SHAPING FUTURES. BUILDING LEGACIES

ST KABIR PUBLIC SCHOOL

SECTOR 26, CHANDIGARH, 160019

PRE-BOARD EXAMINATION, 2025-2026

Class-X
Subject-Mathematics (041) (Standard)

Duration-3 Hours
Max. Marks - 80

General Instructions:
Read the following instructions carefully and follow them:

1. This question paper contains 38 questions. All Questions are compulsory.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Question numbers 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion- Reason based questions of 1 mark each.
4. In Section B, Question numbers 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Question numbers 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Question numbers 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Question numbers 36-38 are case study-based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. There is no overall choice. However, an internal choice in 2 questions of Section B, 2 questions of Section C and 2 questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required. Take π =22/7 wherever required if not stated.
10. Use of calculators is not allowed.

(Section A)

Section A consists of 20 questions of 1 mark each.

Q 1. Which of these numbers can be expressed as a product of two or more prime numbers? **(1)**

(i) 15 (ii) 34568 (iii) (15×13)

(A) only (ii) (B) only (iii) (C) only (i) and (ii) (D) all (i), (ii) and (iii)

Q 2. In a formula racing competition, the time taken by two racing cars A and B to complete 1 round of the track is 30 minutes and p minutes respectively. If the cars meet again at the starting point for the first time after 90 minutes and the HCF $(30, p) = 15$, then the value of p is: **(1)**

(A) 45 minutes
(B) 60 minutes
(C) 75 minutes
(D) 180 minutes

Q 3. $p(x)$ is a polynomial given by: **(1)**

$p(x) = -2x + 8x^2 - 1$

At which of the following points will the graph of $p(x)$ intersect the positive $x-$ axis?

(i) $\frac{1}{2}$ (ii) $\frac{1}{4}$

(A) only (i)

(B)only(ii)

(C) both (i) and (ii)

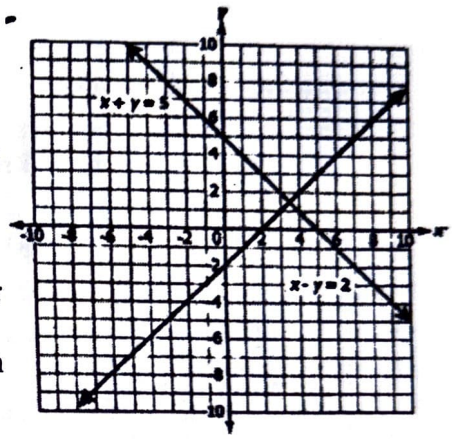
(D)none, it never intersects positive $x-$ axis

Q 4. What should be subtracted from the polynomial $x^2 - 16x + 30$, so that 15 is the zero of resulting 'polynomial'? **(1)**

(A) 38 (B) 14

(C) 15 (D) 16

Q 5. Consider the graph shown **(1)**



Which of these is true about the given graph?

(A) These lines have a unique solution as they are intersecting at a point.

(B) These lines have infinitely many solutions as they lie in the same quadrant.

(C) These lines have a unique solution as the coefficient of x in both the equations is one.

(D) These lines have infinitely many solutions as they lie in the same quadrant.

Q 6. Mr. Singh buys a property every year for 12 years. Every year he buys X acres more than the previous year. If in the $8th$ year he bought 45 acres of land and in the $5th$ year he bought 30 acres of land, how many acres did he buy in the last year? **(1)**

(A) $[10 + 11(5)]$ Acres (B) $[10 + 12(5)]$ Acres

(C) $[5 + 11(10)]$ Acres (D) $[5 + 12(10)]$ Acres

Q 7. On a graph, two-line segments, AB and CD of equal length are drawn. Which of these could be the coordinates of the points, A, B, C and D? **(1)**

(A) $A(-3,4)$ $B(-1,2)$ and $C(3,4)$ $D(1,2)$

(B) $A(-3,-4)$ $B(-1,2)$ and $C(3,4)$ $D(1,2)$

(C) $A(-3,4)$ $B(-1,-2)$ and $C(3,4)$ $D(1,2)$

(D) $A(3,4)$ $B(-1,2)$ and $C(3,4)$ $D(1,2)$

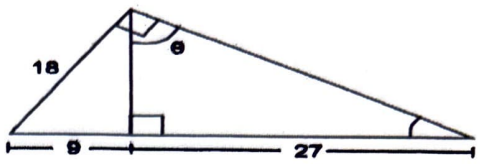
Q 8. The coordinates of the point A, where AB is the diameter of the circle whose centre is $(3,-2)$ and B $(7,4)$ is: **(1)**

(A) $(-1,-8)$ (B) $(-1,8)$

(C) $(1,8)$ (D) $(1,-8)$

Q 9. Observe the figure (1)

Which of these is the value of $\cos\theta$?



(A) $\frac{1}{2}$ (B) $\frac{2}{1}$

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

Q10. Shown below is a solved trigonometric problem. (1)

$$\frac{\text{cosec}\,\theta+\cot\theta-1}{\text{cosec}\,\theta-\cot\theta+1}$$

$$= \frac{\text{cosec}\,\theta+\cot\theta-(\cot^2\theta-\text{cosec}^2\theta)}{\text{cosec}\,\theta-\cot\theta+1} \quad \text{(Step 1)}$$

$$= \frac{\cot\theta+\text{cosec}\,\theta-(\cot\theta+\text{cosec}\,\theta)(\cot\theta+\text{cosec}\,\theta)}{\text{cosec}\,\theta-\cot\theta+1} \quad \text{(Step 2)}$$

$$= \frac{(\cot\theta+\text{cosec}\,\theta)(1-\cot\theta+\text{cosec}\,\theta)}{\text{cosec}\,\theta-\cot\theta+1} \quad \text{(Step 3)}$$

$$= \cot\theta + \text{cosec}\,\theta$$

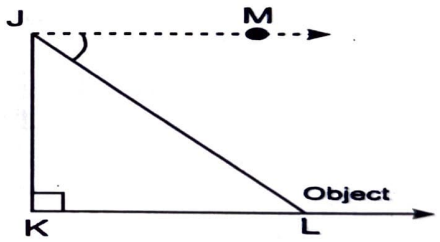
In which step is there an error in solving?

(A) Step 1 (B) Step 2

(C) Step 3 (D) There is no error

Q11. Consider the figure shown (1)

If ∠LJM is the angle of depression, what is the line of sight in the figure shown?



(A) JM (B) JL

(C) JK (D) KL

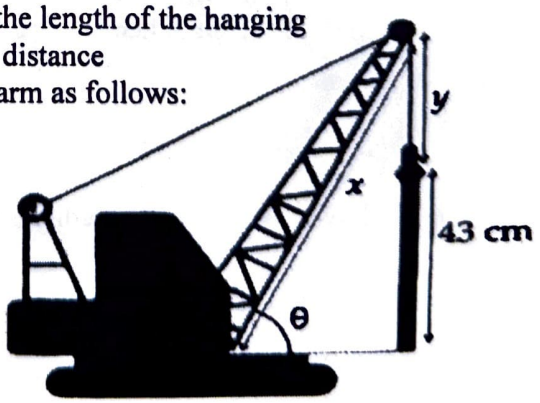
Q12. Ananya, Suman and Dipti see a crane lifting a metal rod, as shown in the following figure. They notice that more precision must be required in operating the crane as the rod gets closer to the base of the crane, since the rod could hit the crane if it tilts. (1)

Taking the length of the crane's arm as x metres, and the length of the hanging line as y metres, they find the approximate horizontal distance between the end of the rod and the base of the crane's arm as follows:

Ananya: $\frac{\tan\theta}{(y+43)}$ m

Suman: $x\cos\theta$ m

Dipti: $x\,\text{cosec}\,\theta$ m



Who is/are correct?

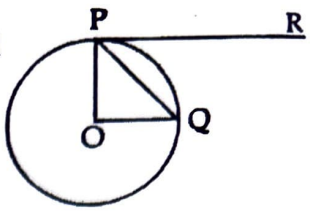
(A) only Ananya

(B) only Suman

(C) only Suman and Dipti

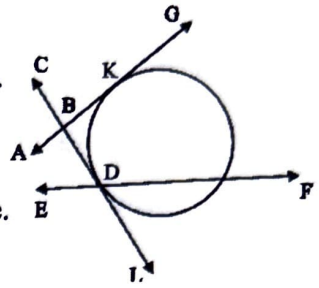
(D) only Ananya and Suman

Q13. If O is centre of a circle and Chord PQ makes an angle 50° with the tangent PR at the point of contact P, then the angle subtended by the chord at the centre is: **(1)**



(A) 130° (B) 100°
(C) 50° (D) 30°

Q14. A figure is shown: **(1)**



Which of the following is true?

(a) Lines AG and CL are the tangents and line EF is a secant to the circle.

(b) Lines AG and CL are the secants and line EF is a tangent to the circle.

(c) Line AG is a tangent and lines EF and CL are the secants to the circle.

(d) Line AG is a secant and lines EF and CL are the tangents to the circle.

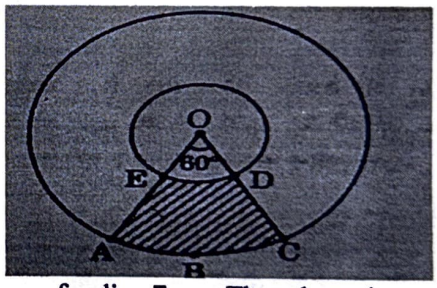
Q15. A school is organising a cultural fest. **(1)**

- 60% of students participate in music or dance.
- 40% participate in music.
- 30% participate in dance.
- 10% participate in both.

If one student is selected at random, what is the probability that the student participates in neither?

(A) 0.20 (B) 0.10
(C) 0.30 (D) 0.40

Q16. Two concentric circles of radius 8 cm and 5 cm are shown, and a sector forms an angle of 60° at the centre O. What is the area of the shaded region. **(1)**



(A) $38\ \pi cm^2$ (B) $\frac{77\pi}{2}\ cm^2$
(C) $\frac{11\pi}{2}\ cm^2$ (D) $\frac{13\pi}{2}\ cm^2$

Q17. A sphere of maximum volume is cut out from a solid hemisphere of radius 7 cm. Then the ratio of the volume of the original hemisphere to that of the cut-out sphere is: **(1)**

(A) 2 : 1 (B) 16 : 1
(C) 3 : 1 (D) 4 : 1

Q18. The table below shows the measurements of 3 right circular cones. **(1)**

Cone	Radius (in cm)	Slant Height (in cm)
P	3	5
Q	5	7
R	3.5	10

Which of these have the same curved surface area?
(A) only P and Q
(B) only Q and R
(C) only R and P
(D) P, Q and R have different curved surface areas because they have different radii and slant heights.

DIRECTIONS: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option:
(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 and 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.

Q19. **Assertion (A):** Total Surface area of the top is the sum of the curved surface area of the hemisphere and the curved surface area of the cone. **(1)**

Reason (R): Top is obtained by joining the plane surfaces of the hemisphere and cone together.

Q20. Based on the given information, choose the correct option that correctly describes statements (A) and (R). The chart below shows the marks obtained by students of sections *A* and *B* of grade 10. The results are recorded in groups as follows: **(1)**

	Number of students	
Mark	**Section A**	**Section B**
20 – 29	1	2
30 – 30	1	1
40 – 49	10	9
50 – 59	11	11
60 – 69	5	4
70 – 79	2	3

Assertion (A): The median mark of section A is equal to the median mark of section B.

Reason (R): The cumulative frequency of the median class and the preceding class are the same for both the sections.

(Section – B)

Section B consists of 5 questions of 2 marks each.

Q21. $\sqrt{5}$ is an irrational number. Meera was asked to prove that $(3+\sqrt{5})$ is an irrational number. **(2)**
Shown below are the steps of Meera's proof:

Step 1	Let $(3+\sqrt{5})$ be a rational number. Then $(3+\sqrt{5})$ can be written as $\frac{p}{q}$, where p and $q(q \neq 0)$ are co-primes.
Step 2	Hence, $\sqrt{5} = \left(\frac{p}{q} - 3\right)$.
Step 3	Since p and q are integers, $\left(\frac{p}{q} - 3\right)$ is also integer.
Step 4	Since $\left(\frac{p}{q} - 3\right)$ is an integer and every integer is a rational number, $\left(\frac{p}{q} - 3\right)$ is a rational number. It implies that $\sqrt{5}$ is a rational number.
Step 5	But this contradicts the fact that $\sqrt{5}$ is an irrational number. Hence $(3+\sqrt{5})$ is an irrational number.

She made an error in one step due to which her subsequent steps were incorrect too.
In which step did she make that error? Justify your answer.

Q22. In a blueprint of a building, the coordinates of the two opposite ends of a wall are $P(1,2)$ and $Q(7,8)$. **(2)**
Find the midpoint of the wall, where a decorative piece will be installed.

Q23. **(A)**A water pipeline runs from point P(0,0) to Q(9,6). A valve needs to be installed at a point that divides **(2)**
the pipeline in the ratio 1: 2. Find the coordinates of the valve position.

OR

(B) Point $P\ (x, y)$ is equidistant from points $A\ (5,1)$ and $B\ (1,5)$. Prove that $x = y$.

Q24. **(A)**If $\sin A - \cos A = 0$ for some acute angle A, then find the value of $2\ \tan^2 A + \frac{1}{\text{cosec}^2 A} + 1$. **(2)**

OR

(B) If $4\cot^2 45° - \sec^2 60° + \sin^2 60° + P = \frac{3}{4}$, then find the value of P.

Q25. At a traffic signal, the probability of getting a red light is 0.3, yellow light is 0.2 and green light is 0.5. **(2)**
If a person reaches the signal at random, what is the probability that:
(i) he does not get a green light
(ii) he does not get a red light.

(Section – C)

Section C consists of 6 questions of 3 marks each.

Q26. National Art convention got registrations from students from all parts of the country, 60 are interested in music, 84 are interested in dance and 108 students are interested in handicrafts. For optimum cultural exchange, organisers wish to keep them in minimum number of groups such that each group consists of students interested in the same art form and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each art form. How many rooms are required if each group will be allotted a room? **(3)**

Q27. **(A)**If α, β are zeroes of quadratic polynomial $5x^2 + 5x + 1$, find the value of **(3)**

(i) $\alpha^2 + \beta^2$

(ii) $\alpha^{-1} + \beta^{-1}$

OR

(B) A pharmaceutical company models the top surface area of a tablet box using the polynomial: $A(x) = x^2 + 8x + 15\ cm^2$

If the length of the box is $x + 5$ cm:

(i) Find the breadth of the box.

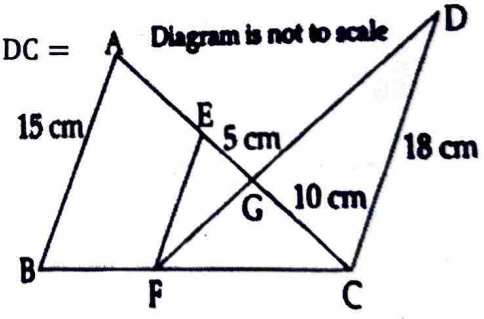
(ii) Factorise the polynomial.

Find the values of x for which the area becomes zero.

Q28. In the figure shown, BA, FE and CD are parallel lines. Given that $EG = 5$ cm, $GC = 10$ cm, $AB = 15$ cm and $DC = 18$ cm **(3)**

Calculate:-

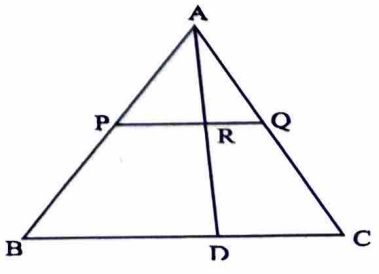
(i) EF (ii) AC



Q29. **(A)**A triangular park has vertices at A, B and C. A straight road DE is constructed inside the triangle such that it is parallel to side BC and intersects sides AB and AC at D and E respectively. If $AD = 4.5$m, $DB = 3$m and $AE = 6$m, find the length of EC. Also, verify whether DE divides the triangle in the correct proportion. **(3)**

OR

(B) In ΔABC, P and Q are points on AB and AC respectively such that PQ is parallel to BC. Prove that the median AD drawn from A on BC bisects PQ.



Q30. Prove that: $\frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta} = \frac{3}{4}$, if $\tan\theta = \frac{1}{\sqrt{7}}$ **(3)**

Q31. A jackfruit is in the shape of a cylinder with two hemispherical ends. If the total length of jack fruit is **(3)**
60 cm and diameter is 25 cm.
(i) Find the volume of the jack fruit (take $\pi = 3.14$)
(ii) A person orders a jackfruit through Amazon. Amazon wants to pack the jack fruit in a cuboidal container. What is the volume of the smallest such box?

(Section – D)
Section D consists of 4 questions of 5 marks each

Q32. Three consecutive natural numbers are such that the square of the middle number exceeds the difference of the squares of the other two by 60. Find the numbers. **(5)**

Q33. **(A)**In an $A.P.$ of 40 terms, the sum of first 9 terms is 153 and the sum of last 6 terms is 687. Determine the first term and common difference of $A.P.$ Also, find the sum of all the terms of the $A.P.$ **(5)**

OR

(B) A school awards scholarships to its top 15 students in such a way that the top student gets ₹2000, the second get ₹1950, the third gets ₹ 1900, and so on.
(i) What is the amount received by the $15th$ student?
(ii) Find the total amount distributed among all 15 students.

If the school has a budget of ₹ 25,000 for scholarships, does it have enough funds?

Q34. **(A)**An athletic track is made up of two semicircles and two straight paths, each 100 m long. The radius of each semicircle is 35 m. A runner takes 8 rounds of the track. Find: **(5)**

(i) Total distance covered

(ii) Area enclosed by the track

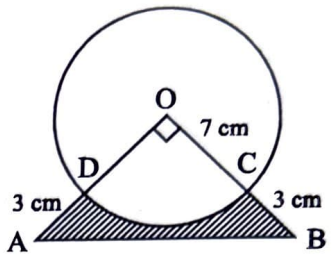
(iii) Cost to lay synthetic turf inside the track at ₹120 per m^2

OR

(B) In an annual day function of a school, the organizers to give a cash prize along with a memento to their best students. Each memento is made as shown in the figure and its base $ABCD$ is shown from the front side. The rate of silver plating is 20 per cm^2.

Based on the above, answer the following:

(i) What is the area of the quadrant ODCO?
(ii) Find the area of ΔAOB.
(iii) What is the total cost of silver plating the shaded part ABCD
(iv) What is the length of arc CD?



Q35. The monthly expenditure on milk in 200 families of a Housing Society is given below: **(5)**

Monthly Expenditure (in ₹)	Number of Families
1000 – 1500	24
1500 – 2000	40
2000 – 2500	33
2500 – 3000	x
3000 – 3500	30
3500 – 4000	22
4000 – 4500	16
4500 – 5000	7

Find the value of x and also, find the median and mean expenditure on milk.

(Section – E)

Section E consists of 3 case study-based questions of 4 marks each.

Q36. Sanjay wants to travel from his home to his office. He compares the fare of two cab services:

- Cab A charges a fixed ₹ 50 plus ₹10 per kilometre.
- Cab B has no fixed charge but charges ₹ 12 per kilometre.

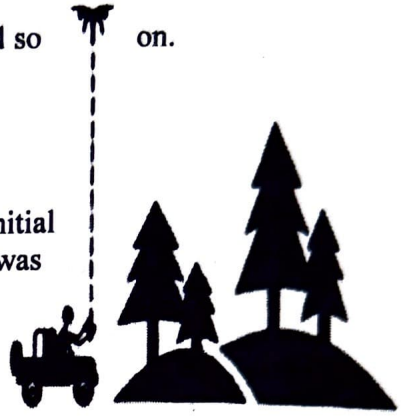
Let the number of kilometres travelled be x, and the total fare be y.

(i) Write the linear equations representing the total fare for each cab. **(1)**
(ii) If Sanjay travels 5 km, which cab will cost less and by how much? **(1)**
(iii) **(A)** Find the distance at which both cabs charge the same fare.

OR

(B) Graphically interpret the point of intersection of the two equations **(2)**

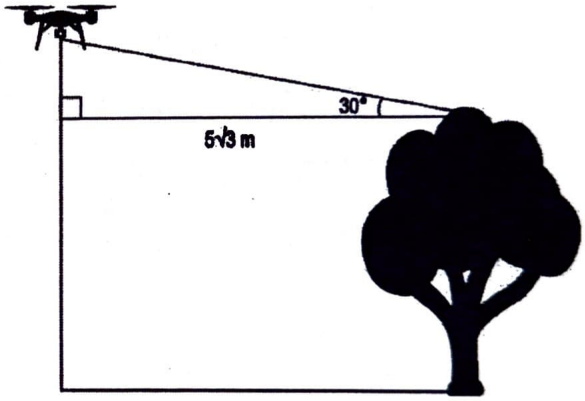
Q37. A drone, is an aircraft without any human pilot and is controlled by a remote- control device. Its various applications include policing, surveillance, photography, precision agriculture, forest fire monitoring, river monitoring and so on.
David used an advanced drone with high resolution camera during an expedition in a forest region which could fly upto 100 m height above the ground level.



David rode on an open jeep to go deeper into the forest. The initial position of drone with respect to the open jeep on which David was riding is shown.
David's jeep started moving to enter the forest at an average speed of 10 m/s. He Simultaneously started flying the drone in the same direction as that of the jeep.

Based on the above information answer the following questions.

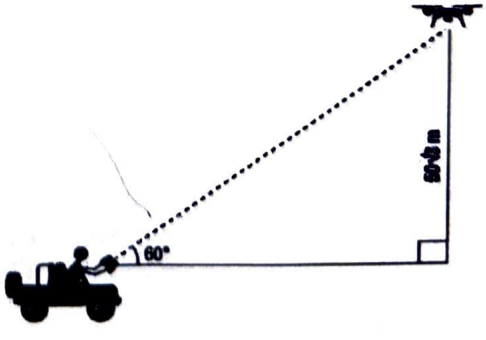
(i) David reached near one of the tallest trees in the forest. He stopped the drone at a horizontal distance of $5\sqrt{3}$ m from the top of the tree and at a vertical distance of 65 m below it maximum vertical range.
If the angle of elevation of the drone from the top of the tree was 30°, find the height of the tree. Show your work. **(1)**



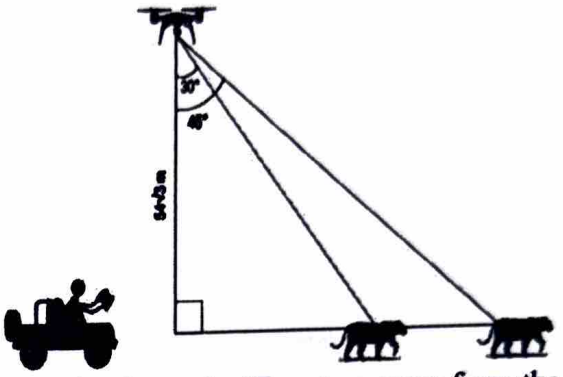
(ii) The drone was flying at a height of $30\sqrt{3}$ metres at a constant speed in the horizonal direction when it spotted a zebra near a pond, right below the drone. The drone travelled for 30 metres from there and it could see the zebra, at the same place, at an angle of depression of θ from it.
Draw a diagram to represent this situation and find θ. Show you work. **(1)**

(iii) **(A)** After 2 minutes of starting the expedition both the drone and the jeep stopped at the same moment so that the drone can capture some images. The position of the drone and the jeep when they stopped is as shown. Find the average speed of the drone in m/s rounded off up to 2 decimal places. Show your work. **(2)**

OR



(B) At some point during the expedition, David kept the drone stationary for some time to capture the images of a tiger. The angle of depression from the drone to the tiger changed from 30° to 45° in 3 seconds as shown



What was the average speed of the tiger during that time? Show your work.

Q38. In a residential complex, a streetlight pole is placed such that it stands 17 meters away from the center of a circular garden of radius 8 meters. Two steel wires are tied from the top of the pole to touch the garden's boundary at points A and B, forming tangents to the circle.

(i) What geometric property do the two wires PA and PB satisfy with respect to the circle? **(1)**

(ii) State whether triangle OAP (O is the center of the garden) is a right-angled triangle. Justify your answer. **(1)**

(iii) **(A)** Calculate the length of each wire. **(2)**

OR

(B) If the angle $\angle APB$ between the two wires is 80°, find the angle $\angle AOB$ at the center of the garden between the two radii OA and OB.