



Series WX1YZ/5



SET~2

प्रश्न-पत्र कोड

Q.P. Code

430/5/2

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.

गणित (बुनियादी)

MATHEMATICS (BASIC)

*

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 23 हैं।
Please check that this question paper contains 23 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 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 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 no. **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 no. **21** to **25** are very short answer (VSA) type questions, carrying **2** marks each.
- (v) In **Section C**, Questions no. **26** to **31** are short answer (SA) type questions, carrying **3** marks each.
- (vi) In **Section D**, Questions no. **32** to **35** are long answer (LA) type questions carrying **5** marks each.
- (vii) In **Section E**, Questions no. **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 calculators is **not** allowed.

SECTION A

This section comprises multiple choice questions (MCQs) of 1 mark each.

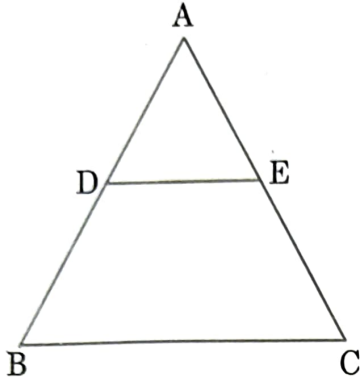
1. Mean and median of some data are 32 and 30 respectively. Using empirical relation, mode of the data is :
 - (a) 36
 - (b) 26
 - (c) 30
 - (d) 20
2. In two triangles ΔPQR and ΔABC , it is given that $\frac{AB}{BC} = \frac{PQ}{PR}$. For these two triangles to be similar, which of the following should be true ?
 - (a) $\angle A = \angle P$
 - (b) $\angle B = \angle Q$
 - (c) $\angle B = \angle P$
 - (d) $CA = QR$



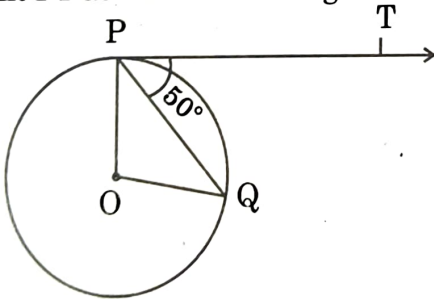
3. If $\cos \theta = \frac{3}{7}$, then $\frac{\cos \theta}{1 - \sin^2 \theta}$ is equal to :
- (a) $\frac{3}{\sqrt{40}}$ (b) $\frac{3}{7}$
(c) $\frac{7}{3}$ (d) $\frac{7}{\sqrt{40}}$
4. If the lines represented by equations $3x + 2my = 2$ and $2x + 5y + 1 = 0$ are parallel, then the value of m is :
- (a) $\frac{2}{5}$ (b) $-\frac{5}{4}$
(c) $\frac{3}{2}$ (d) $\frac{15}{4}$
5. $\Delta ABC \sim \Delta DEF$ and their perimeters are 32 cm and 24 cm respectively. If $AB = 10$ cm, then DE equals :
- (a) 8 cm (b) 7.5 cm
(c) 15 cm (d) $5\sqrt{3}$ cm
6. The two roots of the equation $3x^2 - 2\sqrt{6}x + 2 = 0$ are :
- (a) real and distinct
(b) not real
(c) real and equal
(d) rational
7. The median class for the data given below is :
- | | | | | | |
|-----------|---------|---------|---------|----------|-----------|
| Class | 20 – 40 | 40 – 60 | 60 – 80 | 80 – 100 | 100 – 120 |
| Frequency | 10 | 12 | 14 | 13 | 17 |
- (a) 80 – 100 (b) 20 – 40
(c) 40 – 60 (d) 60 – 80
8. A circle is of radius 3 cm. The distance between two of its parallel tangents is :
- (a) 12 cm (b) 6 cm
(c) 3 cm (d) 4.5 cm



9. In the given figure, ABC is a triangle in which $AD = 1.6$ cm, $BD = 4.8$ cm, $AE = 1.1$ cm and $EC = 2.2$ cm. Then :



- (a) $DE \parallel BC$
(b) $DE = \frac{1}{2} BC$
(c) $DE = BC$
(d) DE is not parallel to BC ($DE \nparallel BC$)
10. The 8th term of an A.P. is 17 and its 14th term is 29. The common difference of this A.P. is :
- (a) 3 (b) 2
(c) 5 (d) -2
11. In the given figure, O is the centre of a circle, PQ is a chord and the tangent PT at P makes an angle of 50° with PQ. The measure of $\angle POQ$ is :



- (a) 130° (b) 100°
(c) 90° (d) 75°
12. Two dice are rolled together. The probability that the sum of the numbers that appeared is 9, is :
- (a) $\frac{5}{36}$ (b) $\frac{1}{9}$
(c) $\frac{1}{12}$ (d) $\frac{1}{6}$



13. If one zero of the quadratic polynomial $kx^2 + 3x + k$ is 2, then the value of k is :
- (a) $-\frac{6}{5}$ (b) $\frac{6}{5}$
(c) $\frac{5}{6}$ (d) $-\frac{5}{6}$
14. LCM of $(2^3 \times 3 \times 5)$ and $(2^4 \times 5 \times 7)$ is :
- (a) 40 (b) 560
(c) 1680 (d) 1120
15. The distance between the points $(6, 2)$ and $(-6, 2)$ is :
- (a) $6\sqrt{2}$ units (b) 12 units
(c) $2\sqrt{6}$ units (d) 6 units
16. If $\sin \theta = \frac{a}{b}$, then $\sec \theta$ is equal to $(0 \leq \theta \leq 90^\circ)$:
- (a) $\frac{a}{\sqrt{b^2 - a^2}}$ (b) $\frac{b}{\sqrt{b^2 - a^2}}$
(c) $\frac{\sqrt{b^2 - a^2}}{b}$ (d) $\frac{\sqrt{b^2 - a^2}}{a}$
17. The sum of the first 100 even natural numbers is :
- (a) 10100 (b) 2550
(c) 5050 (d) 10010
18. The value(s) of k for which the roots of quadratic equation $x^2 + 4x + k = 0$ are real, is :
- (a) $k \geq 4$ (b) $k \leq 4$
(c) $k \geq -4$ (d) $k \leq -4$

Questions number 19 and 20 are Assertion and Reason based questions carrying 1 mark each. 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) : When two coins are tossed together, the probability of getting no tail is $\frac{1}{4}$.

Reason (R) : The probability $P(E)$ of an event E satisfies $0 \leq P(E) \leq 1$.

20. Assertion (A) : The surface area of largest sphere that can be inscribed in a hollow cube of side 'a' cm is $\pi a^2 \text{ cm}^2$.

Reason (R) : The surface area of a sphere of radius 'r' is $\frac{4}{3} \pi r^3$.

SECTION B

This section comprises very short answer (VSA) type questions of 2 marks each.

21. Find the sum of the first 20 terms of the A.P. : $\frac{2}{3}, 0, -\frac{2}{3}, -\frac{4}{3}, \dots$
22. (a) Show that A(1, 2), B(5, 4), C(3, 8) and D(-1, 6) are vertices of a parallelogram ABCD.
- OR**
- (b) Show that the points A(3, 0), B(6, 4) and C(-1, 3) are vertices of a right-angled triangle.
23. (a) Evaluate :

$$\frac{\sin 30^\circ + \tan 45^\circ}{\sec 30^\circ + \cot 45^\circ}$$

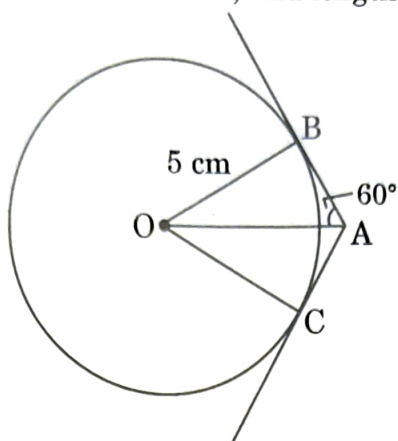
OR

- (b) For $A = 30^\circ$ and $B = 60^\circ$, verify that :
- $$\sin(A + B) = \sin A \cos B + \cos A \sin B.$$

24. Find HCF of 660 and 704 by prime factorization.



25. In the given figure, tangents AB and AC are drawn to a circle centred at O. If $\angle OAB = 60^\circ$ and $OB = 5$ cm, find lengths OA and AC.



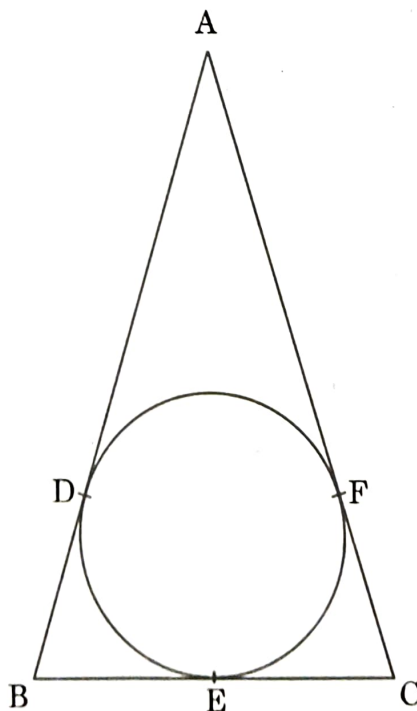
SECTION C

This section comprises short answer (SA) type questions of 3 marks each.

26. Prove that :

$$\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} + \frac{\sin \theta - \cos \theta}{\sin \theta + \cos \theta} = \frac{2 \sec^2 \theta}{\tan^2 \theta - 1}$$

27. ABC is an isosceles triangle with $AB = AC$, circumscribed about a circle. Prove that BC is bisected at E.





28. (a) Sabina went to a bank ATM to withdraw ₹ 2,000. She received ₹ 50 and ₹ 100 notes only. If Sabina got 25 notes in all, how many notes of ₹ 50 and ₹ 100 did she receive ?

OR

- (b) Five years ago, Amit was thrice as old as Baljeet. Ten years hence, Amit shall be twice as old as Baljeet. What are their present ages ?

29. Prove that $8 + 5\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

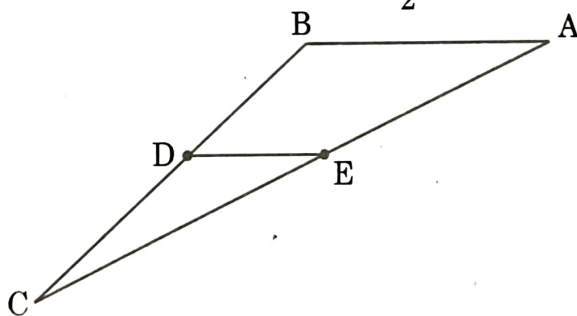
30. Find mean of the following data :

Class	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75	75 – 90
Frequency	12	15	11	20	16	6

31. (a) Determine the ratio in which the point $P(a, -2)$ divides the line segment joining the points $A(-4, 3)$ and $B(2, -4)$. Also, find the value of 'a'.

OR

- (b) In the given figure, in ΔABC points D and E are mid-points of sides BC and AC respectively. If given vertices are $A(4, -2)$, $B(2, -2)$ and $C(-6, -7)$, then verify the result $DE = \frac{1}{2} AB$.



SECTION D

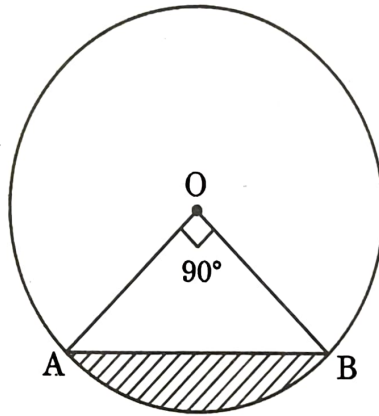
This section comprises long answer (LA) type questions of 5 marks each.

32. (a) A 2-digit number is four times the sum of its digits and twice the product of its digits. Find the number.

OR

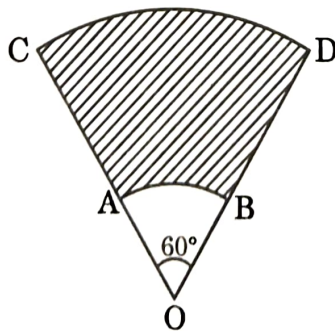


- (b) The length of the rectangle exceeds its breadth by 8 cm and the area of the rectangle is 240 cm^2 . Find the dimensions of the rectangle.
33. If a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then prove that the other two sides are divided in the same ratio.
34. A man in a boat rowing away from a lighthouse 100 m high takes 2 minutes to change the angle of elevation of the top of lighthouse from 60° to 45° . Find the speed of the boat. (Use $\sqrt{3} = 1.73$)
35. (a) In the given figure, AB is a chord of a circle of radius 7 cm and centred at O. Find the area of the shaded region if $\angle AOB = 90^\circ$. Also, find length of minor arc AB.



OR

- (b) AB and CD are arcs of two concentric circles of radii 3.5 cm and 10.5 cm respectively and centred at O. Find the area of the shaded region if $\angle AOB = 60^\circ$. Also, find the length of arc CD.



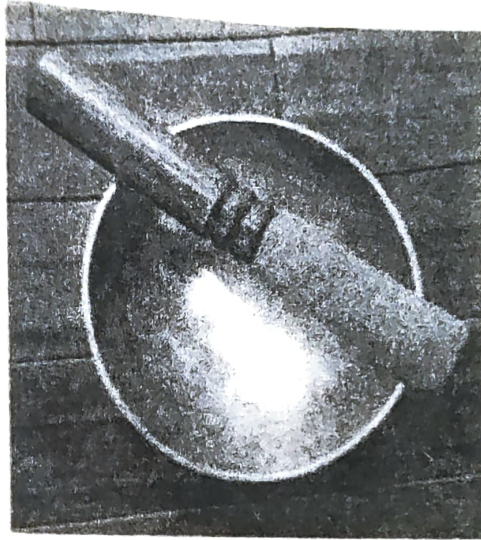


SECTION E

This section comprises 3 case study based questions of 4 marks each.

Case Study - 1

36. Singing bowls (hemispherical in shape) are commonly used in sound healing practices. Mallet (cylindrical in shape) is used to strike the bowl in a sequence to produce sound and vibration.



One such bowl is shown here whose dimensions are :

Hemispherical bowl has outer radius 6 cm and inner radius 5 cm.

Mallet has height of 10 cm and radius 2 cm.

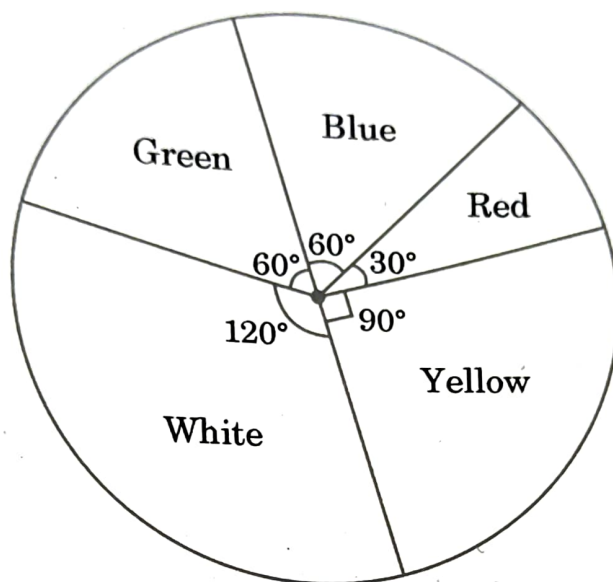
Based on the above, answer the following questions :

- | | | |
|-----------|--|---|
| (i) | What is the volume of the material used in making the mallet ? | 1 |
| (ii) | The bowl is to be polished from inside. Find the inner surface area of the bowl. | 1 |
| (iii) | (a) Find the volume of metal used to make the bowl. | 2 |
| OR | | |
| (iii) | (b) Find total surface area of the mallet. (Use $\pi = 3.14$) | 2 |



Case Study - 2

37. Some students were asked to list their favourite colour. The measure of each colour is shown by the central angle of a pie chart given below :



Study the pie chart and answer the following questions :

- (i) If a student is chosen at random, then find the probability of his/her favourite colour being white ? 1
- (ii) What is the probability of his/her favourite colour being blue or green ? 1
- (iii) (a) If 15 students liked the colour yellow, how many students participated in the survey ? 2

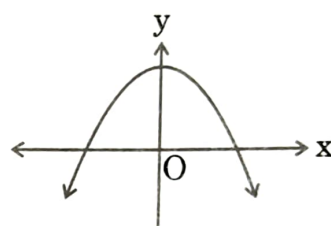
OR

- (iii) (b) What is the probability of the favourite colour being red or blue ? 2



Case Study - 3

38. Rainbow is an arch of colours that is visible in the sky after rain or when water droplets are present in the atmosphere. The colours of the rainbow are generally, red, orange, yellow, green, blue, indigo and violet. Each colour of the rainbow makes a parabola. We know that any quadratic polynomial $p(x) = ax^2 + bx + c$, ($a \neq 0$) represents a parabola on the graph paper.



Based on the above, answer the following questions :

- (i) The graph of a rainbow $y = f(x)$ is shown in the figure. Write the number of zeroes of the curve. 1
- (ii) If the graph of a rainbow does not intersect the x-axis but intersects y-axis at one point, then how many zeroes will it have ? 1
- (iii) (a) If a rainbow is represented by the quadratic polynomial $p(x) = x^2 + (a + 1)x + b$, whose zeroes are 2 and -3, find the value of a and b. 2

OR

- (iii) (b) The polynomial $x^2 - 2x - (7p + 3)$ represents a rainbow. If -4 is a zero of it, find the value of p. 2