

Series : 2LKNM



SET ~ 2

रोल नं.

Roll No.

○ ○ ○ ○ ○ ○ ○ ○ ○ ○



प्रश्न-पत्र कोड
Q.P. Code

30/2/2

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 :

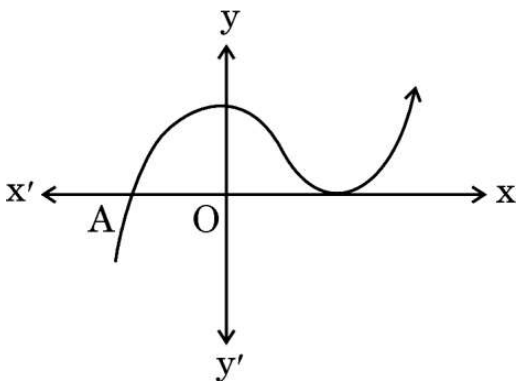
Read the following instructions very carefully and strictly follow them :

- (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 graph of $y = f(x)$ is given. The number of distinct zeroes of $y = f(x)$ is :



(A) 0

(B) 1

(C) 2

(D) 3

2. कक्षा X के दो अनुभाग A और B हैं। अनुभाग A में 28 छात्र और अनुभाग B में 30 छात्र हैं। कक्षा पुस्तकालय के लिए आपको पुस्तकों की न्यूनतम संख्या क्या अर्जित करनी चाहिए ताकि उन्हें अनुभाग A या अनुभाग B के छात्रों में समान रूप से वितरित किया जा सके ?
- (A) 144 (B) 2
(C) 420 (D) 272
3. रैखिक समीकरणों का युग्म $\frac{3x}{2} + \frac{5y}{3} = 7$ और $9x + 10y = 14$, है :
- (A) संगत
(B) असंगत
(C) एक हल के साथ संगत
(D) अनेक हलों के साथ संगत
4. 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।
5. x का मान ज्ञात कीजिए जिसके लिए $2x$, $(x + 10)$ और $(3x + 2)$ एक समांतर श्रेढी (A.P.) के तीन क्रमागत पद हैं :
- (A) 6 (B) - 6
(C) 18 (D) - 18
6. किसी प्राकृत संख्या n के लिए, 5^n का इकाई अंक होता है :
- (A) 0 (B) 5
(C) 3 (D) 2
7. त्रिभुजों ABC और PQR में, $\angle A = \angle Q$ और $\angle B = \angle R$ है, तो $AB : AC$ बराबर है :
- (A) PQ : PR
(B) PQ : QR
(C) QR : QP
(D) PR : QR

2. There are two sections A and B of Grade X. There are 28 students in Section A and 30 students in Section B. What is the minimum number of books you will acquire for the class library so that they can be distributed equally among students of Section A or Section B ?
- (A) 144 (B) 2
(C) 420 (D) 272
3. The pair of linear equations $\frac{3x}{2} + \frac{5y}{3} = 7$ and $9x + 10y = 14$, is :
- (A) consistent
(B) inconsistent
(C) consistent with one solution
(D) consistent with many solutions
4. The natural number 1 is :
- (A) a prime number.
(B) a composite number.
(C) prime as well as composite.
(D) neither prime nor composite.
5. The value of x for which $2x$, $(x + 10)$ and $(3x + 2)$ are the three consecutive terms of an A.P. is :
- (A) 6 (B) - 6
(C) 18 (D) - 18
6. For any natural number n, 5^n ends with the digit :
- (A) 0 (B) 5
(C) 3 (D) 2
7. In triangles ABC and PQR, $\angle A = \angle Q$ and $\angle B = \angle R$, then AB : AC is equal to :
- (A) PQ : PR
(B) PQ : QR
(C) QR : QP
(D) PR : QR

8. 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) $-\frac{1}{3}$
9. 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
10. यदि बिंदुओं $(4, p)$ और $(1, 0)$ के बीच की दूरी 5 है, तो p बराबर है :
- (A) ± 4
- (B) 4
- (C) -4
- (D) 0
11. 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) $\frac{364}{3}\pi$

8. 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) $-\frac{1}{3}$
9. 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
10. If the distance between the points $(4, p)$ and $(1, 0)$ is 5, then p is equal to :
- (A) ± 4 (B) 4
- (C) -4 (D) 0
11. 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) $\frac{364}{3}\pi$

12. यदि $\cos A = \frac{4}{5}$ है, तो $\tan A$ का मान है :

(A) $\frac{3}{5}$

(B) $\frac{3}{4}$

(C) $\frac{4}{3}$

(D) $\frac{5}{3}$

13. त्रिज्या 'r' तथा केन्द्रीय कोण 60° वाले एक वृत्तखंड का क्षेत्रफल है :

(A) $\frac{\pi r^2}{2} - \frac{1}{2}r^2$

(B) $\frac{2\pi r}{4} - \frac{\sqrt{3}}{4}r^2$

(C) $\frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}r^2$

(D) $\frac{2\pi r}{4} - r^2 \sin 60^\circ$

14. 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

12. If $\cos A = \frac{4}{5}$, then the value of $\tan A$ is :

(A) $\frac{3}{5}$

(B) $\frac{3}{4}$

(C) $\frac{4}{3}$

(D) $\frac{5}{3}$

13. Area of a segment of a circle of radius 'r' and central angle 60° is :

(A) $\frac{\pi r^2}{2} - \frac{1}{2}r^2$

(B) $\frac{2\pi r}{4} - \frac{\sqrt{3}}{4}r^2$

(C) $\frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}r^2$

(D) $\frac{2\pi r}{4} - r^2 \sin 60^\circ$

14. If $2 \sin A = 1$, then the value of $\tan A + \cot A$ is :

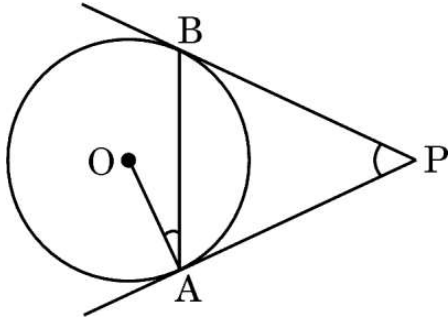
(A) $\sqrt{3}$

(B) $\frac{4}{\sqrt{3}}$

(C) $\frac{\sqrt{3}}{2}$

(D) 1

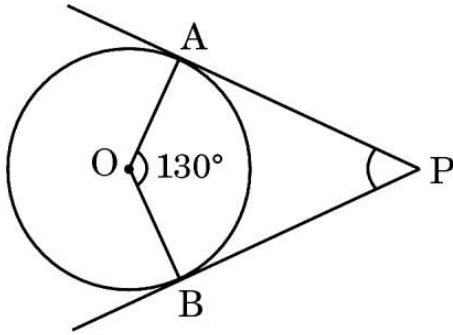
15. In the given figure, PA and PB are tangents to a circle centred at O. If $\angle OAB = 15^\circ$, then $\angle APB$ equals :



- (A) 30° (B) 15°
(C) 45° (D) 10°
16. 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
17. 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) $\frac{9}{25}$

18. 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°

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 mean of first 'n' natural numbers is $\frac{n-1}{2}$.

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

20. 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 .

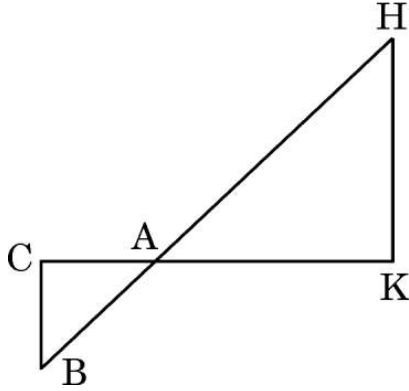
Reason (R): The surface area of a cuboid of dimensions $l \times b \times h$ is $(lb + bh + hl)$.

खण्ड ख

इस खण्ड में 5 अति लघु-उत्तरीय (VSA) प्रकार के प्रश्न हैं, जिनमें प्रत्येक के 2 अंक हैं।

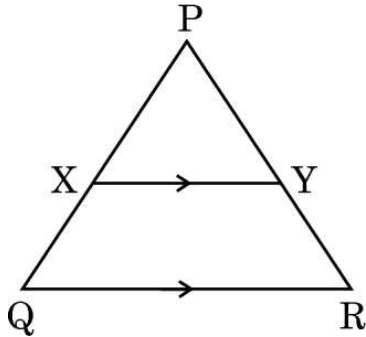
5×2=10

21. (क) दिए गए चित्र में, $\triangle AHK \sim \triangle ABC$ है। यदि $AK = 10$ cm, $BC = 3.5$ cm और $HK = 7$ cm है, तो AC की लंबाई ज्ञात कीजिए।



अथवा

- (ख) दिए गए चित्र में, $XY \parallel QR$, $\frac{PQ}{XQ} = \frac{7}{3}$ और $PR = 6.3$ cm है। YR की लंबाई ज्ञात कीजिए।

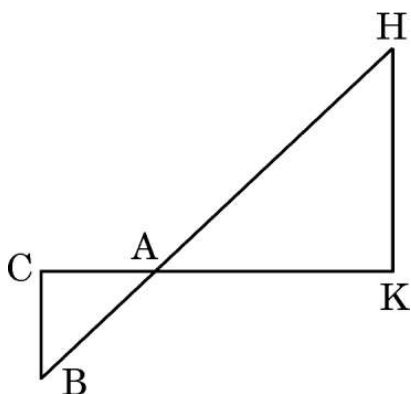


SECTION B

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

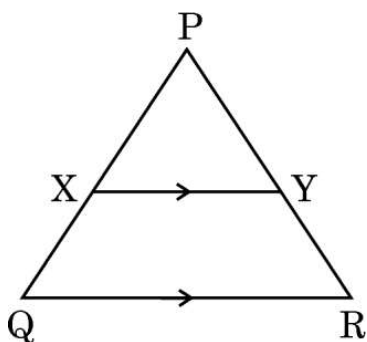
5×2=10

21. (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 .



22. (क) मान ज्ञात कीजिए :

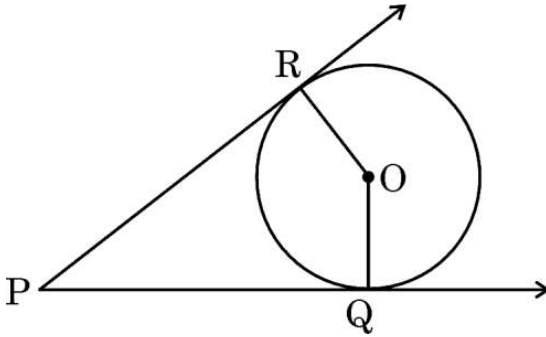
$$\frac{5 \cos^2 60^\circ + 4 \sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$$

अथवा

(ख) सिद्ध कीजिए कि :

$$1 + \frac{\cot^2 \alpha}{1 + \operatorname{cosec} \alpha} = \operatorname{cosec} \alpha$$

23. दिए गए चित्र में, O वृत्त का केंद्र है। PQ तथा PR स्पर्श रेखाएँ हैं। सिद्ध कीजिए कि चतुर्भुज PQOR चक्रीय है।



24. p का मान ज्ञात कीजिए, जिसके लिए द्विघात बहुपद $px^2 - 14x + 8$ का एक शून्यक दूसरे शून्यक का 6 गुना है।

25. यदि बिंदु A(4, 5), B(m, 6), C(4, 3) और D(1, n) एक समांतर चतुर्भुज ABCD के शीर्ष हैं, तो m और n के मान ज्ञात कीजिए।

22. (a) Evaluate :

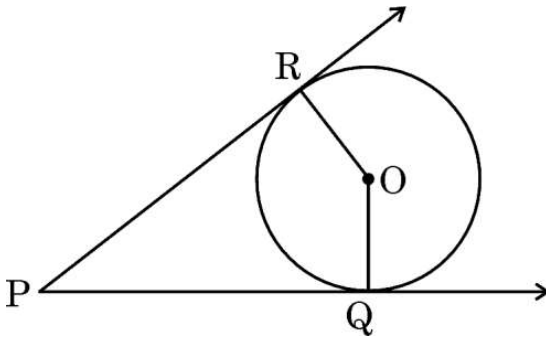
$$\frac{5 \cos^2 60^\circ + 4 \sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$$

OR

(b) Prove that :

$$1 + \frac{\cot^2 \alpha}{1 + \operatorname{cosec} \alpha} = \operatorname{cosec} \alpha$$

23. In the given figure, O is the centre of the circle. PQ and PR are tangents. Show that the quadrilateral PQOR is cyclic.



24. Find the value of p, for which one zero of the quadratic polynomial $px^2 - 14x + 8$ is 6 times the other.

25. If the points A(4, 5), B(m, 6), C(4, 3) and D(1, n) taken in this order are the vertices of a parallelogram ABCD, then find the values of m and n.

खण्ड ग

इस खण्ड में 6 लघु-उत्तरीय (SA) प्रकार के प्रश्न हैं, जिनमें प्रत्येक के 3 अंक हैं।

6×3=18

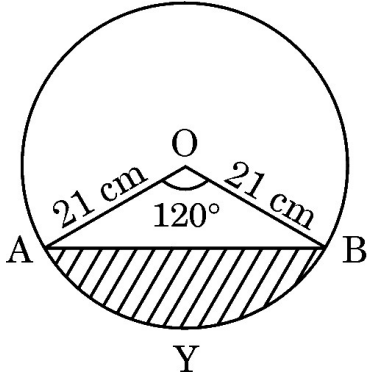
26. (क) सिद्ध कीजिए कि :

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

अथवा

(ख) यदि $\frac{\sec \alpha}{\operatorname{cosec} \beta} = p$ और $\frac{\tan \alpha}{\operatorname{cosec} \beta} = q$ है, तो सिद्ध कीजिए कि $(p^2 - q^2) \sec^2 \alpha = p^2$.

27. दिए गए चित्र में दर्शाए गए वृत्तखंड AYB का क्षेत्रफल ज्ञात कीजिए, यदि वृत्त की त्रिज्या 21 cm है तथा $\angle AOB = 120^\circ$. [$\pi = \frac{22}{7}$ का प्रयोग कीजिए]



28. दो पासों को एक साथ फेंका जाता है। प्रायिकता ज्ञात कीजिए कि (i) दोनों पासों पर आने वाली संख्याओं का योगफल 5 हो, और (ii) दोनों पासों पर आने वाली संख्याओं का अंतर 3 हो।

29. सिद्ध कीजिए कि $\sqrt{5}$ एक अपरिमेय संख्या है।

30. बिंदुओं $A(-1, 4)$ और $B(-3, -2)$ को मिलाने वाले रेखाखंड के समत्रिभाजन बिंदुओं (points of trisection) के निर्देशांक ज्ञात कीजिए।

SECTION C

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

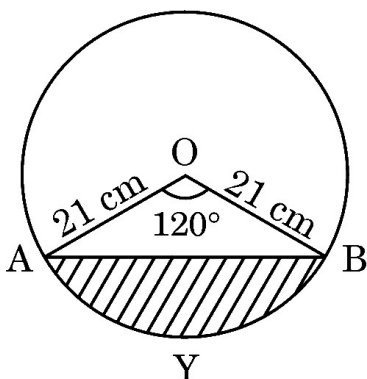
- 26.** (a) Prove that :

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

OR

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

- 27.** Find the area of the segment AYB shown in the figure, if the radius of the circle is 21 cm and $\angle AOB = 120^\circ$. [Use $\pi = \frac{22}{7}$]



- 28.** Two dice are thrown at the same time. Determine the probability that the
(i) sum of the numbers on the two dice is 5, and (ii) difference of the numbers on the two dice is 3.
- 29.** Prove that $\sqrt{5}$ is an irrational number.
- 30.** Find the coordinates of the points of trisection of the line segment joining the points A(-1, 4) and B(-3, -2).

31. (a) Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

OR

- (b) If a regular hexagon ABCDEF circumscribes a circle, then prove that $AB + CD + EF = BC + DE + FA$.

SECTION D

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

32. If the median of the following distribution is 32.5, then find the values of x and y.

<i>Class</i>	<i>Frequency</i>
0 – 10	x
10 – 20	5
20 – 30	9
30 – 40	12
40 – 50	y
50 – 60	3
60 – 70	2
Total	40

33. Aarush bought 2 pencils and 3 chocolates for ₹ 11 and Tanish bought 1 pencil and 2 chocolates for ₹ 7 from the same shop. Represent this situation in the form of a pair of linear equations. Find the price of 1 pencil and 1 chocolate, graphically.

34. (a) In a flight of 600 km, an aircraft slowed down its speed due to bad weather. Its average speed for the trip reduced by 200 km/h from its usual speed and time of flight increased by 30 minutes. Find the scheduled duration of the flight.

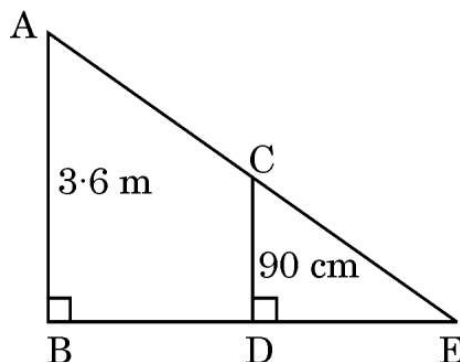
OR

- (b) Two pipes are used to fill a swimming pool. If the pipe of the larger diameter is used for 4 hours and the pipe of the smaller diameter for 9 hours, only half of the pool can be filled. Find how long it would take for each pipe to fill the pool, separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool.

35. (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.



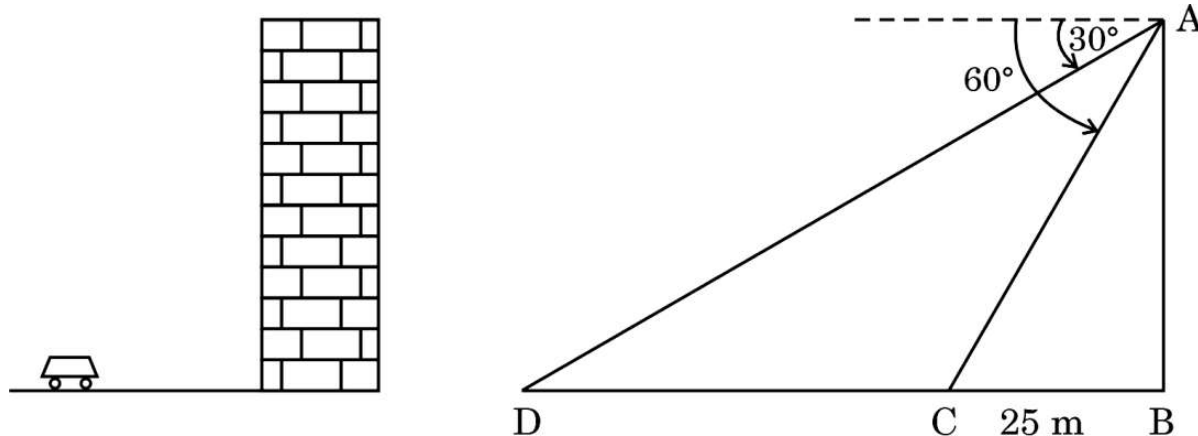
SECTION E

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

$3 \times 4 = 12$

Case Study - 1

- 36.** 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 :

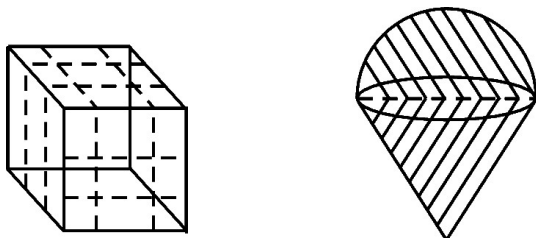
- (i) What is the height of the building ? 1
- (ii) What is the distance between the two positions of the car ? 1
- (iii) (a) What would be the total time taken by the car to reach the foot of the building from the starting point ? 2

OR

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

Case Study – 2

37. 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 – 3

38. 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