D) 0°

• • •

5. 22nd term of the A.P. : $\dfrac{3}{2}, \dfrac{1}{2}, \dfrac{-1}{2}, \dfrac{-3}{2}, \dots$ is

(A) $\dfrac{45}{2}$

(B) -9

(C) $\dfrac{-39}{2}$

(D) -21

6. In the given graph, the polynomial $p(x)$ is shown. Number of zeroes of $p(x)$ is

(A) 3

(B) 2

(C) 1

(D) 4

7. If probability of happening of an event is 57%, then probability of non-happening of the event is

(A) 0.43

(B) 0.57

(C) 53%

(D) $\dfrac{1}{57}$

8. OAB is sector of a circle with centre O and radius 7 cm. If length of arc $\overset{\frown}{AB} = \dfrac{22}{3}$ cm, then $\angle AOB$ is equal to

(A) $\left(\dfrac{120}{7}\right)^{\circ}$

(B) $45°$

(C) $60°$

(D) $30°$

9. If the sum of first n terms of an A.P. is given by $S_n = \dfrac{n}{2}(3n + 1)$, then the first term of the A.P. is

(A) 2

(B) $\dfrac{3}{2}$

(C) 4

(D) $\dfrac{5}{2}$

10. To calculate mean of a grouped data, Rahul used assumed mean method. He used $d = (x - A)$, where A is assumed mean. Then $\bar{x}$ is equal to

(A) $A + \bar{d}$

(B) $A + h\bar{d}$

(C) $h(A + \bar{d})$

(D) $A - h\bar{d}$

• • •

11. The point $(3, -5)$ lies on the line $mx - y = 11$. The value of m is

(A) 3

(B) -2

(C) 8

(D) 2

12. If $\sqrt{3} \sin\theta = \cos\theta$, then value of θ is

(A) $\sqrt{3}$

(B) $60°$

(C) $\dfrac{1}{\sqrt{3}}$

(D) $30°$

13. ABCD is a rectangle with its vertices at $(2, -2)$, $(8, 4)$, $(4, 8)$ and $(-2, 2)$ taken in order. Length of its diagonal is

(A) $4\sqrt{2}$

(B) $6\sqrt{2}$

(C) $4\sqrt{26}$

(D) $2\sqrt{26}$

14. Two dice are rolled together. The probability of getting a sum more than 9 is

(A) $\dfrac{5}{6}$

(B) $\dfrac{5}{18}$

(C) $\dfrac{1}{6}$

(D) $\dfrac{1}{2}$

15. In $\triangle ABC$, DE||BC. If AE $= (2x + 1)$ cm, EC $= 4$ cm, AD $= (x + 1)$ cm and DB $= 3$ cm, then value of x is
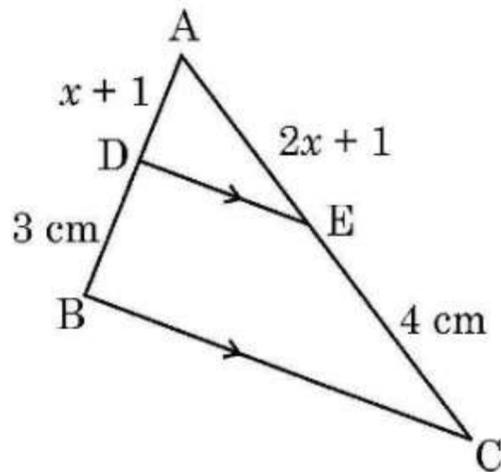
(A) 1

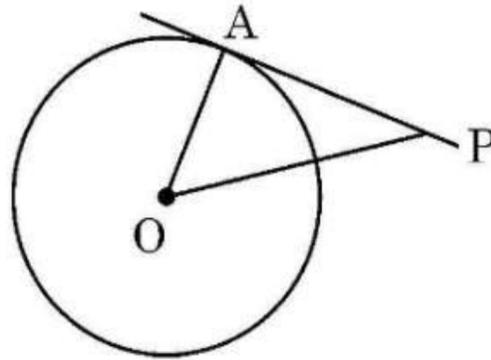(B) $\dfrac{1}{2}$

(C) -1

(D) $\dfrac{1}{3}$

• • •

16. The value of k for which the system of equations $3x - 7y = 1$ and $kx + 14y = 6$ is inconsistent, is
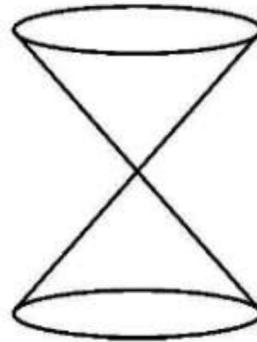
(A) -6

(B) $\dfrac{2}{3}$

(C) 6

(D) $\dfrac{-3}{2}$

17. In the given figure, PA is tangent to a circle with centre O. If $\angle APO = 30°$ and OA = 2.5 cm, then OP is equal to

(A) 2.5 cm

(B) 5 cm

(C) $\dfrac{5}{\sqrt{3}}$ cm

(D) 2 cm

18. Two identical cones are joined as shown in the figure. If radius of base is 4 cm and slant height of the cone is 6 cm, then height of the solid is

(A) 8 cm

(B) $4\sqrt{5}$ cm

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

(D) 12 cm

(Assertion – Reason based questions)

Directions : In question numbers **19** and **20**, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option :

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

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not correct explanation for 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) :** $(a + \sqrt{b}) \cdot (a - \sqrt{b})$ is a rational number, where a and b are positive integers.

   Reason (R) : Product of two irrationals is always rational.

20. **Assertion (A) :** $\triangle ABC \sim \triangle PQR$ such that $\angle A = 65°$, $\angle C = 60°$. Hence $\angle Q = 55°$.

   Reason (R) : Sum of all angles of a triangle is 180°.

Section – B

(Very Short Answer Type Questions)   5 × 2 = 10

Q. Nos. **21** to **25** are Very Short Answer type questions of **2** marks each.

21. A box contains 120 discs, which are numbered from 1 to 120. If one disc is drawn at random from the box, find the probability that
   (i)   it bears a 2– digit number
   (ii) the number is a perfect square.

22. (a)   Evaluate : $\dfrac{\cos 45°}{\tan 30° + \sin 60°}$

   OR

   (b)   Verify that $\sin 2A = \dfrac{2 \tan A}{1 + \tan^2 A}$, for $A = 30°$.

23. (a)   Solve the quadratic equation $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$ using quadratic formula.

   OR

   (b)   Find the nature of roots of the equation $4x^2 - 4a^2x + a^4 - b^4 = 0$, $b \neq 0$

24. Using prime factorisation, find the HCF of 180, 140 and 210.

25. The perimeters of two similar triangles are 22 cm and 33 cm respectively. If one side of first triangle is 9 cm, then find the length of corresponding side of the second triangle.

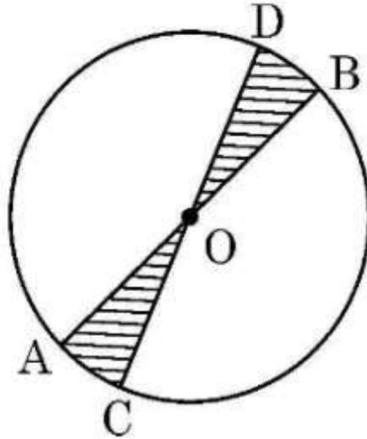## Section – C

(Short Answer Type Questions)   6 × 3 = 18

Q. Nos. **26** to **31** are Short Answer type questions of **3** marks each.

26. Given that $\sqrt{5}$ is an irrational number, prove that $2 + 3\sqrt{5}$ is an irrational number.

27. (a) Find the A.P. whose third term is 16 and seventh term exceeds the fifth term by 12. Also, find the sum of first 29 terms of the A.P.

OR

(b) Find the sum of first 20 terms of an A.P. whose n^{th} term is given by $a_n = 5 + 2n$. Can 52 be a term of this A.P. ?

28. Prove that $\dfrac{\sin\theta}{1+\cos\theta} + \dfrac{1+\cos\theta}{\sin\theta} = 2\csc\theta$.

29. Find length and breadth of a rectangular park whose perimeter is 100 m and area is 600 m^2.

30. AB and CD are diameters of a circle with centre O and radius 7 cm. If $\angle BOD = 30°$, then find the area and perimeter of the shaded region.

31. (a) α, β are zeroes of the polynomial $3x^2 - 8x + k$. Find the value of k, if $\alpha^2 + \beta^2 = \dfrac{40}{9}$.

OR

(b) Find the zeroes of the polynomial $2x^2 + 7x + 5$ and verify the relationship between its zeroes and co-efficients.

● ● ●

Section – D

(Long Answer Type Questions) $4 \times 5 = 20$

Q. Nos. **32** to **35** are Long Answer type questions of **5** marks each.

32. Find 'mean' and 'mode' marks of the following data :

Marks	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30
Number of students	2	3	8	15	14	8

33. (a) Solve the following pair of linear equations by graphical method :

$2x + y = 9$ and $x - 2y = 2$

OR

(b) Nidhi received simple interest of ₹ 1,200 when invested ₹ x at 6% p.a. and ₹ y at 5% p.a. for 1 year. Had she invested ₹ x at 3% p.a. and ₹ y at 8% p.a. for that year, she would have received simple interest of ₹ 1,260. Find the values of x and y.
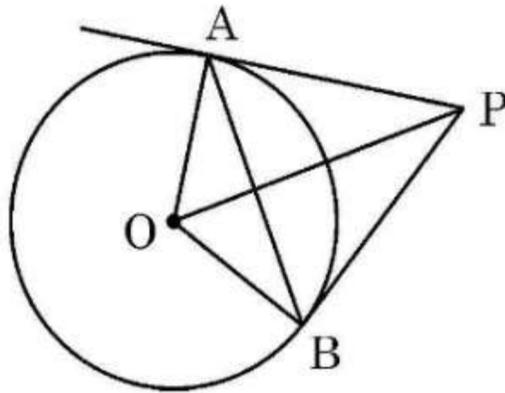
34. (a) The given figure shows a circle with centre O and radius 4 cm circumscribed by ΔABC. BC touches the circle at D such that BD = 6 cm, DC = 10 cm. Find the length of AE.
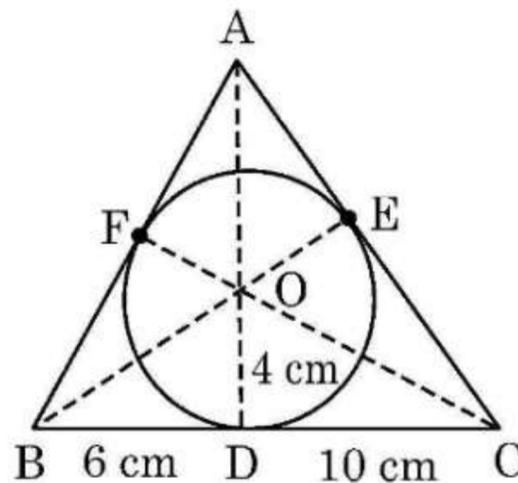
OR

. . .

(b) PA and PB are tangents drawn to a circle with centre O.

If $\angle AOB = 120°$ and OA = 10 cm, then

(i) Find $\angle OPA$. 1

(ii) Find the perimeter of $\triangle OAP$. 3

(iii) Find the length of chord AB. 1

35. A drone is flying at a height of h metres. At an instant it observes the angle of elevation of top of an industrial turbine as 60° and angle of depression of foot of the turbine as 30°. If height of turbine is 200 metres, find the value of h and the distance of drone from the turbine.
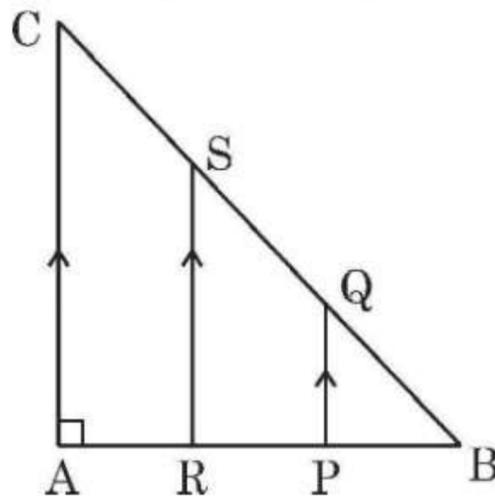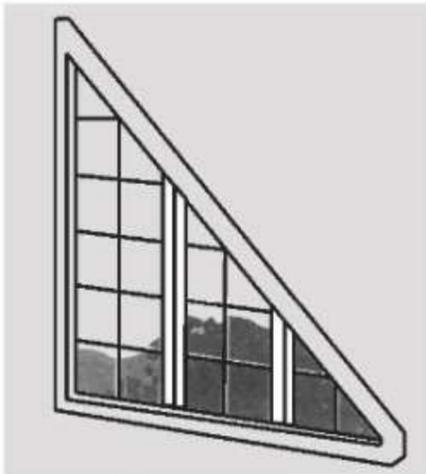
(Use $\sqrt{3} = 1.73$)

Section – E

(Case-study based Questions) $3 \times 4 = 12$

Q. Nos. 36 to 38 are Case-study based Questions of 4 marks each.

36.

A triangular window of a building is shown above. Its diagram represents a $\triangle ABC$ with $\angle A = 90°$ and AB = AC. Points P and R trisect AB and PQ ∥ RS ∥ AC.

Based on the above, answer the following questions :

(i) Show that $\triangle BPQ \sim \triangle BAC$. 1
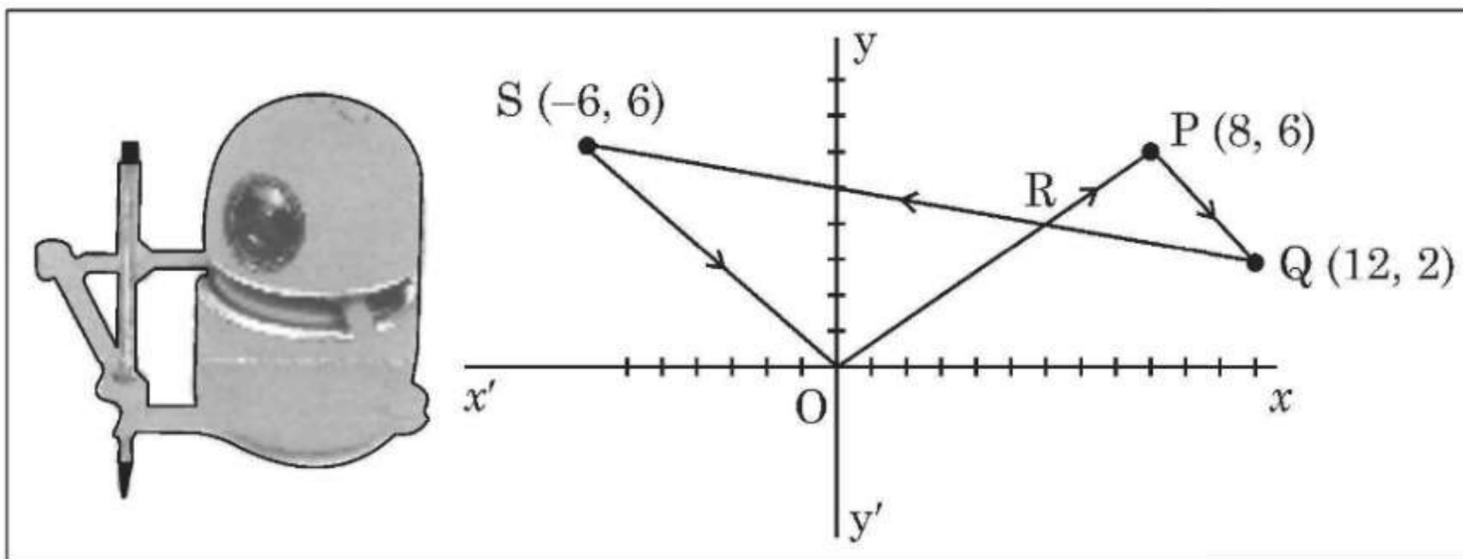
• • •

(ii) Prove that $PQ = \dfrac{1}{3} AC$. **1**

(iii) (a) If AB = 3 m, find length BQ and BS. Verify that $BQ = \dfrac{1}{2} BS$. **2**

OR

(iii) (b) Prove that $BR^2 + RS^2 = \dfrac{4}{9} BC^2$.

37. Gurveer and Arushi built a robot that can paint a path as it moves on a graph paper. Some co-ordinate of points are marked on it. It starts from (0, 0), moves to the points listed in order (in straight lines) and ends at (0, 0).

Arushi entered the points P(8, 6), Q(12, 2) and S(– 6, 6) in order. The path drawn by robot is shown in the figure.

Based on the above, answer the following questions :

(i) Determine the distance OP. **1**

(ii) QS is represented by equation $2x + 9y = 42$. Find the co-ordinates of the point where it intersects y – axis. **1**

(iii) (a) Point R(4.8, y) divides the line segment OP in a certain ratio, find the ratio. Hence, find the value of y. **2**
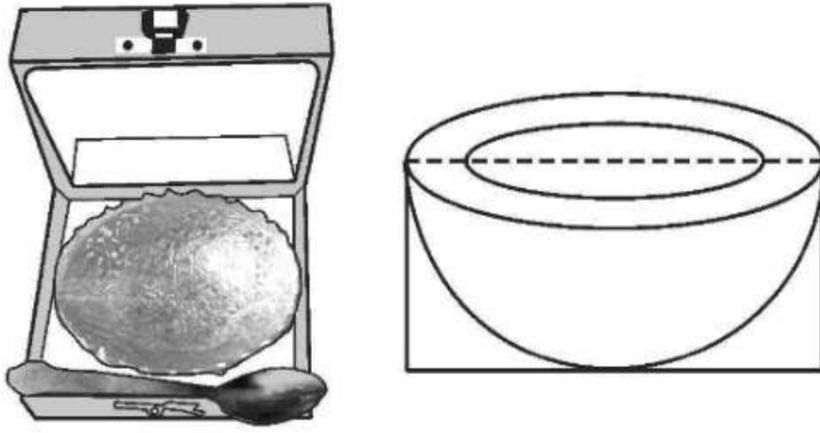
OR

(iii) (b) Using distance formula, show that $\dfrac{PQ}{OS} = \dfrac{2}{3}$.

38.

A hemispherical bowl is packed in a cuboidal box. The bowl just fits in the box. Inner radius of the bowl is 10 cm. Outer radius of the bowl is 10.5 cm.

Based on the above, answer the following questions :

(i)   Find the dimensions of the cuboidal box.   **1**

(ii)   Find the total outer surface area of the box.   **1**

(iii) (a)   Find the difference between the capacity of the bowl and the
             volume of the box. (use $\pi = 3.14$)   **2**

OR

(iii) (b)   The inner surface of the bowl and the thickness is to be painted.
             Find the area to be painted.

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