SET ~ 1

Series WX1YZ/4

प्रश्न-पत्र कोड
Q.P. Code **30/4/1**

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.

गणित (मानक) – सैद्धान्तिक
MATHEMATICS (STANDARD) - Theory

#

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*
Time allowed : 3 hours | *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.

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 number **1** to **18** are multiple choice questions (MCQs) and question number **19** and **20** are Assertion-Reason based questions of **1** mark each.*

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

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

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

*(vii) 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.*

*(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 figures wherever required. Take π = 22/7 wherever required if not stated.

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

SECTION - A

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

1. The ratio of HCF to LCM of the least composite number and the least prime number is : **1**

(a) 1:2 (b) 2:1 (c) 1:1 (d) 1:3

2. The roots of the equation $x^2 + 3x - 10 = 0$ are : **1**

(a) 2, –5 (b) –2, 5 (c) 2, 5 (d) –2, –5

3. The next term of the A.P. : $\sqrt{6}$, $\sqrt{24}$, $\sqrt{54}$ is : **1**

(a) $\sqrt{60}$ (b) $\sqrt{96}$ (c) $\sqrt{72}$ (d) $\sqrt{216}$

4. The distance of the point (–1, 7) from x-axis is : **1**

(a) –1 (b) 7 (c) 6 (d) $\sqrt{50}$

5. What is the area of a semi-circle of diameter 'd' ? **1**

(a) $\frac{1}{16}\pi d^2$ (b) $\frac{1}{4}\pi d^2$ (c) $\frac{1}{8}\pi d^2$ (d) $\frac{1}{2}\pi d^2$

6. The empirical relation between the mode, median and mean of a distribution is : **1**

(a) Mode = 3 Median – 2 Mean (b) Mode = 3 Mean – 2 Median

(c) Mode = 2 Median – 3 Mean (d) Mode = 2 Mean – 3 Median

7. The pair of linear equations $2x = 5y + 6$ and $15y = 6x - 18$ represents two lines which are : **1**

(a) intersecting (b) parallel

(c) coincident (d) either intersecting or parallel

8. If α, β are zeroes of the polynomial x^2-1, then value of $(\alpha + \beta)$ is : **1**

(a) 2 (b) 1 (c) -1 (d) 0

9. If a pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then sun's elevation is : **1**

(a) 60° (b) 45° (c) 30° (d) 90°

10. $\sec\theta$ when expressed in terms of $\cot\theta$, is equal to : **1**

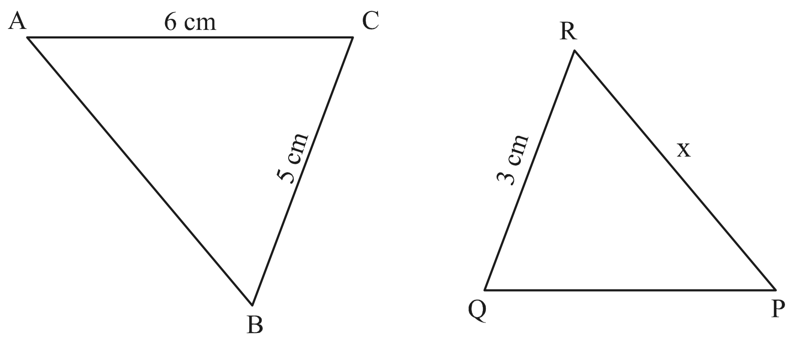
(a) $\dfrac{1+\cot^2\theta}{\cot\theta}$ (b) $\sqrt{1+\cot^2\theta}$

(c) $\dfrac{\sqrt{1+\cot^2\theta}}{\cot\theta}$ (d) $\dfrac{\sqrt{1-\cot^2\theta}}{\cot\theta}$

11. Two dice are thrown together. The probability of getting the difference of numbers on their upper faces equals to 3 is : **1**

(a) $\dfrac{1}{9}$ (b) $\dfrac{2}{9}$ (c) $\dfrac{1}{6}$ (d) $\dfrac{1}{12}$

12.



In the given figure, $\Delta ABC \sim \Delta QPR$. If AC = 6 cm, BC = 5 cm, QR = 3 cm and PR = x; then the value of x is : **1**

(a) 3.6 cm (b) 2.5 cm (c) 10 cm (d) 3.2 cm

13. The distance of the point $(-6, 8)$ from origin is : **1**

(a) 6 (b) -6 (c) 8 (d) 10

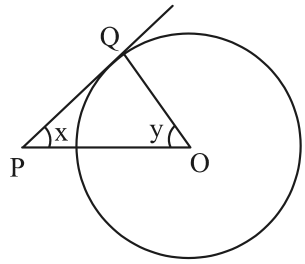
14. In the given figure, PQ is a tangent to the circle with centre O. If $\angle OPQ = x$, $\angle POQ = y$, then $x + y$ is : **1**

(a) 45°

(b) 90°

(c) 60°

(d) 180°



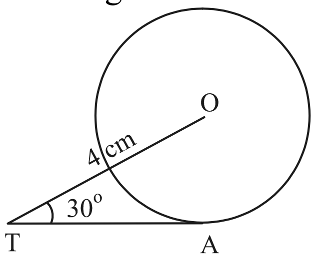
15. In the given figure, TA is a tangent to the circle with centre O such that OT = 4 cm, $\angle OTA = 30^{\circ}$, then length of TA is : **1**

(a) $2\sqrt{3}$ cm

(b) 2 cm

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

(d) $\sqrt{3}$ cm



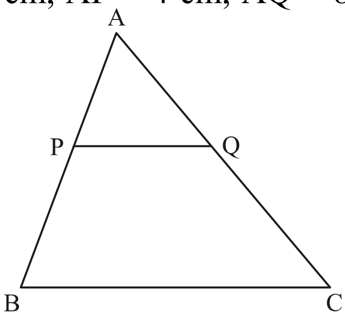
16. In Δ ABC, PQ || BC. If PB = 6 cm, AP = 4 cm, AQ = 8 cm, find the length of AC. **1**

(a) 12 cm

(b) 20 cm

(c) 6 cm

(d) 14 cm



17. If α, β are the zeroes of the polynomial $p(x) = 4x^2 - 3x - 7$, then $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ is equal to : **1**

(a) $\frac{7}{3}$ (b) $\frac{-7}{3}$ (c) $\frac{3}{7}$ (d) $\frac{-3}{7}$

18. A card is drawn at random from a well-shuffled pack of 52 cards. The probability that the card drawn is not an ace is : **1**

(a) $\frac{1}{13}$ (b) $\frac{9}{13}$ (c) $\frac{4}{13}$ (d) $\frac{12}{13}$

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

19. **Assertion (A) :** The probability that a leap year has 53 Sundays is $\frac{2}{7}$.

Reason (R) : The probability that a non-leap year has 53 Sundays is $\frac{5}{7}$. **1**

(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 and 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.

20. **Assertion (A) :** a, b, c are in A.P. if and only if $2b = a + c$.
Reason (R) : The sum of first n odd natural numbers is n^2. **1**

(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 and 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.

SECTION – B

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

21. Two numbers are in the ratio 2 : 3 and their LCM is 180. What is the HCF of these numbers ? **2**

22. If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k. **2**

23. **(A)** Find the sum and product of the roots of the quadratic equation $2x^2 - 9x + 4 = 0$. **2**

OR

(B) Find the discriminant of the quadratic equation $4x^2 - 5 = 0$ and hence comment on the nature of roots of the equation. **2**

24. If a fair coin is tossed twice, find the probability of getting 'atmost one head'. **2**

25. **(A)** Evaluate $\dfrac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$ **2**

OR

(B) If A and B are acute angles such that $\sin (A - B) = 0$ and $2 \cos (A + B) - 1 = 0$, then find angles A and B. **2**

SECTION – C

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

26. **(A)** How many terms are there in an A.P. whose first and fifth terms are – 14 and 2, respectively and the last term is 62. **3**

OR

(B) Which term of the A.P. : 65, 61, 57, 53, ... is the first negative term ? **3**

27. Prove that $\sqrt{5}$ is an irrational number. **3**

28. 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. **3**

29. **(A)** Prove that $\dfrac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$ **3**

OR

(B) Prove that sec A (1 – sin A) (sec A + tan A) = 1. **3**

30. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle. **3**

31. Find the value of ‘p’ for which the quadratic equation $px(x - 2) + 6 = 0$ has two equal real roots. **3**

SECTION – D

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

32. **(A)** A straight highway leads to the foot of a tower. A man standing on the top of the 75 m high tower observes two cars at angles of depression of 30° and 60°, which are approaching the foot of the tower. If one car is exactly behind the other on the same side of the tower, find the distance between the two cars. (use $\sqrt{3} = 1.73$) **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 30°. Determine the height of the tower. **5**

33. **(A)** D is a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$, prove that $CA^2 = CB.CD$ **5**

OR

(B) If AD and PM are medians of triangles ABC and PQR, respectively where $\Delta ABC \sim \Delta PQR$, prove that $\dfrac{AB}{PQ} = \dfrac{AD}{PM}$. **5**

34. A student was asked to make a model shaped like a cylinder with two cones attached to its ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its total length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model. **5**

35. The monthly expenditure on milk in 200 families of a Housing Society is given below :

Monthly Expenditure (in ₹)	**1000-1500**	**1500-2000**	**2000-2500**	**2500-3000**	**3000-3500**	**3500-4000**	**4000-4500**	**4500-5000**
Number of families	**24**	**40**	**33**	***x***	**30**	**22**	**16**	**7**

Find the value of x and also, find the median and mean expenditure on milk. **5**

SECTION – E

Section – E consists of three Case Study Based questions of 4 marks each.

36. Two schools 'P' and 'Q' decided to award prizes to their students for two games of Hockey ₹ x per student and Cricket ₹ y per student. School 'P' decided to award a total of ₹ 9,500 for the two games to 5 and 4 students respectively; while school 'Q' decided to award ₹ 7,370 for the two games to 4 and 3 students respectively.

Based on the above information, answer the following questions :

(i) Represent the following information algebraically (in terms of x and y). **1**

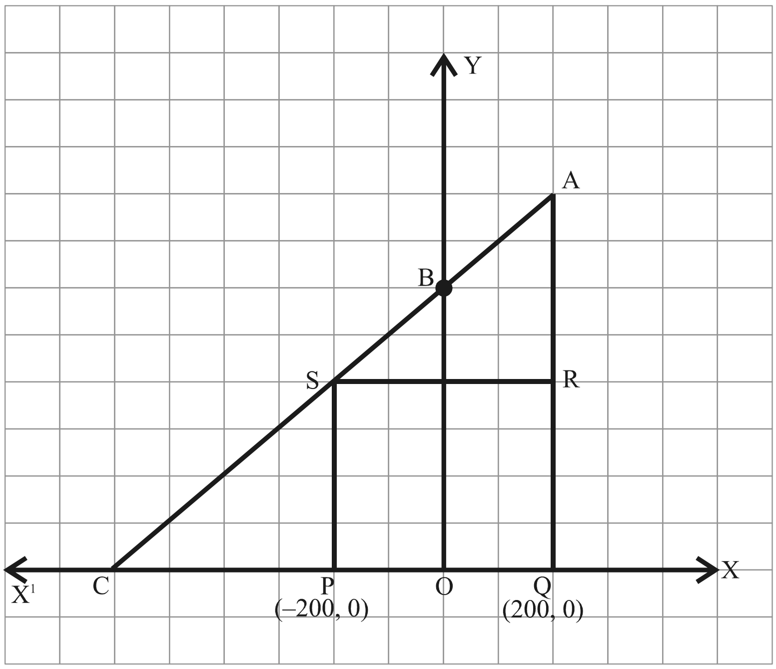
(ii) (a) What is the prize amount for hockey ? **2**

OR

(b) Prize amount on which game is more and by how much ? **2**

(iii) What will be the total prize amount if there are 2 students each from two games ? **1**

37. Jagdish has a field which is in the shape of a right angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O.



Based on the above information, answer the following questions :

(i) Taking O as origin, coordinates of P are (–200, 0) and of Q are (200, 0). PQRS being a square, what are the coordinates of R and S ? **1**

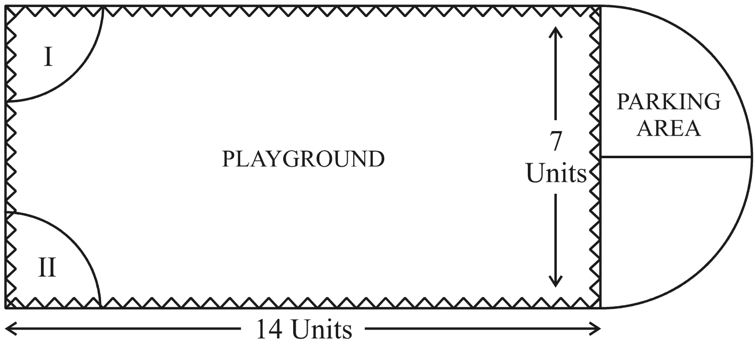
(ii) (a) What is the area of square PQRS ? **2**

OR

(b) What is the length of diagonal PR in square PQRS ? **2**

(iii) If S divides CA in the ratio K:1, what is the value of K, where point A is (200, 800) ? **1**

38. Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking.



After survey, it was decided to build rectangular playground, with a semi-circular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats.

Based on the above information, answer the following questions :

(i) What is the total perimeter of the parking area ? **1**

(ii) (a) What is the total area of parking and the two quadrants ? **2**

OR

(b) What is the ratio of area of playground to the area of parking area ? **2**

(iii) Find the cost of fencing the playground and parking area at the rate of ₹ 2 per unit. **1**