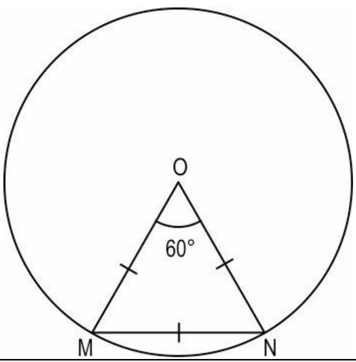
PRACTICE QUESTIONS- MARKING SCHEME
CLASS X
SUBJECT: MATHEMATICS (STANDARD)

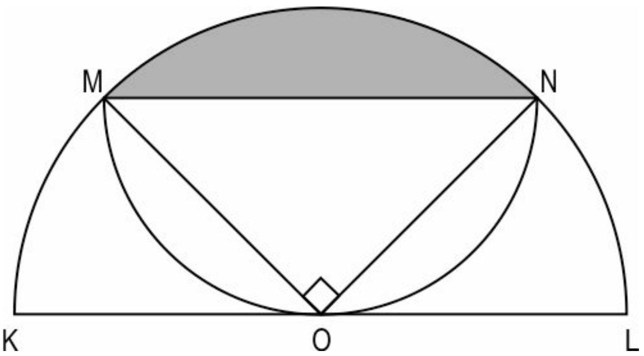
SECTION A - Multiple Choice Questions of 1 mark each.

Question number	Answer key
1	B
2	C
3	C
4	B
5	D
6	C
7	D
8	B
9	C
10	B
11	C
12	B
13	C
14	B
15	B
16	A
17	B
18	B
19	C
20	D

SECTION B – Very short answer questions of 2 marks each.

Q. no	Expected answer	Marks
21	Solves any two equations to get their point of intersection as (4, -7). Substitutes the coordinates (4, -7) in the third equation and shows that they satisfy it. Hence, concludes that the three lines intersect at a common point.	1 1
22	Writes that the angle subtended by arc NP at the centre is double the angle subtended at the circumference and finds the measure of $\angle NOP$ as $2 \times 25° = 50°$. Writes that the radius is perpendicular to the tangent at the point of contact and finds the measure of $\angle ONQ$ as 90°. Writes that sum of angles of a triangle is 180° and finds the measure of $\angle OQN$ as $180° - (50° + 90°) = 40°$.	0.5 1 0.5

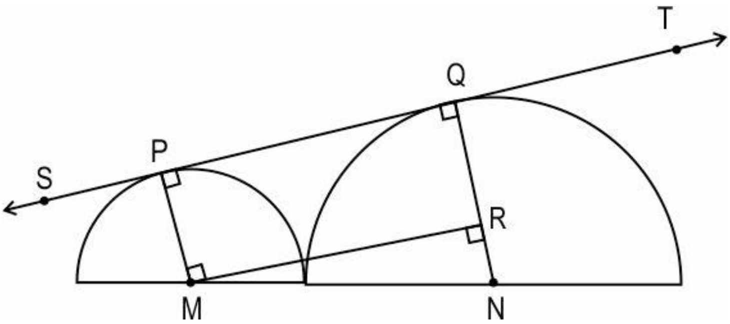
23	Finds that the two numbers are of the form 101p and 101q where $p > q$ and p and q are co-prime to each other. Uses the given information and writes: $101p - 101q = 303$ $\Rightarrow 101(p - q) = 303$ $\Rightarrow p - q = 3$ $\Rightarrow p = q + 3$ Identifies that the smallest 4-digit number can be found when q and p are 10 and 13 respectively. Finds the two numbers as 1010 and 1313.	0.5 0.5 1
24	Writes (A + 2B) = 90°, as cos 90° = 0. Writes (B - A) = 30°, as cos 30° = $\frac{\sqrt{3}}{2}$. Subtracts (B - A) from (A + 2B) to get (2A + B) = 60°. Writes that cosec 60° = $\frac{2}{\sqrt{3}}$. **OR** i) Writes that the statement is false. Gives a reason. For example, tan θ = $\frac{\sin\theta}{\cos\theta}$. So, since tan θ is directly proportional to sin θ. In the given interval (0° < θ < 90°), as the value of sin θ increases, the value of cos θ decreases and hence the value of tan θ increases. ii) Writes that the statement is false. Gives a reason. For example, as cosec θ = $\frac{1}{\sin\theta}$, the cosecant function is inversely proportional to the sine function. So, when the value of sin θ is maximum, the value of cosec θ will be minimum.	0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5
25	Draws a rough figure using the given information. The figure may look as follows:  	0.5

	(Note: The figure is not to scale.) Writes that since OM = ON (radii), hence ∠OMN = ∠ONM = 60° (angles opposite equal sides) and ΔMON is an equilateral triangle. Finds the arc length of the minor sector as $\frac{60°}{360°} \times 2 \times \frac{22}{7} \times \frac{7}{2} = \frac{22}{6}$ or $\frac{11}{3}$ cm. OR Draws a rough figure joining O with M and N such that ∠MON = 90°. The figure may look as follows:  *(Note: The figure is not to scale.)* Finds the area of sector MON as $\frac{90°}{360°} \times \pi \times 6^2 = 9\pi$ cm^2. Finds the area of ΔMON as $\frac{1}{2} \times 6 \times 6 = 18$ cm^2. Finds the area of the shaded segment as $(9\pi - 18)$ cm^2 or $9(\pi - 2)$ cm^2.	0.5 1 0.5 0.5 0.5 0.5

SECTION C – Short answer questions of 3 marks each.

Q. no	Expected answer	Marks
26	Finds the prime factorisation of 12^4 as $(2^8 \times 3^4)$. Finds the prime factorisation of 6^4 as $(2^4 \times 3^4)$ and the prime factorisation of 8^2 as 2^6. Compares the prime factorisations of 6^4, 8^2 and 12^4 and identifies that 256 or equivalently, 2^8 is the smallest value of k.	1 1 1
27	(i) Simplifies $\frac{1}{m} + \frac{1}{n}$ as $\frac{(m+n)}{mn}$.	0.5

	Identifies $m + n = \frac{1}{3}$ and $mn = \frac{-2}{3}$. Substitutes the values of $(m + n)$ and (mn) and finds: $\frac{1}{m} + \frac{1}{n} = -\frac{1}{2}$ (ii) Rewrites $(m^2 + n^2)$ using the appropriate identity as: $m^2 + n^2 = (m+n)^2 - 2mn$ Substitutes the values of $(m + n)$ and (mn) in the above expression to get: $m^2 + n^2 = \left(\frac{1}{3}\right)^2 - 2\left(\frac{-2}{3}\right)$ Simplifies the expression and finds: $m^2 + n^2 = \frac{13}{9}$	0.5 0.5 0.5 0.5 0.5
28	i) Substitutes any point on the line from the graph in the equation $ax + y + 8 = 0$ and finds the value of a as (-2). ii) Solves the pair of linear equations either algebraically or graphically and finds the point of intersection of the two lines as (5, 2). **OR** Assumes the prices of one round of shooting and bowling in the combo packs to be x and y respectively. Frames the pair of linear equations as: $3x + 2y = 285$ $4x + 5y = 485$ Solves the above pair of linear equations by an appropriate method to find the value of y as Rs 45. Writes that the price of one round of bowling in the solo pack is Rs 60 and hence concludes that the price of one round of bowling in the solo pack is 60 – 45 = Rs 15 more than that of the combo pack.	1 2 1 1.5 0.5
29	Assumes the radius of the circle as x cm and since NVUW is a square, WU = UV = x cm. Uses the Pythagoras theorem in ΔSUT and finds the length of ST as $\sqrt{(400 + 100)} = 10\sqrt{5}$ cm.	0.5 0.5 0.5

	Finds the length of VT as $(10 - x)$ cm and uses properties of tangents to write YT = VT. Uses properties of tangents to equate SY and SW to write the equation as: $20 - x = 10\sqrt{5} - (10 - x)$ Solves the above equation for x to find the radius of the circle as $(15 - 5\sqrt{5})$ cm. **OR** Joins MP, NQ and uses the perpendicularity of radius to tangents to draw MR parallel line to PQ. The rough figure may look as follows:  *(Note: The figure is not to scale.)* Finds RN as 16 - 9 = 7 cm and MN as 9 + 16 = 25 cm. Uses the Pythagoras theorem in ΔMRN to find the length of MR as $\sqrt{(25^2 - 7^2)} = 24$ cm. Writes that since MRQP is a rectangle, PQ = MR = 24 cm.	1 0.5 1.5 0.5 0.5 0.5
30	Simplifies LHS of the given equation using $(a^2 - b^2)$ identity and the trigonometric identity $\sin^2 x + \cos^2 x = 1$ as: $\frac{(\cos^2 x - \sin^2 x)}{1 - \tan x}$ Simplifies the above expression by rewriting the denominator in terms of sine and cosine ratios as: $\frac{\cos x\,(\cos^2 x - \sin^2 x)}{(\cos x - \sin x)}$ Simplifies the above expression using $(a^2 - b^2)$ identity as $\cos x\,(\cos x + \sin x)$.	1 1 0.5 0.5

	Simplifies the above expression by multiplying and dividing with sin x to get $\frac{(\cot x + 1)}{\sec x \operatorname{cosec} x}$.	
31	Calculates the probability of the dart landing on the smaller sections (1 to 8) as $\frac{1}{16}$ and the larger sections (9 to 12) as $\frac{1}{8}$. Finds the probability of the dart landing on a composite number as $\frac{9}{16}$. The working may look as follows: $(3 \times \frac{1}{16}) + (3 \times \frac{1}{8}) = \frac{9}{16}$ Finds the probability of the dart landing on an even number as $\frac{1}{2}$. The working may look as follows: $(4 \times \frac{1}{16}) + (2 \times \frac{1}{8}) = \frac{1}{2}$ Finds the probability of the dart landing on a factor of 12 as $\frac{7}{16}$. The working may look as follows: $(5 \times \frac{1}{16}) + (1 \times \frac{1}{8}) = \frac{7}{16}$ Compares the above probabilities and concludes that Arya has the highest chances of winning.	1 0.5 0.5 0.5 0.5

SECTION D – Long answer questions of 5 marks each.

Q. no	Expected answer	Marks
32	Expresses the number of products sold in the first month (n) in terms of the price in the first month (p) as $n = \frac{12000}{p}$. Frames the following equation based on information given regarding the second month: $(p - 20)\left(\frac{12000}{p} + 40\right) = 12000 + 2000$ Simplifies into standard quadratic form as $p^2 - 70p - 6000 = 0$. Solves the quadratic equation using any suitable method to obtain $p = 120$ or $p = -50$. (Neglects $p = -50$ as price cannot be negative.) Finds the price of the product in the second month as $p - 20 = 120 - 20 =$ Rs 100.	0.5 1.5 1 1 1

	OR Expresses the area of the tiled portion as $(5 - 2x)(4 - 2x)$ m^2. Expresses the area of the painted portion as $[20 - (5 - 2x)(4 - 2x)]$ m^2. Frames a quadratic equation using the information given as follows: $500[(5 - 2x)(4 - 2x)] + 200[20 - (5 - 2x)(4 - 2x)] = 5800$ Simplifies into standard quadratic form as $12x^2 -54x + 42 = 0$. Solves the quadratic equation using any suitable method to obtain $x = 1$ or $x = 3.5$ to conclude that the width of the painted portion would be 1 m. ($x = 3.5$ m is not possible because the painted portion would exceed the length and height of the wall.)	 1 1 1 1 1
33	Uses the formula $l \times b \times h$ to find the volume of the box as 138000 cm^3, where $l = 30$ cm, $b = 40$ cm and $h = 115$ cm. Uses the formula $\frac{1}{3}\pi r^2 h$ to find the volume of the ice-cream cone as 154 cm^3, where $r = 3.5$ cm and $h = 12$ cm. Uses the formula $\frac{2}{3}\pi r^3$ to find the volume of the hemisphere as 89.83 cm^3. Finds the volume of 1 serving of dessert as the (volume of cone) + (volume of hemisphere) = 243.83 cm^3. Rounds the volume of 1 serving off to 244 cm^3. Finds the approximate number of desserts that can be served as 565, on solving $\frac{138000}{244} = 565.57$. **OR** i) Uses the formula $\pi r^2 h$ to find the volume of the tanker as 220 m^3, where $r = 1$ m and $h = 70$ m. Uses the formula lbh to find the volume of the cuboidal tank as 42 m^3, where $l = 7$ m, $b = 2$ m, and $h = 3$ m. Divides 220 m^3 by 42 m^3 to get 5.23. Writes that the tanker can supply water to 5 colonies. (Award full marks if student does not fully divide the numbers, but notices that the quotient is between 5 and 6, and uses that to conclude that 5 tanks can be completely filled.) ii) Uses formula $\frac{4}{3}\pi r^3$ to find the volume of one *matka* as 38,808 cm^3.	1 1.5 1.5 0.5 0.5 1 1 1

	Converts volume of one *matka* to m^3 as roughly 0.04 m^3. Finds volume of 400 *matkas* as roughly 16 m^3. Finds volume of 3 cuboidal tanks as $42 \times 3 = 126$ m^3. Finds the volume of water supplied by the tanker by adding (126 + 16) to get the answer as 142 m^3.	1 0.5 0.5
34	Writes that, in ΔPQR and ΔSTR, ∠PRQ = ∠SRT (common) ∠PQR = ∠STR (corresponding angles) _ _ _ _ _ _ _ _ (i) Uses the above step to conclude that by AA criterion of similarity of triangles, ΔPQR ~ ΔSTR. _ _ _ _ _ _ _ (ii) Finds the area of ΔPQR as $\frac{1}{2}\ b\ (H+h)$ square units. _ _ _ _ _ _ _ (iii) Finds the area of ΔSTR as $\frac{1}{2}\ aH$ square units. _ _ _ _ _ _ _ (iv) Finds the area of the trapezium PQTS as: $\frac{1}{2}\ b\ (H+h)$ - $\frac{1}{2}\ aH = \frac{1}{2}\ (b-a)H + \frac{1}{2}\ bh$ square units. _ _ _ _ _ _ _ (v) Uses step 2 to write the ratio of the sides as: $\frac{H+h}{H} = \frac{b}{a}$ $\Rightarrow H = \frac{ah}{b-a}$ _ _ _ _ _ _ _ (vi) Uses steps 5 and 6 to find the area of the trapezium PQTS as $\frac{1}{2}\ (a+b)h$ square units.	1 0.5 0.5 0.5 1 1 0.5
35	Constructs the frequency distribution table for male and female MPs as:	3.5

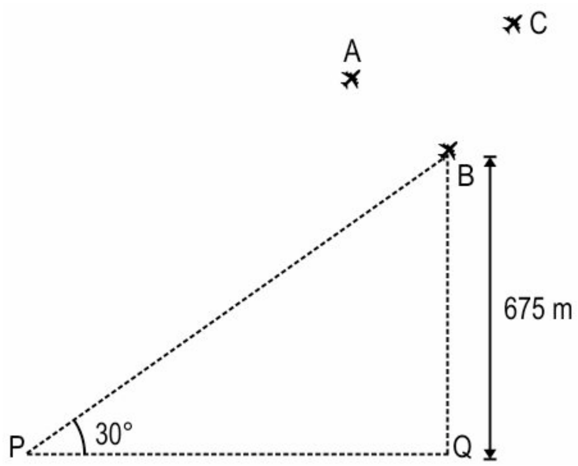
Age (in years)	Class Mark (x_i)	Number of female MPs (f_i)	$f_i x_i$	Number of male MPs (m_i)	$m_i x_i$
25 - 35	30	4	120	7	210
35 - 45	40	17	680	42	1680
45 - 55	50	24	1200	114	5700
55 - 65	60	20	1200	143	8580
65 - 75	70	12	840	125	8750
75 - 85	80	3	240	27	2160
85 - 95	90	0	0	10	900
Total		80	4280	468	27980

Q. no	Expected answer	Marks
	Finds the mean age of female MPs as $\frac{4280}{80} = 53.5$ years.	0.5
	Finds the mean age of male MPs as $\frac{27980}{468} = 59.8$ years.	0.5
	Uses the above two steps to find the average difference between male and female MPs as 59.8 - 53.5 = 6.3 years which rounds to 6 years.	0.5

SECTION E – Case-based questions of 4 marks each.

Q. no	Expected answer	Marks
36 i)	Finds the common difference between two sets of consecutive terms as: Second term - First term = 30915 - 27360 = 3555 Third term - Second term = 34470 - 30915 = 3555	0.5
	Concludes that the common difference is the same and hence the average monthly velocity forms an arithmetic progression.	0.5
36 ii)	Writes the expression for the sum of average monthly velocities of the first 10 months as $\frac{10}{2}$ $[(2 \times 27360) + (10 - 1)(3555)]$.	0.5
	Simplifies the above expression to find *p* as 433575 km/hour.	0.5
36 iii)	Assumes that the spacecraft passed Braille after *n* months and writes that the expression for the average monthly velocity when it passed Borelly as:	1

	$27360 + (n + 15 - 1)(3555)$ $= 27360 + (n - 1)(3555) + (15 \times 3555)$ (It is given that the velocity when it passed Braille is $27360 + (n - 1)(3555) = 55800$ km/hr.) Simplifies the above expression to find the average monthly velocity of the spacecraft when it passed Borelly as: $55800 + (15 \times 3555)$ $= 109125$ km/hour **OR** Assumes that the spacecraft passed Braille after *n* months and finds the *n*th term of the progression as: $27360 + (n - 1)(3555) = 55800$ Solves the above equation for *n* as 9 months.	1 1 1
37 i)	Identifies the coordinates of the green ball as (7, 1) and the nearest pocket P_4 as (9, 3). Uses the distance formula to calculate the distance as √8 or 2√2 units as follows: $\sqrt{(9-7)^2 - (3-1)^2} = \sqrt{8} = 2\sqrt{2}$ (Award full marks if any other method is used.)	0.5 0.5
37 ii)	Finds the coordinates of the yellow ball using the midpoint formula with $W(-3, -2)$ and $G(7, 1)$ to obtain $\left(2, \frac{-1}{2}\right)$ as follows: $\left(\frac{-3+7}{2}, \ \frac{-2+1}{2}\right)$	1
37 iii)	Considers the point where the ball struck the rail as (*c*, 3) and the coordinates of P_2 (other end point) as (2, -4). Finds *c* using the section formula as follows: $\left(\frac{2}{7}, 0\right) = \left(\frac{4 \times c + 3 \times 2}{4+3}, \frac{4 \times 3 + 3 \times (-4)}{4+3}\right)$ $\therefore \ \frac{4 \times c + 3 \times 2}{4+3} = \frac{2}{7}$ $c = -1$ Concludes that the point at which the ball struck the rail is (-1, 3).	0.5 1.5

	OR	
	Calculates the distance between the blue ball and red ball (BR) as $2\sqrt{5}$ units using the distance formula as follows: $BR = \sqrt{(-1-1)^2 + (-3-1)^2} = \sqrt{20} = 2\sqrt{5}$ units	0.5
	Calculates the distance between the red ball and P_5 (RP_5) as $\sqrt{5}$ units using the distance formula as follows: $RP_5 = \sqrt{(2-1)^2 + (3-1)^2} = \sqrt{5}$ units	0.5
	Calculates the distance between the blue ball and P_5 (BP_5) as $3\sqrt{5}$ units using the distance formula as follows: $BP_5 = \sqrt{(-1-2)^2 + (-3-3)^2} = \sqrt{45} = 3\sqrt{5}$ units	0.5
	Concludes that red ball will lie on the straight path between the blue ball and P_5 by proving that the three points are collinear as $BR + RP_5 = BP_5$. The working may look as follows: $BR + RP_5 = 2\sqrt{5} + \sqrt{5} = 3\sqrt{5} = BP_5$ (Award full marks if any other method is used.)	0.5
38 i)	Draws the required triangle as shown below, and labels BQ as 675 m.  *(Note: The figure is not to scale.)*	0.5
	Uses $\tan 30° = \frac{1}{\sqrt{3}} = \frac{BQ}{PQ}$ to find $PQ = 675\sqrt{3}$ m.	0.5
38 ii)	Draws required triangle as shown below.	0.5

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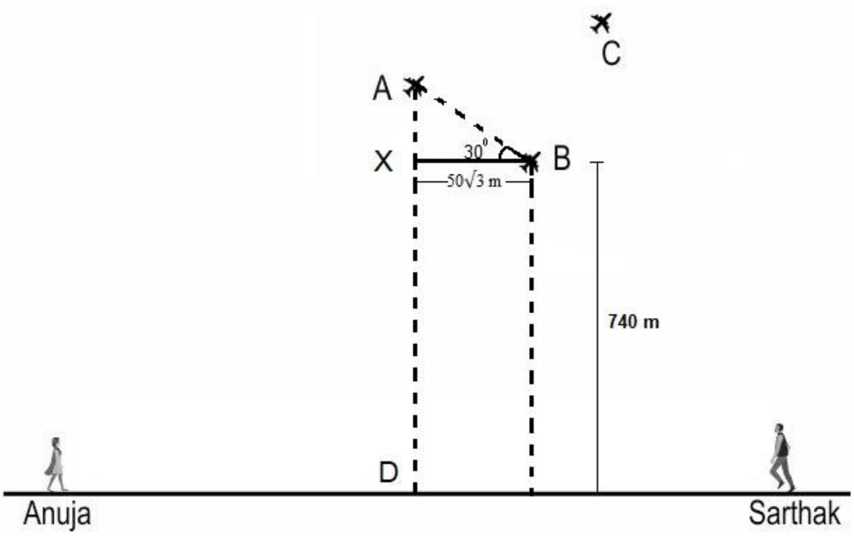
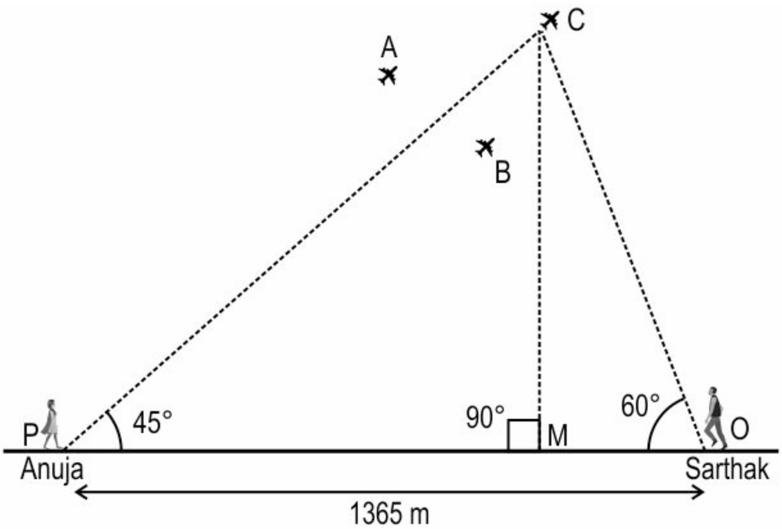


(Note: The figure is not to scale.)

Finds AX = BX tan 30° $= 50\sqrt{3} \times \frac{1}{\sqrt{3}} = 50$ m.

Finds the altitude of the plane as AX + XD = 740 + 50 = 790 m.

Draws the required triangles as shown below.



(Note: The figure is not to scale.)

Uses tan 45° $= 1 = \frac{\mathrm{CM}}{\mathrm{PM}}$ to get CM = PM.

Uses tan 60° $= \sqrt{3} = \frac{\mathrm{CM}}{\mathrm{MO}}$ to get CM = MO√3.

Finds the plane's horizontal distance from Sarthak using
PM + MO = 1365 m to get MO $= \frac{1365}{\sqrt{3}+1}$ m.

OR

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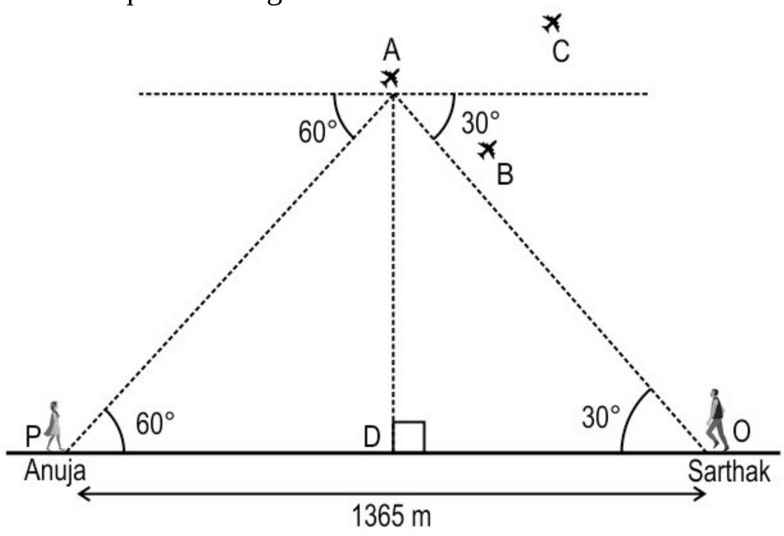
Draws required triangles as shown below.


(Note: The figure is not to scale.)

Uses $\tan 60° = \frac{\mathrm{AD}}{\mathrm{DP}} = \sqrt{3}$ to get $\mathrm{DP} = \frac{\mathrm{AD}}{\sqrt{3}}$.

Uses $\tan 30° = \frac{\mathrm{AD}}{\mathrm{DO}} = \frac{1}{\sqrt{3}}$ to get $\mathrm{DO} = \mathrm{AD}\sqrt{3}$.

Uses DP + DO = 1365 m to get $\frac{\mathrm{AD}}{\sqrt{3}} + \mathrm{AD}\sqrt{3} = 1365$.

Solves this to get the altitude of the plane, AD = 341.25√3 m.
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