नोट	NOTE
(I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 23 हैं ।	(I) Please check that this question paper contains 23 printed pages.
(II) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।	(II) Code number 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 40 प्रश्न हैं ।	(III) Please check that this question paper contains 40 questions.
(IV) कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।	(IV) 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 ।	(V) 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.

गणित (मानक) – सैद्धान्तिक

MATHEMATICS (STANDARD) – Theory

निर्धारित समय : 3 घण्टे	अधिकतम अंक : 80
Time allowed : 3 hours	*Maximum Marks : 80*

Read the following instructions very carefully and strictly follow them :

(i)   This question paper comprises **four** sections – A, B, C and D. This question paper carries **40** questions. All questions are **compulsory**.

(ii)   **Section A** : Question Numbers **1** to **20** comprises of **20** questions of **one** mark each.

(iii)   **Section B** : Question Numbers **21** to **26** comprises of **6** questions of **two** marks each.

(iv)   **Section C** : Question Numbers **27** to **34** comprises of **8** questions of **three** marks each.

(v)   **Section D** : Question Numbers **35** to **40** comprises of **6** questions of **four** marks each.

(vi)   There is no overall choice in the question paper. However, an internal choice has been provided in 2 questions of one mark, 2 questions of two marks, 3 questions of three marks and 3 questions of four marks. You have to attempt only one of the choices in such questions.

(vii) In addition to this, separate instructions are given with each section and question, wherever necessary.

(viii) Use of calculators is **not** permitted.

SECTION A

Question numbers 1 to 20 carry 1 mark each.

Question numbers 1 to 10 are multiple choice questions.

Choose the correct option.

1.   The value(s) of k for which the quadratic equation $2x^2 + kx + 2 = 0$ has equal roots, is

    (A)   4

    (B) ± 4

    (C) -4

    (D)   0

2.   Which of the following is **not** an A.P. ?

    (A) $-1{\cdot}2, 0{\cdot}8, 2{\cdot}8, \ldots$

    (B) $3, 3 + \sqrt{2}, 3 + 2\sqrt{2}, 3 + 3\sqrt{2}, \ldots$

    (C) $\dfrac{4}{3}, \dfrac{7}{3}, \dfrac{9}{3}, \dfrac{12}{3}, \ldots$

    (D) $\dfrac{-1}{5}, \dfrac{-2}{5}, \dfrac{-3}{5}, \ldots$

3. The radius of a sphere (in cm) whose volume is 12π cm³, is

(A) 3

(B) $3\sqrt{3}$

(C) $3^{2/3}$

(D) $3^{1/3}$

4. The distance between the points $(m, -n)$ and $(-m, n)$ is

(A) $\sqrt{m^2 + n^2}$

(B) $m + n$

(C) $2\sqrt{m^2 + n^2}$

(D) $\sqrt{2m^2 + 2n^2}$

5. In Figure-1, from an external point P, two tangents PQ and PR are drawn to a circle of radius 4 cm with centre O. If $\angle QPR = 90°$, then length of PQ is

(A) 3 cm

(B) 4 cm

(C) 2 cm

(D) $2\sqrt{2}$ cm

Figure-1

6. On dividing a polynomial p(x) by $x^2 - 4$, quotient and remainder are found to be x and 3 respectively. The polynomial p(x) is

(A) $3x^2 + x - 12$

(B) $x^3 - 4x + 3$

(C) $x^2 + 3x - 4$

(D) $x^3 - 4x - 3$

7. In Figure-2, DE ∥ BC. If $\dfrac{AD}{DB} = \dfrac{3}{2}$ and AE = 2·7 cm, then EC is equal to
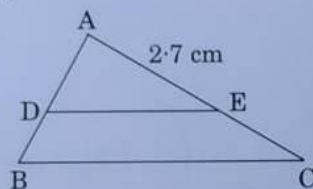
(A) 2·0 cm

(B) 1·8 cm

(C) 4·0 cm

(D) 2·7 cm

Figure-2

8. The point on the x-axis which is equidistant from (– 4, 0) and (10, 0) is

(A) (7, 0)

(B) (5, 0)

(C) (0, 0)

(D) (3, 0)

OR

The centre of a circle whose end points of a diameter are (– 6, 3) and (6, 4) is

(A) (8, – 1)

(B) (4, 7)

(C) $\left(0, \dfrac{7}{2}\right)$

(D) $\left(4, \dfrac{7}{2}\right)$

P.T.O.

9. The pair of linear equations

$$\frac{3x}{2} + \frac{5y}{3} = 7 \quad \text{and} \quad 9x + 10y = 14 \text{ is}$$

(A) consistent

(B) inconsistent

(C) consistent with one solution

(D) consistent with many solutions

10. In Figure-3, PQ is tangent to the circle with centre at O, at the point B. If $\angle AOB = 100°$, then $\angle ABP$ is equal to
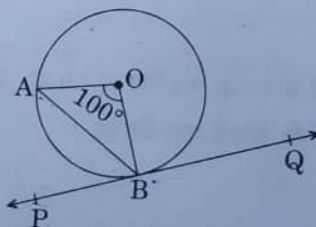
(A) 50°

(B) 40°

(C) 60°

(D) 80°

Figure-3

Fill in the blanks in question numbers 11 to 15.

11. Simplest form of $\dfrac{1 + \tan^2 A}{1 + \cot^2 A}$ is _____ .

12. If the probability of an event E happening is 0·023, then $P(\overline{E}) = $ _____ .

13. All concentric circles are _____ to each other.

14. The probability of an event that is sure to happen, is _____ .

15. AOBC is a rectangle whose three vertices are A(0, –3), O(0, 0) and B(4, 0). The length of its diagonal is _____ .

.30/5/3

9

Answer the following question numbers 16 to 20.

16. Write the value of $\sin^2 30° + \cos^2 60°$.

17. Form a quadratic polynomial, the sum and product of whose zeroes are (-3) and 2 respectively.

OR

Can $(x^2 - 1)$ be a remainder while dividing $x^4 - 3x^2 + 5x - 9$ by $(x^2 + 3)$? Justify your answer with reasons.

18. Find the sum of the first 100 natural numbers.

19. The LCM of two numbers is 182 and their HCF is 13. If one of the numbers is 26, find the other.

20. In Figure-4, the angle of elevation of the top of a tower from a point C on the ground, which is 30 m away from the foot of the tower, is 30°. Find the height of the tower.
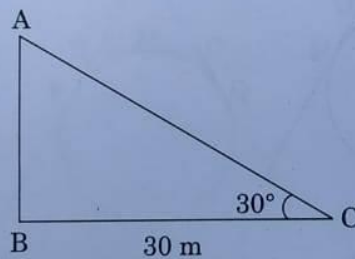

Figure-4

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. A cone and a cylinder have the same radii but the height of the cone is 3 times that of the cylinder. Find the ratio of their volumes.

22. In Figure-5, a quadrilateral ABCD is drawn to circumscribe a circle. Prove that
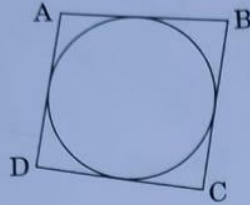
AB + CD = BC + AD.

Figure-5

OR
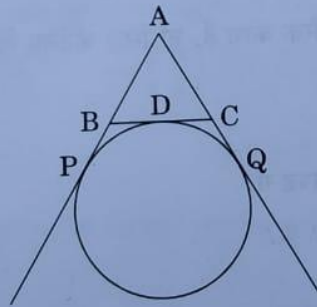
In Figure-6, find the perimeter of △ ABC, if AP = 12 cm.

Figure-6

23. Find the mode of the following distribution :

Marks :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of Students :	4	6	7	12	5	6

24. In Figure-7, if PQ ∥ BC and PR ∥ CD, prove that $\dfrac{QB}{AQ} = \dfrac{DR}{AR}$.
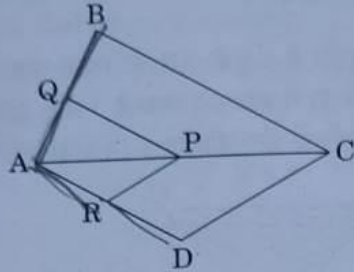

Figure-7

25. Show that $5 + 2\sqrt{7}$ is an irrational number, where $\sqrt{7}$ is given to be an irrational number.

OR

Check whether 12^n can end with the digit 0 for any natural number n.

26. If A, B and C are interior angles of a △ ABC, then show that

$$\cos\left(\frac{B+C}{2}\right) = \sin\left(\frac{A}{2}\right).$$

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. Prove that :

$$(\sin^4\theta - \cos^4\theta + 1)\operatorname{cosec}^2\theta = 2$$

28. Find the sum :

$$(-5) + (-8) + (-11) + \ldots + (-230)$$

29. Construct a △ ABC with sides BC = 6 cm, AB = 5 cm and ∠ ABC = 60°. Then construct a triangle whose sides are $\dfrac{3}{4}$ of the corresponding sides of △ ABC.

OR

Draw a circle of radius 3·5 cm. Take a point P outside the circle at a distance of 7 cm from the centre of the circle and construct a pair of tangents to the circle from that point.

30. In Figure-8, ABCD is a parallelogram. A semicircle with centre O and the diameter AB has been drawn and it passes through D. If AB = 12 cm and OD ⊥ AB, then find the area of the shaded region. (Use π = 3·14)
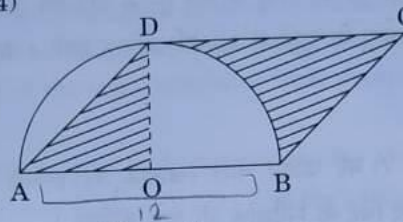

Figure-8

31. Read the following passage and answer the questions given at the end :

Diwali Fair

A game in a booth at a Diwali Fair involves using a spinner first. Then, if the spinner stops on an even number, the player is allowed to pick a marble from a bag. The spinner and the marbles in the bag are represented in Figure-9.

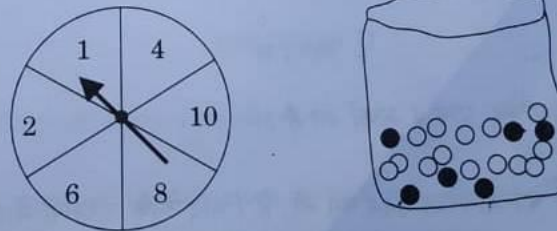Prizes are given, when a black marble is picked. Shweta plays the game once.

Figure-9

(i) What is the probability that she will be allowed to pick a marble from the bag ?

(ii) Suppose she is allowed to pick a marble from the bag, what is the probability of getting a prize, when it is given that the bag contains 20 balls out of which 6 are black ?

32. A fraction becomes $\frac{1}{3}$ when 1 is subtracted from the numerator and it becomes $\frac{1}{4}$ when 8 is added to its denominator. Find the fraction.

OR

The present age of a father is three years more than three times the age of his son. Three years hence the father's age will be 10 years more than twice the age of the son. Determine their present ages.

33. Find the ratio in which the y-axis divides the line segment joining the points $(6, -4)$ and $(-2, -7)$. Also find the point of intersection.

OR

Show that the points $(7, 10)$, $(-2, 5)$ and $(3, -4)$ are vertices of an isosceles right triangle.

34. Use Euclid Division Lemma to show that the square of any positive integer is either of the form $3q$ or $3q + 1$ for some integer q.

SECTION D

Question numbers 35 to 40 carry 4 marks each.

35. Sum of the areas of two squares is 544 m². If the difference of their perimeters is 32 m, find the sides of the two squares.

OR

A motorboat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

36. For the following data, draw a 'less than' ogive and hence find the median of the distribution.

Age (in years) :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Number of persons :	5	15	20	25	15	11	9

OR

The distribution given below shows the number of wickets taken by bowlers in one-day cricket matches. Find the mean and the median of the number of wickets taken.

Number of wickets :	20 – 60	60 – 100	100 – 140	140 – 180	180 – 220	220 – 260
Number of bowlers :	7	5	16	12	2	3

37. A statue 1·6 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 45°. Find the height of the pedestal. (Use $\sqrt{3}$ = 1·73)

38. Obtain other zeroes of the polynomial

$$p(x) = 2x^4 - x^3 - 11x^2 + 5x + 5$$

if two of its zeroes are $\sqrt{5}$ and $-\sqrt{5}$.

OR

What minimum must be added to $2x^3 - 3x^2 + 6x + 7$ so that the resulting polynomial will be divisible by $x^2 - 4x + 8$?

P.T.O.

39. In a cylindrical vessel of radius 10 cm, containing some water, 9000 small spherical balls are dropped which are completely immersed in water which raises the water level. If each spherical ball is of radius 0·5 cm, then find the rise in the level of water in the vessel.

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