Series : GE1FH

SET~3

रोल नं.
Roll No.

प्रश्न-पत्र कोड
Q.P. Code 30/1/3

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 27 हैं ।

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

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

(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 **27** printed pages.

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

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

(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 candidates will read the question paper only and will not write any answer on the answer-book during this period.

गणित (मानक)
MATHEMATICS (STANDARD)

निर्धारित समय : *3 घण्टे*
अधिकतम अंक : *80*

Time allowed : 3 hours
Maximum Marks : 80

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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 $\pi = \dfrac{22}{7}$ wherever required, if not stated.

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

SECTION A

*This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each. 20×1=20*

1.   What is the mode of a data if median and mean of the same data are 9·6 and 10·5, respectively ?

(A)   7·8

(B)   12·3

(C)   8·4

(D)   7
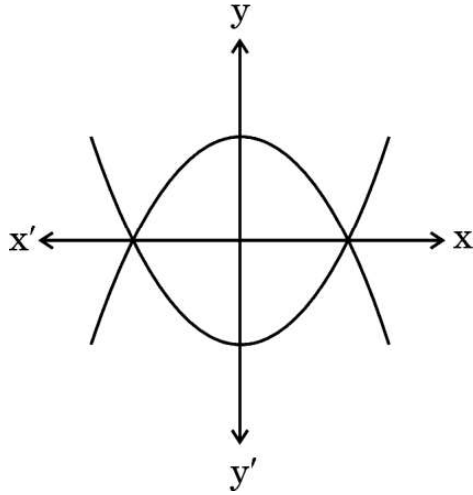
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2. The value of $(\tan A \csc A)^2 - (\sin A \sec A)^2$ is :

    (A)   0

    (B)   1

    (C)   −1

    (D)   2

3. A kite is flying at a height of 150 m from the ground. It is attached to a string inclined at an angle of 30° to the horizontal. The length of the string is :

    (A) $100\sqrt{3}$ m

    (B)   300 m

    (C) $150\sqrt{2}$ m

    (D) $150\sqrt{3}$ m

4. In triangles ABC and DEF, $\angle$ B = $\angle$ E, $\angle$ F = $\angle$ C and AB = 3 DE. Then, the two triangles are :

    (A)   congruent but not similar

    (B)   congruent as well as similar

    (C)   neither congruent nor similar

    (D)   similar but not congruent

5. If θ is an acute angle and $7 + 4 \sin \theta = 9$, then the value of θ is :

    (A)   90°

    (B)   30°
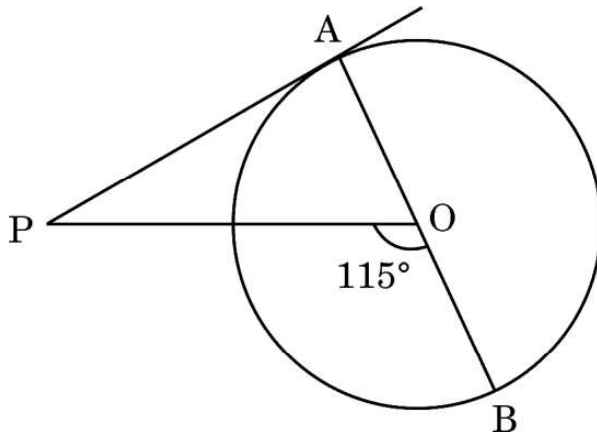
    (C)   45°

    (D)   60°

6. Two polynomials are shown in the graph below. The number of distinct zeroes of both the polynomials is :

(A) 3

(B) 5

(C) 2

(D) 4

7. In the given figure, PA is a tangent from an external point P to a circle with centre O. If ∠ POB = 115°, then ∠ APO is equal to :

(A) 25°

(B) 65°

(C) 90°

(D) 35°

8. A piece of wire 20 cm long is bent into the form of an arc of a circle of radius $\dfrac{60}{\pi}$ cm. The angle subtended by the arc at the centre of the circle is :

(A) 30°

(B) 60°

(C) 90°

(D) 50°

...

9. If HCF(98, 28) = m and LCM(98, 28) = n, then the value of $n - 7m$ is :

(A) 0

(B) 28

(C) 98

(D) 198

10. Which of the following is a rational number between $\sqrt{3}$ and $\sqrt{5}$?

(A) 1·4142387954012 ....

(B) 2·32$\overline{6}$

(C) π

(D) 1·857142

11. The sum of the zeroes of the polynomial $p(x) = 5x - 7x^2 + 3$ is :

(A) $\dfrac{-7}{5}$

(B) $\dfrac{7}{5}$

(C) $\dfrac{5}{7}$

(D) $\dfrac{-5}{7}$

12. If x = 1 and y = 2 is a solution of the pair of linear equations $2x - 3y + a = 0$ and $2x + 3y - b = 0$, then :

(A) a = 2b

(B) 2a = b

(C) a + 2b = 0

(D) 2a + b = 0

•••

13. If a sector of a circle has an area of 40π sq. units and a central angle of $72°$, the radius of the circle is :

(A)   200 units

(B)   100 units

(C)   20 units

(D) $10\sqrt{2}$ units

14. The tangents drawn at the extremities of the diameter of a circle are always :

(A)   parallel

(B)   perpendicular

(C)   equal

(D)   intersecting

15. If $(-1)^n + (-1)^8 = 0$, then n is :

(A)   any positive integer

(B)   any negative integer

(C)   any odd number

(D)   any even number

16. The end points of a diameter of circle are $(2, 4)$ and $(-3, -1)$. The length of its radius is :

(A) $\dfrac{5\sqrt{2}}{2}$ units   (B) $5\sqrt{2}$ units

(C) $3\sqrt{2}$ units   (D) $\pm\dfrac{5\sqrt{2}}{2}$ units

17. The 11th and 13th term of an AP are 39 and 45, respectively. What is the common difference of the AP ?

(A)   42   (B)   21

(C)   6   (D)   3

• • •

18. A card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a spade or a king ?

(A) $\dfrac{1}{13}$

(B) $\dfrac{2}{13}$

(C) $\dfrac{4}{13}$

(D) $\dfrac{9}{13}$

*Questions number **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) :* The probability of selecting a number at random from the numbers 1 to 20 is 1.

Reason (R): For any event E, if $P(E) = 1$, then E is called a sure event.

20. *Assertion (A) :* If we join two hemispheres of same radius along their bases, then we get a sphere.

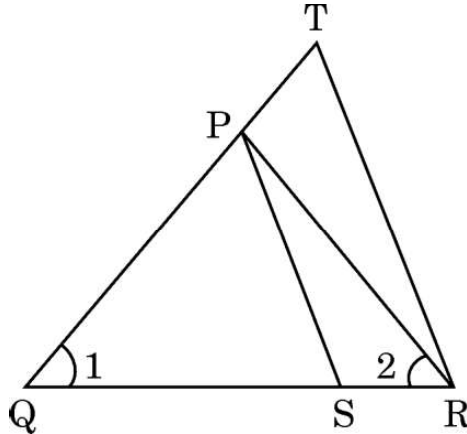   *Reason (R):* Total Surface Area of a sphere of radius r is $3\pi r^2$.

SECTION B

*This section has **5** Very Short Answer (VSA) type questions carrying **2** marks each.* 5×2=10

21. (a) If $\triangle ABC \sim \triangle PQR$ in which AB = 6 cm, BC = 4 cm, AC = 8 cm and PR = 6 cm, then find the length of (PQ + QR).

OR

   (b) In the given figure, $\dfrac{QR}{QS} = \dfrac{QT}{PR}$ and $\angle 1 = \angle 2$, show that $\triangle PQS \sim \triangle TQR$.

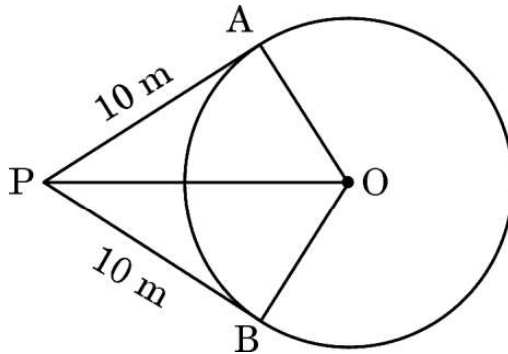**22.** (a) If $x \cos 60° + y \cos 0° + \sin 30° - \cot 45° = 5$, then find the value of x + 2y.

OR

   (b) Evaluate : $\dfrac{\tan^2 60°}{\sin^2 60° + \cos^2 30°}$

23. A person is standing at P outside a circular ground at a distance of 26 m from the centre of the ground. He found that his distances from the points A and B on the ground are 10 m (PA and PB are tangents to the circle). Find the radius of the circular ground.

24. Find the zeroes of the polynomial $p(x) = x^2 + \dfrac{4}{3}x - \dfrac{4}{3}$.

25. Find the length of the median through the vertex B of $\triangle$ ABC with vertices A(9, − 2), B(− 3, 7) and C(−1, 10).

SECTION C

*This section has **6** Short Answer (SA) type questions carrying **3** marks each.*   *6×3=18*

26. Prove that $\sqrt{5}$ is an irrational number.

27. Two dice are rolled together. Find the probability of getting :
(i)   a multiple of 2 on one and a multiple of 3 on the other die.
(ii)   the product of two numbers on the top of the two dice is a perfect square number.

28. (a)   Prove that : $\dfrac{\tan\theta}{1-\cot\theta} + \dfrac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta\,\operatorname{cosec}\theta$
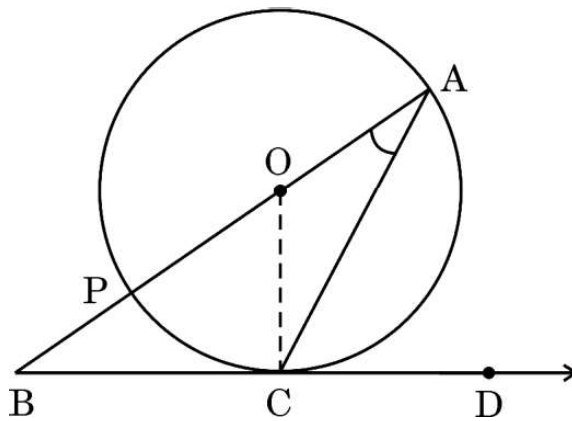
OR

   (b)   Prove that : $\dfrac{\sin A + \cos A}{\sin A - \cos A} + \dfrac{\sin A - \cos A}{\sin A + \cos A} = \dfrac{2}{2\sin^2 A - 1}$

29. A room is in the form of a cylinder surmounted by a hemispherical dome. The base radius of the hemisphere is half of the height of the cylindrical part. If the room contains $\dfrac{1408}{21}$ m³ of air, find the height of the cylindrical part. (Use $\pi = \dfrac{22}{7}$).

30. (a) In the given figure, O is the centre of the circle and BCD is tangent to it at C. Prove that $\angle$ BAC + $\angle$ ACD = 90°.

OR

(b) Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

31. Find the ratio in which the y-axis divides the line segment joining the points (5, – 6) and (– 1, – 4). Also find the point of intersection.

SECTION D

*This section has **4** Long Answer (LA) type questions carrying **5** marks each.   4×5=20*

32. (a) The perimeter of a right triangle is 60 cm and its hypotenuse is 25 cm. Find the lengths of other two sides of the triangle.

OR

(b) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the speed of the train.

33. A bag contains some red and blue balls. Ten percent of the red balls, when added to twenty percent of the blue balls, give a total of 24. If three times the number of red balls exceeds the number of blue balls by 20, find the number of red and blue balls.

34. The lengths of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table :

Length (in mm)	Number of Leaves
118 – 126	3
127 – 135	5
136 – 144	9
145 – 153	12
154 – 162	5
163 – 171	4
172 – 180	2

Find the median length of the leaves.

35. (a) The diagonal BD of a parallelogram ABCD intersects the line segment AE at the point F, where E is any point on the side BC. Prove that $DF \times EF = FB \times FA$.

OR

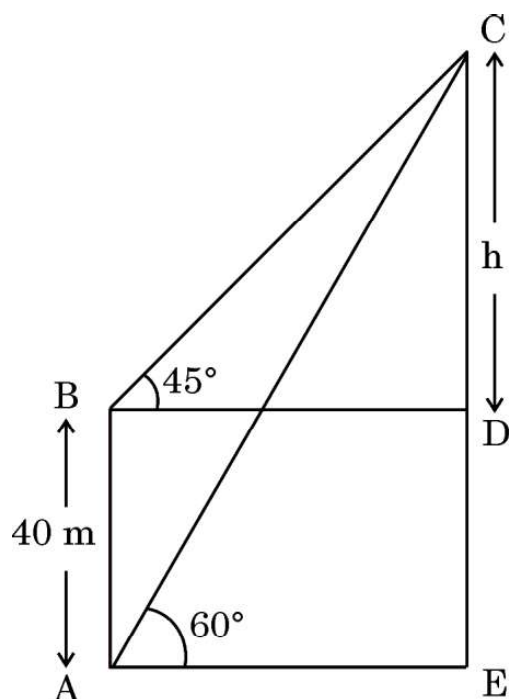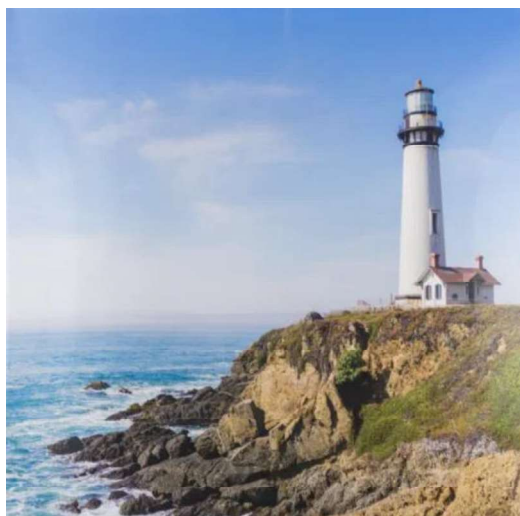(b) In $\triangle ABC$, if $AD \perp BC$ and $AD^2 = BD \times DC$, then prove that $\angle BAC = 90°$.

SECTION E

*This section has **3** case study based questions carrying **4** marks each.*   *3×4=12*

Case Study – 1

36. Amrita stood near the base of a lighthouse, gazing up at its towering height. She measured the angle of elevation to the top and found it to be 60°. Then, she climbed a nearby observation deck, 40 metres higher than her original position and noticed the angle of elevation to the top of lighthouse to be 45°.

Based on the above given information, answer the following questions :

(i)   If CD is h metres, find the distance BD in terms of 'h'.   *1*

(ii)   Find distance BC in terms of 'h'.   *1*

•••

(iii) (a) Find the height CE of the lighthouse [Use $\sqrt{3}$ = 1·73] 2

OR

(iii) (b) Find distance AE, if AC = 100 m. 2

Case Study – 2

37. A school is organizing a charity run to raise funds for a local hospital. The run is planned as a series of rounds around a track, with each round being 300 metres. To make the event more challenging and engaging, the organizers decide to increase the distance of each subsequent round by 50 metres. For example, the second round will be 350 metres, the third round will be 400 metres and so on. The total number of rounds planned is 10.

Based on the information given above, answer the following questions :

(i) Write the fourth, fifth and sixth term of the Arithmetic Progression so formed. 1

(ii) Determine the distance of the 8th round. 1

(iii) (a) Find the total distance run after completing all 10 rounds. 2
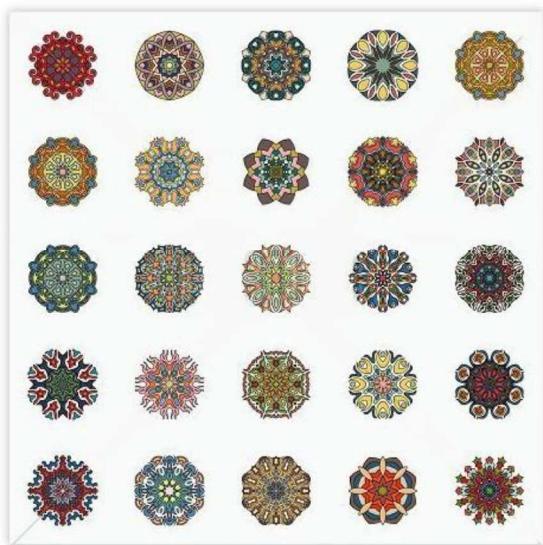
OR

(iii) (b) If a runner completes only the first 6 rounds, what is the total distance run by the runner ? 2
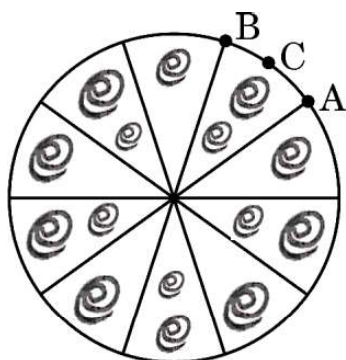
Case Study – 3

38. A brooch is a decorative piece often worn on clothing like jackets, blouses or dresses to add elegance. Made from precious metals and decorated with gemstones, brooches come in many shapes and designs.

One such brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in the figure.

Based on the above given information, answer the following questions :

(i) Find the central angle of each sector. *1*

(ii) Find the length of the arc ACB. *1*

(iii) (a) Find the area of each sector of the brooch. *2*

OR

(iii) (b) Find the total length of the silver wire used. *2*