रोल नं.
Roll No.

गणित (बुनियादी)
MATHEMATICS (BASIC)
#

निर्धारित समय : 3 घण्टे
Time allowed : 3 hours

अधिकतम अंक : 80
Maximum Marks : 80

नोट / NOTE :

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

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

(ii) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को छात्र 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 प्रश्न का क्रमांक अवश्य लिखें।

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

(v) इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक छात्र 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 students will read the question paper only and will not write any answer on the answer-book during this period.

Read the following instructions carefully and follow them :

1. This question paper contains 38 questions. All questions are compulsory.
2. Question paper is divided into FIVE sections - Section A, B, C, D and E.
3. In section A, question number 1 to 18 are multiple choice questions (MCQs) and question number 19 and 20 are Assertion - Reason based questions of 1 mark each.
4. In section B, question number 21 to 25 are very short answer (VSA) type questions. of 2 marks each.
5. In section C, question number 26 to 31 are short answer (SA) type questions carrying 3 marks each.
6. In section D, question number 32 to 35 are long answer (LA) type questions carrying 5 marks each.
7. In section E, question number 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.
8. 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.
9. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.
10. Use of calculators is not allowed.

SECTION - A

Section - A consists of Multiple Choice type questions of 1 mark each.

1. Let E be an event such that P(not E) $=\dfrac{1}{5}$, then P(E) is equal to :

   (a) $\dfrac{1}{5}$ (b) $\dfrac{2}{5}$ (c) 0   (d) $\dfrac{4}{5}$ 1

2. If $p(x) = x^2 + 5x + 6$, then $p(-2)$ is :

   (a) 20   (b) 0   (c) -8 (d) 8   1

3. The mode of the numbers 2, 3, 3, 4, 5, 4, 4, 5, 3, 4, 2, 6, 7 is :

   (a) 2   (b) 3   (c) 4   (d) 5   1

4. How many tangents can be drawn to a circle from a point on it ?

   (a) One   (b) Two   (c) Infinite   (d) Zero   1

5. A quadratic equation whose one root is 2 and the sum of whose roots is zero, is :

   (a) $x^2 + 4 = 0$ (b) $x^2 - 2 = 0$ (c) $4x^2 - 1 = 0$ (d) $x^2 - 4 = 0$ 1

6. Which of the following is not a quadratic equation ?

   (a) $2(x-1)^2 = 4x^2 - 2x + 1$ (b) $2x - x^2 = x^2 + 5$

   (c) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$ (d) $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$ 1

7. A quadratic polynomial whose sum and product of zeroes are 2 and -1 respectively is :

   (a) $x^2 + 2x + 1$ (b) $x^2 - 2x - 1$ (c) $x^2 + 2x - 1$ (d) $x^2 - 2x + 1$ 1

8. (HCF × LCM) for the numbers 30 and 70 is : 1
   (a) 2100   (b) 21   (c) 210   (d) 70

9. The length of the arc of a circle of radius 14 cm which subtends an angle of 60° at the centre of the circle is : 1
   (a) $\frac{44}{3}$ cm   (b) $\frac{88}{3}$ cm   (c) $\frac{308}{3}$ cm   (d) $\frac{616}{3}$ cm

10. If the radius of a semi-circular protractor is 7cm, then its perimeter is : 1
    (a) 11 cm   (b) 14 cm   (c) 22 cm   (d) 36 cm

11. The angle of elevation of the top of a 15 m high tower at a point $15\sqrt{3}$ m away from the base of the tower is : 1
    (a) 30° (b) 45° (c) 60° (d) 90°

12. $\left(\frac{2}{3}\sin 0^\circ - \frac{4}{5}\cos 0^\circ\right)$ is equal to : 1

    (a) $\frac{2}{3}$ (b) $\frac{-4}{5}$ (c) 0   (d) $\frac{-2}{15}$

13. From a well-shuffled deck of 52 cards, a card is drawn at random. What is the probability of getting king of hearts ? 1
    (a) $\frac{1}{52}$ (b) $\frac{1}{26}$ (c) $\frac{1}{13}$ (d) $\frac{12}{13}$

14. The number $(5 - 3\sqrt{5} + \sqrt{5})$ is : 1
    (a) an integer   (b) a rational number
    (c) an irrational number   (d) a whole number

15. If the pair of linear equations $x - y = 1$, $x + ky = 5$ has a unique solution $x = 2$, $y = 1$, then the value of k is : 1
    (a) – 2   (b) – 3   (c) 3   (d) 4

16. If $\triangle ABC \sim \triangle DEF$ and $\angle A = 47^\circ$, $\angle E = 83^\circ$, then $\angle C$ is equal : 1
    (a) 47° (b) 50° (c) 83° (d) 130°

17. The length of the tangent from an external point A to a circle, of radius 3 cm, is 4 cm. The distance of A from the centre of the circle is : 1
    (a) 7 cm   (b) 5 cm   (c) $\sqrt{7}$ cm   (d) 25 cm

18. The pair of linear equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has : 1
    (a) a unique solution   (b) exactly two solutions
    (c) infinitely many solutions   (d) no solution

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) gives the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) does not give the correct explanation of Assertion (A).

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

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

19. **Assertion (A)** : If one root of the quadratic equation $4x^2 - 10x + (k - 4) = 0$ is reciprocal of the other, then value of k is 8.

   Reason (R) : Roots of the quadratic equation $x^2 - x + 1 = 0$ are real. 　1

20. **Assertion (A)** : A tangent to a circle is perpendicular to the radius through the point of contact.

   Reason (R) : The lengths of tangents drawn from an external point to a circle are equal. 　1
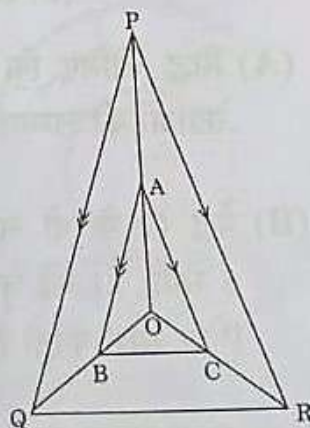
SECTION - B

Section - B comprises of Very Short Answer (VSA) questions of 2 marks each.

21. (A) Find the discriminant of the quadratic equation $3x^2 - 2x + \frac{1}{3} = 0$ and hence find the nature of its roots. 　2

   OR

   (B) Find the roots of the quadratic equation $x^2 - x - 2 = 0$. 　2

22. In the adjoining figure, A, B and C are points on OP, OQ and OR respectively such that AB∥PQ and AC∥PR. Show that BC∥QR. 　2

23. If $\sin \alpha = \frac{1}{2}$, then find the value of $(3 \cos \alpha - 4 \cos^3 \alpha)$. 　2

24. (A) Find the coordinates of the point which divides the join of A (−1, 7) and B (4, −3) in the ratio 2 : 3.
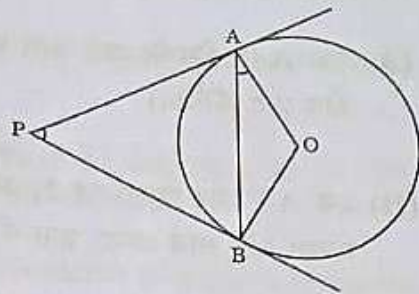
   OR

(B) If the points A (2, 3), B (−5, 6), C (6, 7) and D (p, 4) are the vertices of a parallelogram ABCD, find the value of p.

25. PA and PB are tangents drawn to the circle with centre O as shown in the figure. Prove that ∠APB = 2 ∠OAB.   2

SECTION - C
Section - C comprises of Short Answer (SA) type questions of 3 marks each.

26. Find the area of the sector of a circle of radius 7 cm and of central angle 90°. Also, find the area of corresponding major sector.   3

27. If α, β are zeroes of the quadratic polynomial $x^2 − 5x + 6$, form another quadratic polynomial whose zeroes are $\dfrac{1}{\alpha}, \dfrac{1}{\beta}$.   3

28. A die is rolled once. Find the probability of getting :   3
    (i)   an even prime number.
    (ii) a number greater than 4.
    (iii) an odd number.

29. Prove that $\dfrac{1+\tan^2 A}{1+\cot^2 A} = \sec^2 A − 1$ 3

30. (A) Prove that the lengths of tangents drawn from an external point to a circle are equal.   3

    OR

    (B) Two concentric circles with centre O are of radii 3 cm and 5 cm. Find the length of chord AB of the larger circle which touches the smaller circle at P.   3
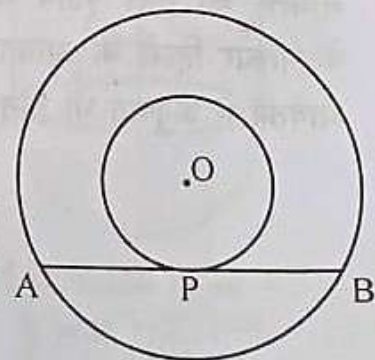
31. (A) If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\dfrac{1}{2}$ if we only add 1 to the denominator. What is the fraction ?   3

    OR

    (B) For which value of 'k' will the following pair of linear equations have no solution ?   3
    $3x + y = 1$
    $(2k − 1) x + (k − 1) y = 2k + 1$

Section - D comprises of Long Answer (LA) type questions of 5 marks each.

32. (A) Find the sum of first 51 terms of an A.P. whose second and third terms are 14 and 18, respectively.

5

OR

(B) The first term of an A.P. is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

5

33. The distribution below gives the weights of 30 students of a class. Find the median weight of the students :

5

Weight in kg	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Number of Students	2	3	8	6	6	3	2

34. The boilers are used in thermal power plants to store water and then used to produce steam. One such boiler consists of a cylindrical part in middle and two hemispherical parts at its both ends.
Length of the cylindrical part is 7m and radius of cylindrical part is $\frac{7}{2}$ m.

Find the total surface area and the volume of the boiler. Also, find the ratio of the volume of cylindrical part to the volume of one hemispherical part.
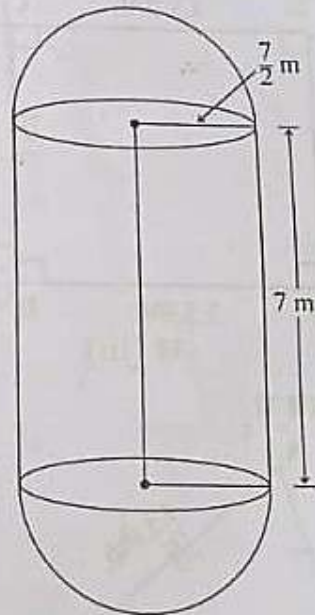
5

35. (A) The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60°. Find the height of the tower.

5

OR

(B) From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.
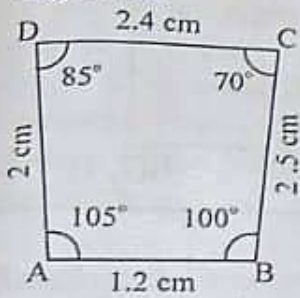
5

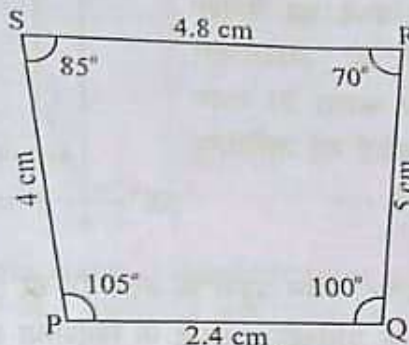Section - E comprises of 3 Case Study / Passage Based questions of 4 marks each.

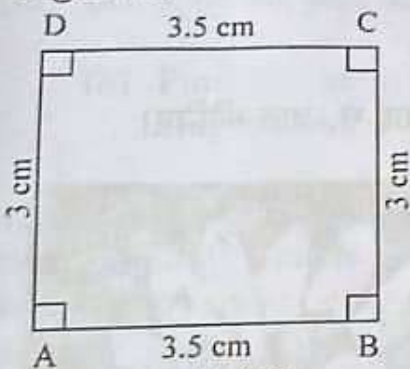36. Observe the figures given below carefully and answer the questions :
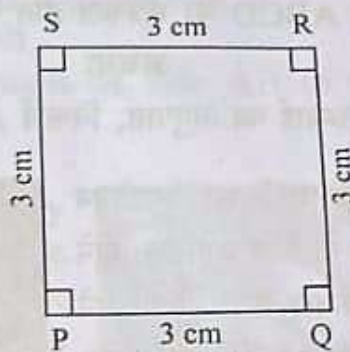
Figure A

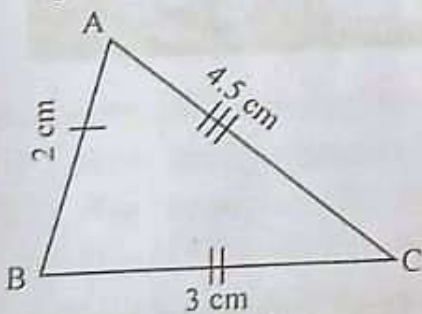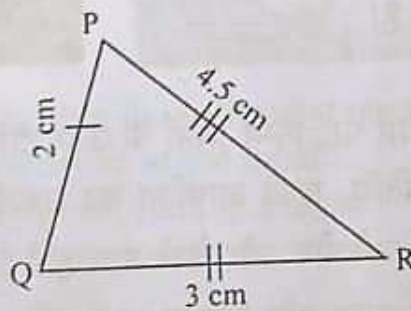A (i)   A (ii)

Figure B

B (iii)   B (iv)

Figure C

C (v)   C (vi)

(i)   Name the figure(s) wherein two figures are similar.   1

(ii)   Name the figure(s) wherein the figures are congruent.   1

(iii)   (a) Prove that congruent triangles are also similar but not the converse.   2

OR

(b) What more is least needed for two similar triangles to be congruent ?   2

37. Use of mobile screen for long hours makes your eye sight weak and give you headaches. Children who are addicted to play "PUBG" can get easily stressed out. To raise social awareness about ill effects of playing PUBG, a school decided to start 'BAN PUBG' campaign, in which students are asked to prepare campaign board in the shape of a rectangle. One such campaign board made by class X student of the school is shown in the figure.
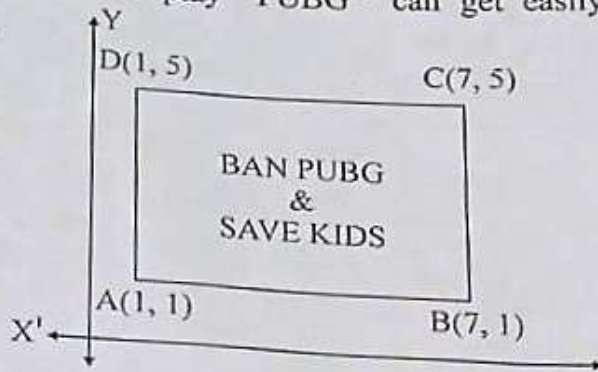
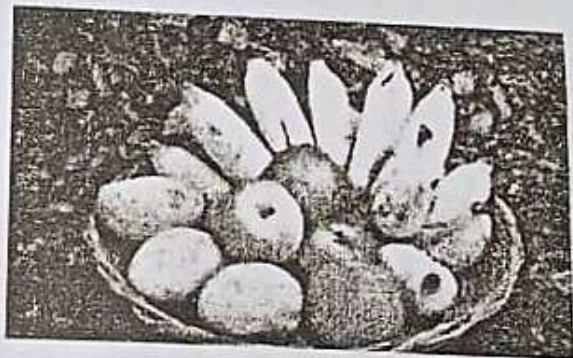Based on the above information, answer the following questions :

(i) Find the coordinates of the point of intersection of diagonals AC and BD. 1

(ii) Find the length of the diagonal AC. 1

(iii) (a) Find the area of the campaign Board ABCD. 2

OR

(b) Find the ratio of the length of side AB to the length of the diagonal AC. 2

38. Khushi wants to organize her birthday party. Being health conscious, she decided to serve only fruits in her birthday party. She bought 36 apples and 60 bananas and decided to distribute fruits equally among all.

Based on the above information, answer the following questions :

(i) How many guests Khushi can invite at the most ? 1

(ii) How many apples and bananas will each guest get ? 1

(iii) (a) If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most ? 2

OR

(b) If the cost of 1 dozen of bananas is ₹ 60, the cost of 1 apple is ₹ 15 and cost of 1 mango is ₹ 20, find the total amount spent on 60 bananas, 36 apples and 42 mangoes. 2