

Series : 2LKNM



SET ~ 3

रोल नं.

Roll No.

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प्रश्न-पत्र कोड
Q.P. Code

30/2/3

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.

नोट / NOTE :

- (I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **27** हैं।
Please check that this question paper contains **27** 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 यथा स्थान पर प्रश्न का क्रमांक अवश्य लिखें।
Please write down the Serial Number of the question in the answer-book at the given place 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 परीक्षार्थी 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 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

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80

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 distance of the point A(4a, 3a) from x-axis is :

- | | |
|--------|----------|
| (A) 3a | (B) – 3a |
| (C) 4a | (D) – 4a |

2. प्राकृत संख्या 1 :

- (A) एक अभाज्य संख्या है।
- (B) एक भाज्य संख्या है।
- (C) अभाज्य और भाज्य दोनों है।
- (D) न तो अभाज्य और न ही भाज्य है।

3. यदि $\cot \theta = 3$ है, तो $\cos \theta$ का मान है :

- (A) $\frac{1}{3}$
- (B) $\frac{1}{\sqrt{10}}$
- (C) $\frac{3}{\sqrt{10}}$
- (D) $\frac{\sqrt{10}}{3}$

4. किसी प्राकृत संख्या n के लिए, 5^n का इकाई अंक होता है :

- (A) 0
- (B) 5
- (C) 3
- (D) 2

5. यदि $2 \sin A = 1$ है, तो $\tan A + \cot A$ का मान है :

- (A) $\sqrt{3}$
- (B) $\frac{4}{\sqrt{3}}$
- (C) $\frac{\sqrt{3}}{2}$
- (D) 1

6. 960 और 240 का लघुत्तम समापवर्त्य (LCM) है :

- (A) 960
- (B) 240
- (C) 60
- (D) 15

2. The natural number 1 is :
- (A) a prime number.
- (B) a composite number.
- (C) prime as well as composite.
- (D) neither prime nor composite.
3. Given $\cot \theta = 3$, the value of $\cos \theta$ is :
- (A) $\frac{1}{3}$ (B) $\frac{1}{\sqrt{10}}$
- (C) $\frac{3}{\sqrt{10}}$ (D) $\frac{\sqrt{10}}{3}$
4. For any natural number n , 5^n ends with the digit :
- (A) 0 (B) 5
- (C) 3 (D) 2
5. If $2 \sin A = 1$, then the value of $\tan A + \cot A$ is :
- (A) $\sqrt{3}$ (B) $\frac{4}{\sqrt{3}}$
- (C) $\frac{\sqrt{3}}{2}$ (D) 1
6. The LCM of 960 and 240 is :
- (A) 960
- (B) 240
- (C) 60
- (D) 15

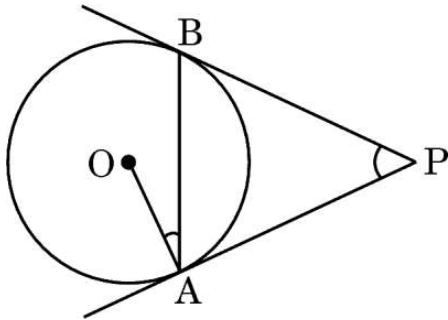
7. जमीन पर एक बिंदु से, जो एक ऊर्ध्वाधर मीनार के पाद से 60 m दूर है, मीनार के शीर्ष का उन्नयन कोण 45° पाया जाता है। मीनार की ऊँचाई (मीटर में) है :

- (A) $10\sqrt{3}$ (B) $30\sqrt{3}$
(C) 60 (D) 30

8. $p(x) = (x - 2)(x + 3)$ के कितने शून्यक हैं ?

- (A) शून्य (B) एक
(C) दो (D) तीन

9. दिए गए चित्र में, PA और PB केन्द्र O वाले वृत्त की स्पर्श रेखाएँ हैं। यदि $\angle OAB = 15^\circ$, तो $\angle APB$ का मान बराबर है :

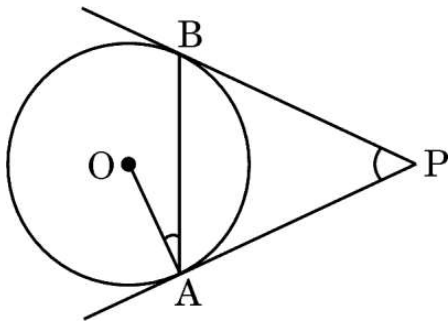


- (A) 30° (B) 15°
(C) 45° (D) 10°

10. यदि α और β बहुपद $f(x) = px^2 - 2x + 3p$ के दो शून्यक हैं और $\alpha + \beta = \alpha\beta$ है, तो p का मान है :

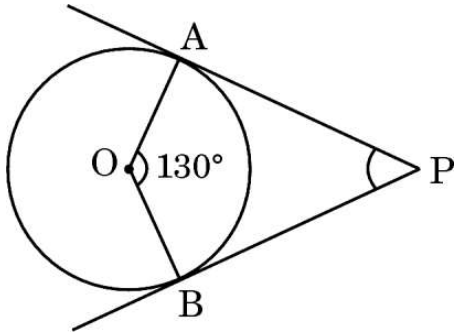
- (A) $-\frac{2}{3}$
(B) $\frac{2}{3}$
(C) $\frac{1}{3}$
(D) $-\frac{1}{3}$

7. From a point on the ground, which is 60 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is found to be 45° . The height (in metres) of the tower is :
- (A) $10\sqrt{3}$ (B) $30\sqrt{3}$
 (C) 60 (D) 30
8. How many zeroes does $p(x) = (x - 2)(x + 3)$ have ?
- (A) Zero (B) One
 (C) Two (D) Three
9. In the given figure, PA and PB are tangents to a circle centred at O. If $\angle OAB = 15^\circ$, then $\angle APB$ equals :



- (A) 30° (B) 15°
 (C) 45° (D) 10°
10. If α and β are two zeroes of a polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$, then value of p is :
- (A) $-\frac{2}{3}$
 (B) $\frac{2}{3}$
 (C) $\frac{1}{3}$
 (D) $-\frac{1}{3}$

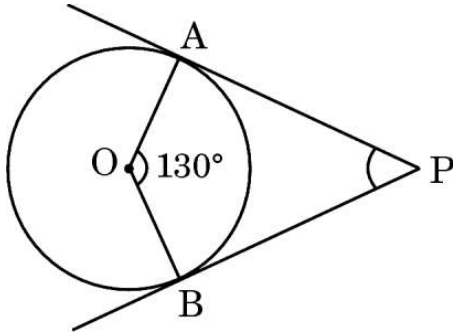
11. दिए गए चित्र में, PA और PB केन्द्र O वाले वृत्त की स्पर्श रेखाएँ हैं। यदि $\angle AOB = 130^\circ$, तो $\angle APB$ का मान बराबर है :



- (A) 130°
- (B) 50°
- (C) 120°
- (D) 90°
12. यदि रैखिक समीकरणों का युग्म : $a_1x + b_1y + c_1 = 0$ और $a_2x + b_2y + c_2 = 0$ संगत एवं आश्रित है, तो :

- (A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
- (B) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$
- (C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
- (D) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

11. In the given figure, PA and PB are tangents to a circle centred at O. If $\angle AOB = 130^\circ$, then $\angle APB$ is equal to :



- (A) 130°
- (B) 50°
- (C) 120°
- (D) 90°
12. If the pair of linear equations : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is consistent and dependent, then

- (A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
- (B) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$
- (C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
- (D) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

13. एक अर्धगोलाकार कटोरा स्टील से बना है, जिसकी मोटाई 1 cm है। कटोरे की बाहरी त्रिज्या 6 cm है। प्रयुक्त स्टील का आयतन (cm^3 में) है :

(A) 182π

(B) $\frac{182}{3} \pi$

(C) $\frac{682}{3} \pi$

(D) $\frac{364}{3} \pi$

14. निम्नलिखित में से कौन-सा अनुक्रम एक समांतर श्रेणी (A.P.) **नहीं** है ?

(A) $2, \frac{5}{2}, 3, \frac{7}{2}, \dots$

(B) $-1 \cdot 2, -3 \cdot 2, -5 \cdot 2, -7 \cdot 2, \dots$

(C) $\sqrt{2}, \sqrt{8}, \sqrt{18}, \dots$

(D) $1^2, 3^2, 5^2, 7^2, \dots$

15. व्यास 'd' वाले अर्धवृत्त का क्षेत्रफल है :

(A) $\frac{\pi d^2}{16}$

(B) $\frac{\pi d^2}{4}$

(C) $\frac{\pi d^2}{8}$

(D) $\frac{\pi d^2}{2}$

13. A hemispherical bowl is made of steel of thickness 1 cm. The outer radius of the bowl is 6 cm. The volume of steel used (in cm^3) is :

(A) 182π

(B) $\frac{182}{3} \pi$

(C) $\frac{682}{3} \pi$

(D) $\frac{364}{3} \pi$

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

(A) $2, \frac{5}{2}, 3, \frac{7}{2}, \dots$

(B) $-1 \cdot 2, -3 \cdot 2, -5 \cdot 2, -7 \cdot 2, \dots$

(C) $\sqrt{2}, \sqrt{8}, \sqrt{18}, \dots$

(D) $1^2, 3^2, 5^2, 7^2, \dots$

15. The area of a semicircle of diameter 'd' is :

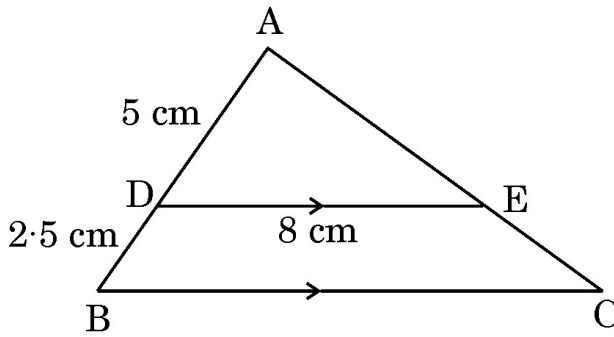
(A) $\frac{\pi d^2}{16}$

(B) $\frac{\pi d^2}{4}$

(C) $\frac{\pi d^2}{8}$

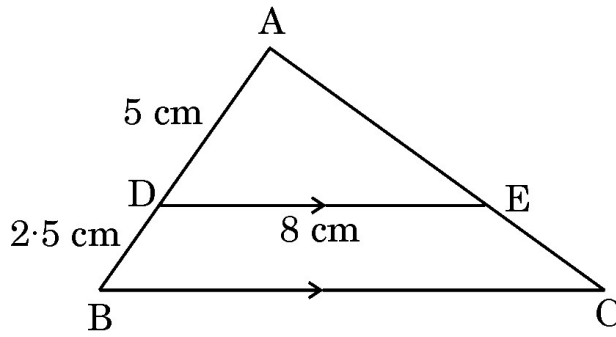
(D) $\frac{\pi d^2}{2}$

16. दिए गए चित्र में, $\triangle ABC$ को दर्शाया गया है, जिसमें $DE \parallel BC$ है। यदि $AD = 5 \text{ cm}$, $DB = 2.5 \text{ cm}$ और $DE = 8 \text{ cm}$ है, तो BC की लंबाई है :



- (A) 10 cm (B) 6 cm
(C) 12 cm (D) 7.5 cm
17. एक बारंबारता बंटन का माध्य और माध्यक क्रमशः 43 और 43.4 हैं। इस बंटन का बहुलक है :
- (A) 43.4
(B) 42.4
(C) 44.2
(D) 49.3
18. $1, 2, 3, 4, \dots, 25$ तक की संख्याओं में से यादृच्छिक रूप से चुनी गई एक संख्या के भाज्य संख्या होने की प्रायिकता है :
- (A) $\frac{15}{25}$
(B) $\frac{10}{25}$
(C) $\frac{11}{25}$
(D) $\frac{9}{25}$

16. In the given figure ΔABC is shown, in which $DE \parallel BC$. If $AD = 5$ cm, $DB = 2.5$ cm and $DE = 8$ cm, then the length of BC is :



- (A) 10 cm (B) 6 cm
(C) 12 cm (D) 7.5 cm
17. The mean and median of a frequency distribution are 43 and 43.4 respectively. The mode of the distribution is :
- (A) 43.4
(B) 42.4
(C) 44.2
(D) 49.3
18. The probability for a randomly selected number out of 1, 2, 3, 4, ..., 25 to be a composite number is :
- (A) $\frac{15}{25}$
(B) $\frac{10}{25}$
(C) $\frac{11}{25}$
(D) $\frac{9}{25}$

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 options (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 surface area of the cuboid formed by joining two cubes of sides 4 cm each, end-to-end, is 160 cm^2 .

Reason (R): The surface area of a cuboid of dimensions $l \times b \times h$ is $(lb + bh + hl)$.

20. Assertion (A) : The mean of first 'n' natural numbers is $\frac{n-1}{2}$.

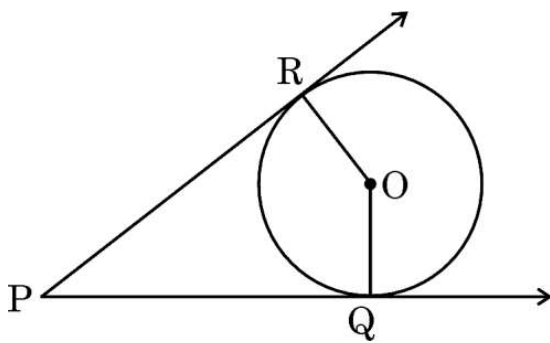
Reason (R): The sum of first 'n' natural numbers is $\frac{n(n+1)}{2}$.

SECTION B

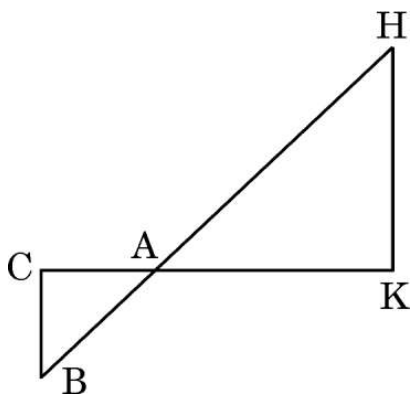
This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each.

$$5 \times 2 = 10$$

21. If the distance between the points $(4, p)$ and $(1, 0)$ is 5, what is the value of p ?
22. In the given figure, O is the centre of the circle. PQ and PR are tangents. Show that the quadrilateral $PQOR$ is cyclic.

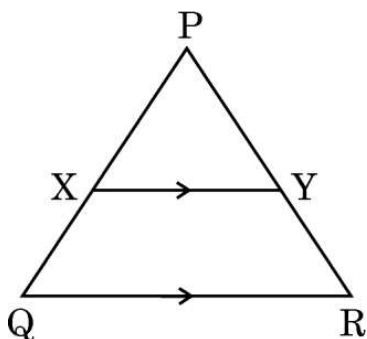


23. If α, β are the zeroes of the quadratic polynomial $px^2 + qx + r$, then find the value of $\alpha^3\beta + \beta^3\alpha$.
24. (a) In the given figure, $\triangle AHK \sim \triangle ABC$. If $AK = 10$ cm, $BC = 3.5$ cm and $HK = 7$ cm, find the length of AC .



OR

- (b) In the given figure, $XY \parallel QR$, $\frac{PQ}{XQ} = \frac{7}{3}$ and $PR = 6.3$ cm. Find the length of YR .



25. (a) If $\tan A = \frac{4}{3}$, find $\sin A$ and $\cos A$.

OR

- (b) Express $\cos A$ and $\tan A$ in terms of $\sin A$.

SECTION C

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

26. (a) Prove that the lengths of tangents drawn from an external point to a circle are equal.

OR

- (b) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2 \angle OPQ$.

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

28. Find the area of the sector of a circle of radius 42 cm and of central angle 30° . Also, find the area of the corresponding major sector. [Use $\pi = \frac{22}{7}$]

29. The three vertices of a rhombus PQRS are $P(2, -3)$, $Q(6, 5)$ and $R(-2, 1)$. Find the coordinates of the fourth vertex S and coordinates of the point where both the diagonals PR and QS intersect.

30. Two different dice are thrown together. Find the probability that the numbers obtained have :

- (i) even sum,
- (ii) even product.

31. (a) Prove that :

$$\frac{\sec^3 \theta}{\sec^2 \theta - 1} + \frac{\operatorname{cosec}^3 \theta}{\operatorname{cosec}^2 \theta - 1} = \sec \theta \cdot \operatorname{cosec} \theta (\sec \theta + \operatorname{cosec} \theta)$$

OR

(b) If $\frac{\sec \alpha}{\operatorname{cosec} \beta} = p$ and $\frac{\tan \alpha}{\operatorname{cosec} \beta} = q$, then prove that $(p^2 - q^2) \sec^2 \alpha = p^2$.

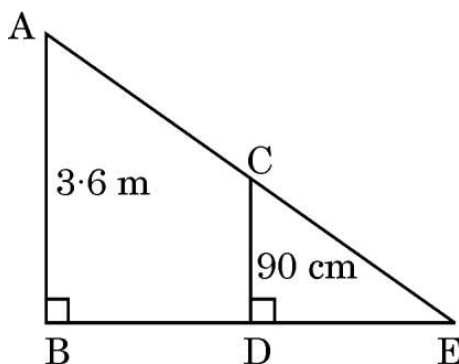
SECTION D

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

32. (a) Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.

OR

(b) As shown in the given figure, a girl of height 90 cm is walking away from the base of a lamp post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.



- 33.** An SBI health insurance agent found the following data for distribution of ages of 100 policy holders. The health insurance policies are given to persons of age 15 years and onwards, but less than 60 years.

<i>Age (in yrs)</i>	<i>Number of policy holders</i>
15 – 20	2
20 – 25	4
25 – 30	18
30 – 35	21
35 – 40	33
40 – 45	11
45 – 50	3
50 – 55	6
55 – 60	2

Find the modal age and median age of the policy holders.

- 34.** Represent the following pair of linear equations graphically and hence comment on the condition of consistency of this pair :

$$x - 5y = 6; 2x - 10y = 12$$

- 35.** (a) In a class test, the sum of Anamika's marks obtained in Maths and Science is 30. Had she got 2 marks more in Maths and 3 marks less in Science, the product of the marks would have been 210. Find the marks she got in the two subjects.

OR

- (b) The length of hypotenuse (in cm) of a right-angled triangle is 6 cm more than twice the length of its shortest side. If the length of its third side is 6 cm less than thrice the length of its shortest side, find the dimensions of the triangle.

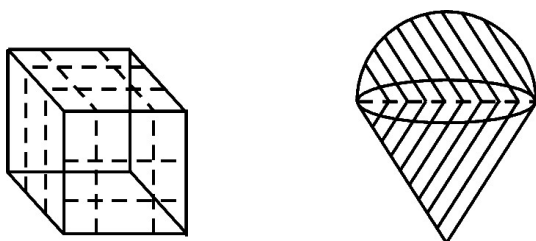
SECTION E

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

3×4=12

Case Study – 1

36. On a Sunday your parents took you to a fair. You could see lot of toys displayed and you wanted them to buy a Rubik's cube and a strawberry ice-cream for you.



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

- (i) Find the length of the diagonal of Rubik's cube if each edge measures 6 cm. 1
- (ii) Find the volume of Rubik's cube if the length of the edge is 7 cm. 1
- (iii) (a) What is the curved surface area of hemisphere (ice-cream) if the base radius is 7 cm ? 2

OR

- (iii) (b) If two cubes of edges 4 cm are joined end-to-end, then find the surface area of the resulting cuboid. 2

Case Study – 2

37. Your elder brother wants to buy a car and plans to take a loan from a bank for his car. He repays his total loan of ₹ 1,18,000 by paying every month, starting with the first instalment of ₹ 1,000 and he increases the instalment by ₹ 100 every month.

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

- (i) Find the amount paid by him in the 30th instalment. 1
- (ii) If the total number of instalments is 40, what is the amount paid in the last instalment ? 1

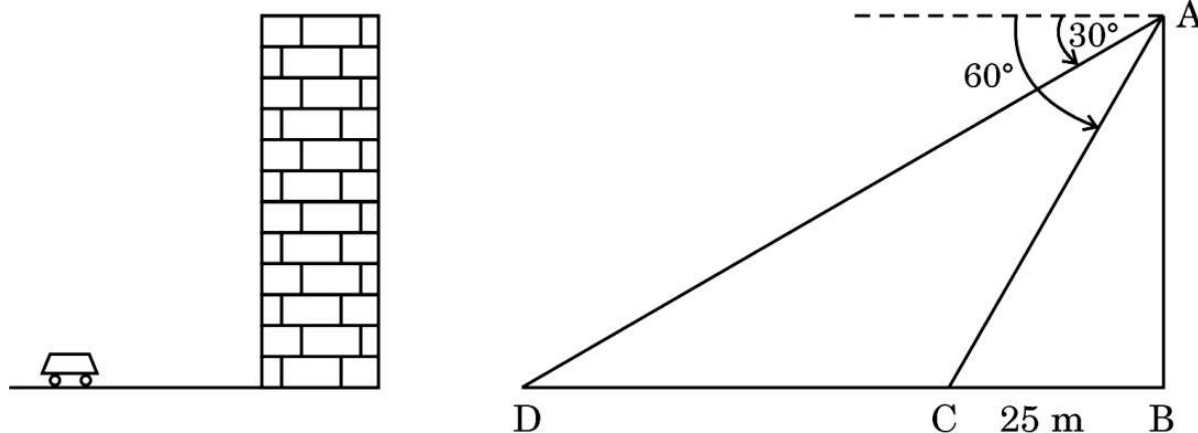
- (iii) (a) What amount does he still have to pay after the 30th instalment ? 2

OR

- (iii) (b) Find the ratio of the tenth instalment to the last instalment. 2

Case Study – 3

38. Tejas is standing at the top of a building and observes a car at an angle of depression of 30° as it approaches the base of the building at a uniform speed. 6 seconds later, the angle of depression increases to 60° , and at that moment, the car is 25 m away from the building.



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

- (i) What is the height of the building ? 1
- (ii) What is the distance between the two positions of the car ? 1
- (iii) (a) What would be the total time taken by the car to reach the foot of the building from the starting point ? 2

OR

- (iii) (b) What is the distance of the observer from the car when it makes an angle of 60° ? 2