

Series : EGFH2



SET~3

रोल नं.
Roll No.



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नोट

- (I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **23** 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।

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प्रश्न-पत्र कोड
Q.P. Code

430/2/3

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.

NOTE

- (I) Please check that this question paper contains **23** 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 (बुनियादी)

MATHEMATICS (BASIC)

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

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 $\pi = \frac{22}{7}$ 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. $20 \times 1 = 20$*

1. The ratio of the area of a quadrant of a circle to the area of a circle is :
 - (A) 2 : 1
 - (B) 1 : 2
 - (C) 1 : 4
 - (D) 4 : 1
2. A cone of height 'h' and radius 'r' is surmounted on a hemisphere of same radius. The total surface area of the entire solid will be :
 - (A) $\pi rh + \pi r^2$
 - (B) $\pi r \sqrt{h^2 + r^2} + \pi r^2$
 - (C) $\pi r \sqrt{h^2 + r^2} + 2\pi r^2$
 - (D) $\pi r \sqrt{h^2 + r^2} + 3\pi r^2$



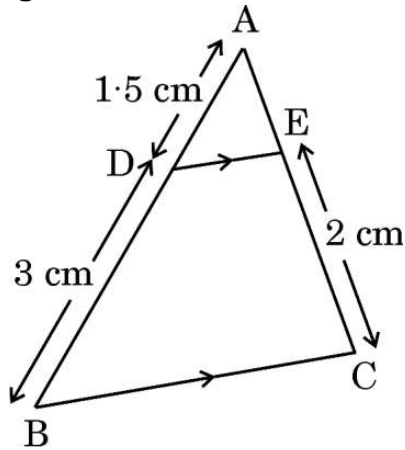
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3. In the formula of mode given by $\text{mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$, f_1 denotes the :
- (A) frequency of the modal class
(B) frequency of class preceding modal class
(C) frequency of class succeeding modal class
(D) cumulative frequency of modal class
4. For a distribution, if mean = median = a, then its mode is :
- (A) 3a (B) 2a
(C) a (D) 0
5. The total number of outcomes in the experiment of simultaneous throw of three dice is :
- (A) 6 (B) 18
(C) 36 (D) 216
6. The value of (HCF – LCM) for the two numbers 3 and 5 is :
- (A) 2 (B) 4
(C) 14 (D) – 14
7. If the number a^n , where n is a natural number, always ends with digit a, then the possible value of 'a' is :
- (A) 2 (B) 4
(C) 6 (D) 8
8. The number of solutions of the system of equations $x = a$, $x = b$ ($a \neq b$) is :
- (A) 0 (B) 1
(C) 2 (D) Infinite
9. One of the values of 'p' for which $px^2 + 4x + p = 0$ has real and equal roots is :
- (A) 4 (B) – 4
(C) 2 (D) 0



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10. Which of the following equations is a quadratic equation ?
(A) $x^2 = (x + 1)^2$ (B) $(x - 1)(x + 2) = 2x + 1$
(C) $(x + 2)^3 = 2x(x^2 - 1)$ (D) $\sqrt{x} = x^2$
11. The distance of the point (2, 3) from the origin is :
(A) 2 (B) 3
(C) 5 (D) $\sqrt{13}$
12. The mid-point of the line segment joining points (1, 3) and (1, -3) lies :
(A) at the origin (B) in the second quadrant
(C) on x-axis (D) on y-axis
13. In the given figure, if $DE \parallel BC$, $AD = 1.5$ cm, $DB = 3$ cm and $EC = 2$ cm, the length of AC is :



- (A) 1.5 cm (B) 3 cm
(C) 3.5 cm (D) 4.5 cm
14. In two concentric circles, a tangent to the smaller circle will intersect the larger circle at :
(A) zero point (B) one point
(C) two points (D) three points
15. The value of $\frac{2 \tan 60^\circ}{1 - \tan^2 60^\circ}$ is :
(A) -3 (B) $\sqrt{3}$
(C) $-\frac{1}{\sqrt{3}}$ (D) $-\sqrt{3}$



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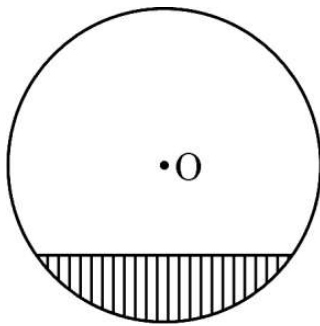
16. $(\sec \theta - \cos \theta)^2 + \sin^2 \theta - \tan^2 \theta = ?$

- (A) 0 (B) 1
(C) 2 (D) 4

17. The length of the shadow of a tower when the sun's altitude changes from 30° to 60° will :

- (A) become shorter (B) become longer
(C) remain same (D) be doubled

18. In the given figure, the shaded region represents :



- (A) minor sector (B) major sector
(C) minor segment (D) major segment

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 Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but 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.

19. Assertion (A) : The prime numbers which divide 36 also divide 6.

Reason (R) : Any number which divides p^2 also divides p .

20. Assertion (A) : All congruent triangles are similar.

Reason (R) : In congruent triangles, the ratio of corresponding sides is 1 : 1.



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SECTION B

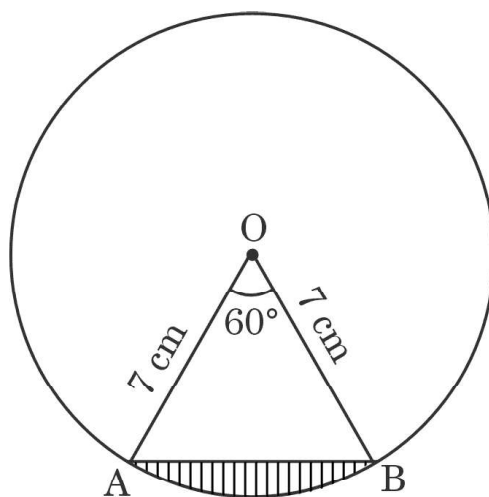
This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each.

5×2=10

21. (a) The area of a smaller circle is equal to the area of a sector of a larger circle with central angle 120° . The radii of the smaller and larger circles are 'r' and 'R' respectively. Find $r : R$.

OR

- (b) In the given figure, O is the centre of a circle of radius 7 cm. AB is a chord of the circle. Find the perimeter of the shaded region.



22. (a) Find the value of c for which the following pair of linear equations has infinitely many solutions :

$$cx + 3y = c - 3$$

$$12x + cy = c$$

OR

- (b) Solve for x and y :

$$3x + 2y = 65$$

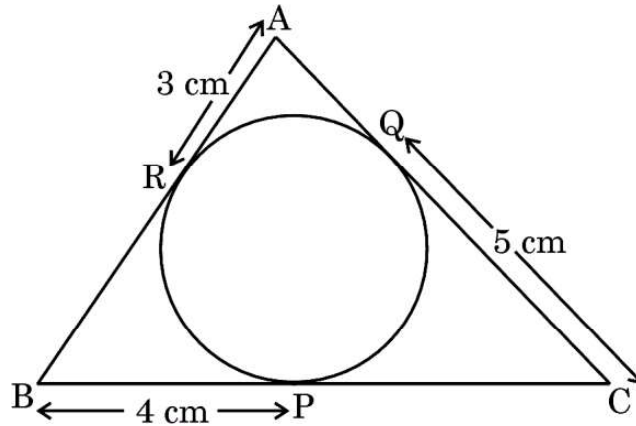
$$2x + 3y = 60$$

23. D is a point on side BC of $\triangle ABC$ such that $\angle ADC = \angle BAC$. Prove that $(CA)^2 = CB \cdot CD$.



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24. In the given figure, $\triangle ABC$ circumscribes a circle. If $AR = 3$ cm, $BP = 4$ cm and $QC = 5$ cm, find the perimeter of $\triangle ABC$.



25. Evaluate :

$$\frac{\sin^2 45^\circ}{\operatorname{cosec}^2 30^\circ - \tan^2 45^\circ}$$

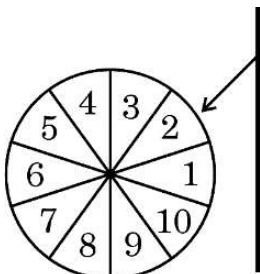
SECTION C

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

26. Prove the following trigonometric identity :

$$\frac{\cos A - 2 \cos^3 A}{2 \sin^3 A - \sin A} = \cot A$$

27. A game of chance consists of spinning a wheel which comes to rest at one of the numbers from 1 to 10 (as shown in the given figure) with equal probabilities.



What is the probability that the wheel stops at

- a prime number greater than 2 ?
- an odd number less than 9 ?
- a multiple of 4 ?



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28. (a) Prove that $\sqrt{5}$ is an irrational number.

OR

- (b) State the “Fundamental Theorem of Arithmetic” and use it to find LCM of 36 and 54.

29. Find the zeroes of the polynomial $q(x) = 6x^2 - 5x - 1$ and verify the relationship between the zeroes of $q(x)$ and its coefficients.

30. (a) Solve graphically the following pair of linear equations :

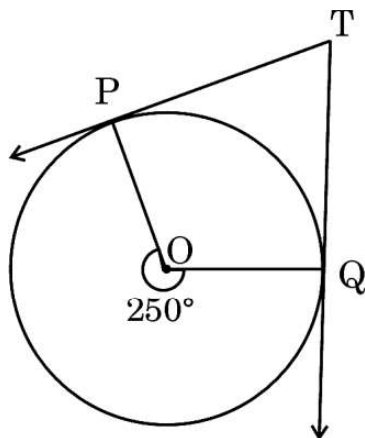
$$2x - y = 2 \text{ and } 4x - y = 4$$

Also, write the coordinates of the points where the lines represented by these equations cut the y-axis.

OR

- (b) An academy offering cricket coaching bought 10 bats and 5 balls for ₹ 32,500. Later, the academy bought 2 bats and 8 balls for ₹ 10,000. If there is no change in the cost of the bat and of the ball, find the cost of 1 bat and 1 ball.

31. In the given figure, TP and TQ are tangents at points P and Q of the circle respectively. If reflex $\angle POQ = 250^\circ$, find the measure of each angle of quadrilateral POQT.



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SECTION D

This section has 4 Long Answer (LA) type questions carrying 5 marks each. $4 \times 5 = 20$

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

Length in (mm)	Number of leaves
100 – 120	8
120 – 140	9
140 – 160	12
160 – 180	5
180 – 200	6

Find the median length (in mm) of the leaves.

OR

- (b) A class teacher has the following absentees record of 30 students of a class.

Number of days	0 – 4	4 – 8	8 – 12	12 – 16	16 – 20	20 – 24
Number of Absent students	1	8	x	6	5	y

If the mean number of days a student was absent is 12, find the values of x and y.

33. (a) The sum of areas of two squares is 2650 cm^2 . If the sum of their perimeters is 280 cm, find the sides of the two given squares.

OR

- (b) Express the equation $\frac{1}{x} - \frac{1}{x-2} = 3$, ($x \neq 0, 2$) as a quadratic equation in standard form. Hence, find the roots of the quadratic equation so obtained.

34. State and prove “Basic Proportionality Theorem.”

35. A spherical glass vessel has a cylindrical neck which is 7 cm long and 2 cm in diameter. The diameter of the spherical part is 14 cm. Find the capacity of the entire glass vessel. (Use $\pi = \frac{22}{7}$)



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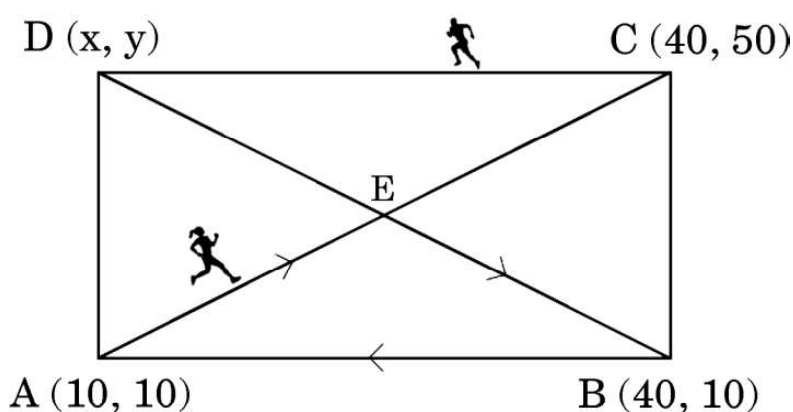
SECTION E

This section has 3 case study based questions carrying 4 marks each.

3×4=12

Case Study – 1

36. A field is in the form of a rectangle. The coordinates of the rectangular field ABCD are A(10, 10), B(40, 10), C(40, 50) and D(x, y). Anil and Anita, two friends decided to have a race. Anita started from point A and moved to point E along the diagonal AC, where E is the point of intersection of both the diagonals of ABCD. From point E, she moved to point B along the other diagonal DB and then moved back to point A along BA. While Anil started from point C and ran to point A via D along the boundary of the field.



Based on the above information, answer the following questions :

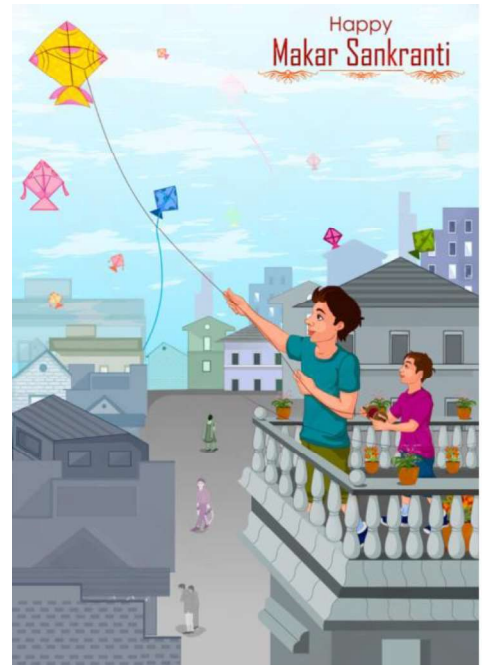
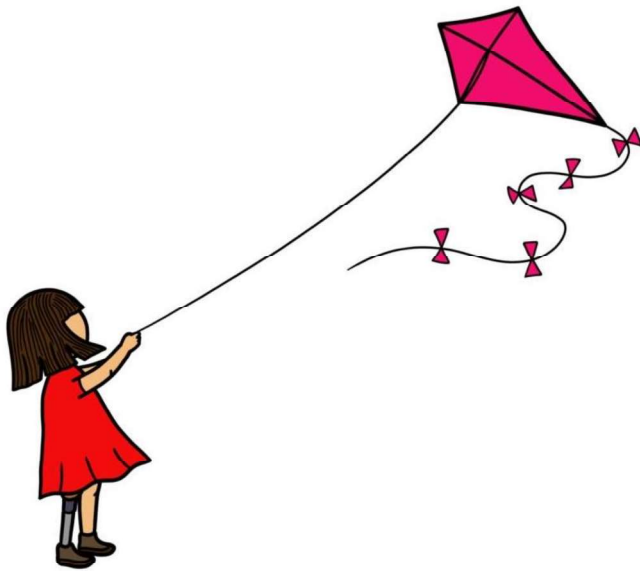
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|-----------|--|---|
| (i) | Find the coordinates of point E. | 1 |
| (ii) | Find the distance between the points B and C. | 1 |
| (iii) | (a) Find the coordinates of point D and the distance BD. | 2 |
| OR | | |
| (b) | Find the total distance travelled by Anita. | 2 |



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Case Study – 2

37. Kite festival is a popular festival in India which takes place during Makar Sankranti. The festival is celebrated by people flying kites from their rooftops. Reena and Ravi are also flying kites to enjoy the festival. The height of Reena's kite is 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground, and the inclination of the string with the ground is 30° . Ravi is flying a kite from a 10 m high building. His kite is also flying 60 m above the ground and the length of the string used by Ravi is same as that of Reena's. θ is the angle of elevation of Ravi's kite from a point on the rooftop.



Based on the above information, answer the following questions :

- (i) Find the length of string used by Reena. 1
- (ii) Find the value of $\sin \theta$. 1
- (iii) (a) If θ changes to 60° , without changing the length of the string, what will be the height of Ravi's kite above the ground ? (Use $\sqrt{3}=1.7$) 2

OR

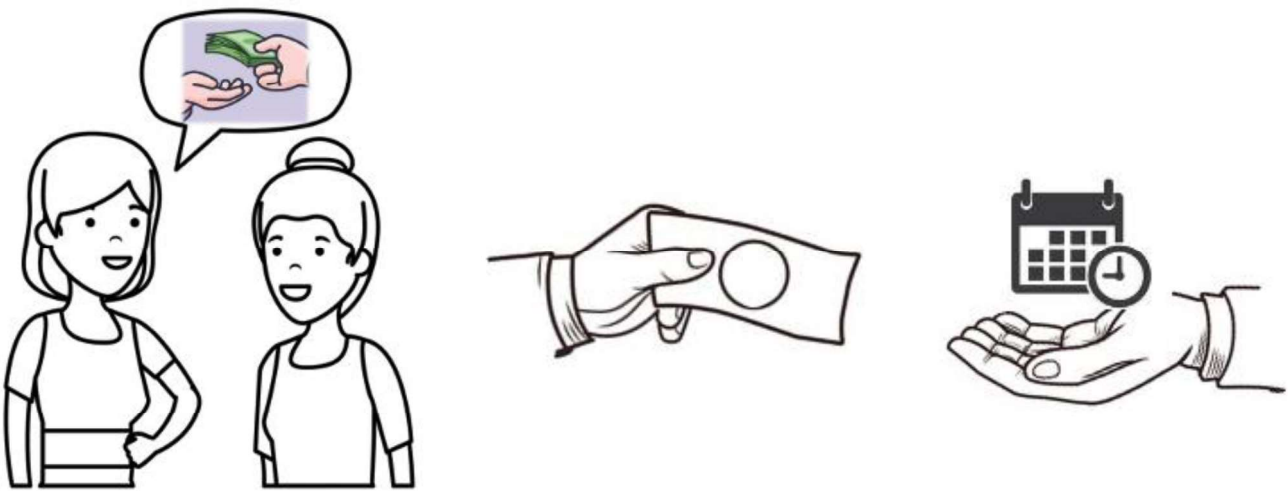
- (b) What would have been the height of Ravi's kite above the ground, if the string had an inclination of 30° with the ground, assuming that the length of the string does not change ? 2



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Case Study – 3

38. A woman borrowed ₹ 10,00,000 from her friend and promised to return the borrowed money in monthly instalments beginning from the next month. After one month, she returned ₹ 10,000, the next month she returned ₹ 15,000, the third month she returned ₹ 20,000 and so on, thereby increasing the monthly instalment uniformly.



Based on the above information, answer the following questions :

- (i) Find the amount of instalment paid in the tenth month. 1
- (ii) In which instalment did she pay ₹ 40,000 ? 1
- (iii) (a) If she returned ₹ 11,50,000 in all, how many instalments did she pay ? 2

OR

- (b) By which instalment has she returned a total amount of ₹ 3,25,000 ? 2

