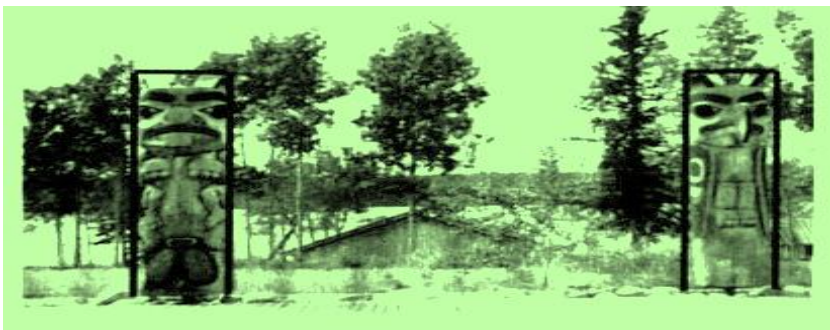
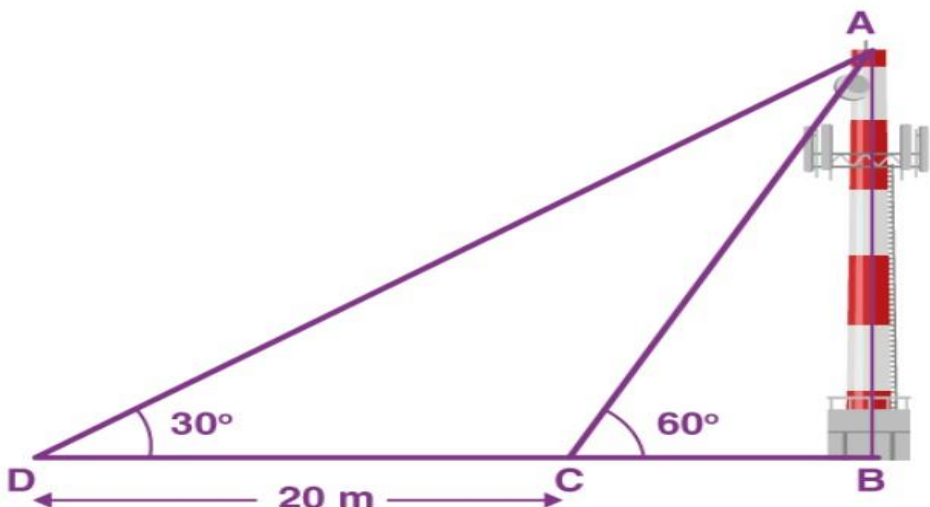
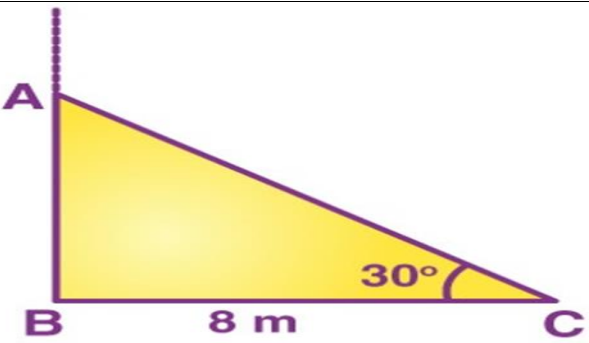
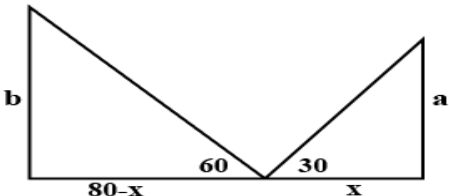
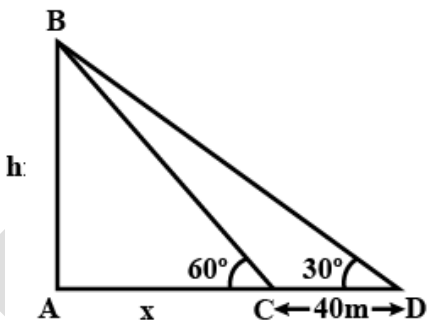


CHAPTER-9
APPLICATION OF TRIGONOMETRY
04 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	<p>In the given picture, two such poles of equal heights are standing 80m apart. From a point somewhere between them in the same line, the angles of elevation of the top of the two poles are 60° and 30° respectively.</p> <p>Based on the above, answer the following questions:</p> <p>(i) Draw a neat labelled diagram.</p>  <p>(ii) Find the height of the pole.</p> <p>(iii) Find the location of the point of observation.</p>	4
2.	The angle of elevation of a cloud from a point 60 m above a lake is 30° and the angle of depression of the reflection of cloud in the lake is 60° . Find the height of the cloud	4
3.	Two ships are there in the sea on either side of a light house in such a way that the ships and the light house are in the same straight line. The angles of depression of two ship as observed from the top of the light house are 60° and 45° . If the height of the light house is 200 m, find the distance between the two ships	4
4.	Two poles of equal heights are standing opposite to each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles.	4
5.	<p>A power plant chimney stands vertically in one corner part of a long building of a power plant factory. From the corner point on the other side of the building, directly opposite the chimney, the angle of elevation of the top of the chimney is 60°. From another point 20 m away from this point on the line joining this point to the foot of the chimney, the angle of elevation of the top of the chimney is 30° as shown in the figure. Find the height of the chimney and the width of the building.</p> 	4
6.	An advertising flashing lights vertical pole breaks due to a storm and the broken part bends so that the top of the pole touches the ground making an angle of 30° with the ground. The distance between the foot of the pole to the point where the top touches the ground is 8 m. Find the height of the advertising pole.	4

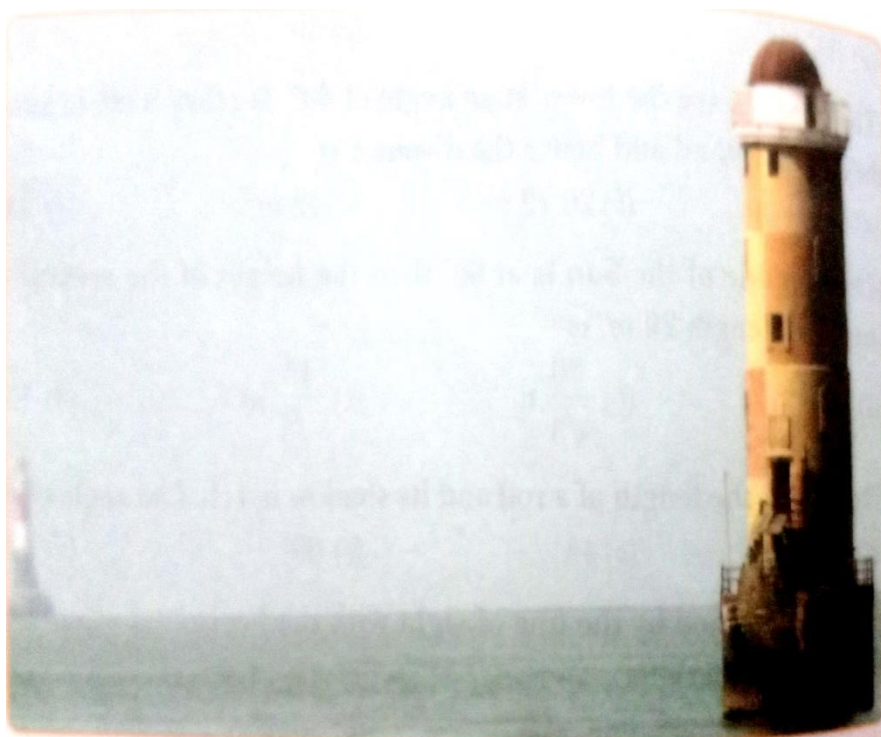
		
7.	<p>Two poles of equal heights are standing opposite to each other on either side of the road which is 80m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles.</p> 	4
8.	<p>A person standing on the bank of a river observes that the angle of elevation of the top of a tree standing on the opposite bank is 60°. When he moves 40 m away from the bank, he finds the angle of elevation to be 30°. Find the height of the tree and the width of the river.</p> 	4
9.	<p>A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath, is about 42 metres in height.</p>	4



- (i) What is the angle of elevation if they are standing at a distance of 42 m away from the monument?
- (ii) They want to see the tower at an angle of 60° . So they want to know the distance where they should stand and hence the distance is
- (iii) If the altitude of Sun is at 60° then the height of the vertical tower that will cast a shadow of length 20 m, is
- (iv) The ratio of length of a rod and its shadow is 1:1. The angle of elevation of the Sun is

10. A guard, stationed at the top of a 300 m tower, observed an unidentified boat coming towards it. A clinometer or inclinometer is an instrument used for measuring angles or slopes. The guard used the clinometer to measure the angle of depression of the boat coming towards the lighthouse and found it to be 30° .

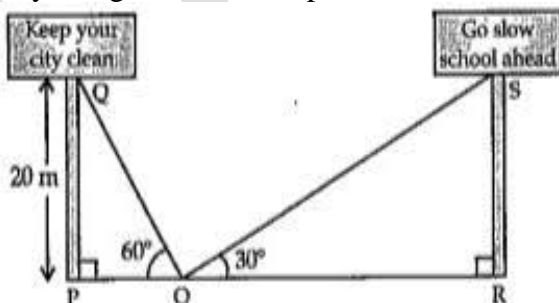
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- (i) Make a labelled figure on the basis of the given information and calculate the distance of the boat from the foot of the observation tower.
- (ii) After 10 minutes, the guard observed that the boat was approaching the tower and its distance from tower is reduced by $300(\sqrt{3} - 1)$ m. He immediately raised the alarm. What was the new angle of depression of the boat from the top of the observation tower?

11. Hoardings on the Road

Two hoardings are put on two poles of equal heights standing on either side of the road. From a point between them on the road the angle of elevation of the top of poles are 60° and 30° respectively. Height of the each pole is 20m



- (i) Find the length of PO
- (ii) Find the length of RO
- (iii) The width of the road is
- (iv) If the angle of elevation made by pole PQ is 45° , then the length of PO

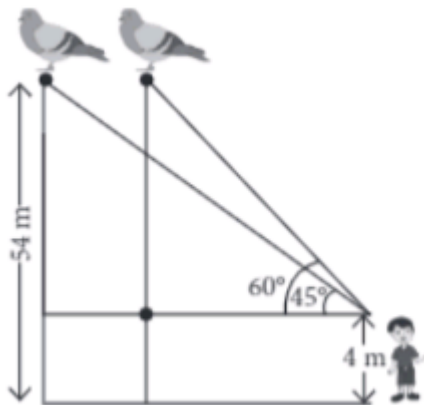
12. Flying pigeon

A boy 4m tall spots a pigeon sitting on the top of a pole of height 54m from the ground. The angle of elevation of the pigeon from the eyes of boy at any instant is 60° . The pigeon flies

4

4

away horizontally in such a way that it remained at a constant height from the ground. After 8 seconds, the angle of elevation of the pigeon from the same point is 45° (take $\sqrt{3}=1.73$)



- (i) Find the distance of first position of the pigeon from the eyes of the boy.
- (ii) Find the distance between the boy and the pole.
- (iii) How much distance the pigeon covers in 8 seconds?
- (iv) If the distance between the position of pigeon increases then the angle of elevation
 - a) Increases
 - b) decreases
 - c) remains unchanged
 - d) can't say

13. A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 138 feet (42 metres) in height.



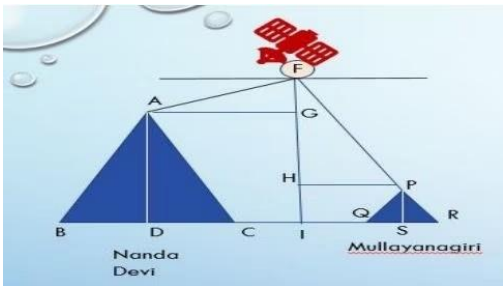
(i) What is the angle of elevation if they are standing at a distance of 42m away from the monument?

- a) 30°
- b) 45°
- c) 60°
- d) 0°

(ii) They want to see the tower at an angle of 60° . So, they want to know the distance where they should stand and hence find the distance.

- a) 25.24 m
- b) 20.12 m
- c) 42 m
- d) 24.64 m

(iii) If the altitude of the Sun is at 60° , then the height of the vertical tower that will cast a shadow of length 20 m is

	<p>a) $20\sqrt{3}$ m b) $20/\sqrt{3}$ m c) $15/\sqrt{3}$ m d) $15\sqrt{3}$ m</p> <p>(iv) The ratio of the length of a rod and its shadow is 1:1. The angle of elevation of the Sun is</p> <p>a) 30° b) 45° c) 60° d) 90°</p>	
14.	<p>20 A Satellite flying at height h is watching the top of the two tallest mountains in Uttarakhand and Karnataka, them being Nanda Devi(height 7,816m) and Mullayanagiri (height 1,930 m). The angles of depression from the satellite, to the top of Nanda Devi and Mullayanagiri are 30° and 60° respectively. If the distance between the peaks of the two mountains is 1937 km, and the satellite is vertically above the midpoint of the distance between the two mountains.</p>  <p>(i)The distance of the satellite from the top of Nanda Devi is</p> <p>a) 1139.4 km b) 577.52 km c) 1937 km d) 1025.36 km</p> <p>(ii)The distance of the satellite from the top of Mullayanagiri is</p> <p>a) 1139.4 km b) 577.52 km c) 1937 km d)1025.36 km</p> <p>(iii) The distance of the satellite from the ground is</p> <p>a) 1139.4 km b) 577.52 km c)1937 km d) 1025.36 km</p> <p>(iv) What is the angle of elevation if a man is standing at a distance of 7816m from Nanda Devi?</p> <p>a) 30° b) 45° c) 60° d) 0°</p>	
15.	<p>The Statue of Unity is a colossal statue of Indian statesman and independence activist Sardar Vallabh bhai Patel (1875–1950), who was the first Deputy Prime Minister and Home minister of independent India and the chief adherent of Mahatma Gandhi during the non-</p>	

violent Indian Independence movement. Patel was highly respected for his leadership in uniting the 562 princely states of India to form the single Union of India. It is located in the state of Gujarat, India. It is the world's tallest statue with a height of (597 ft) 182 metres. It is located on a river facing the Sardar Sarovar Dam on river Narmada in Kevadiya colony, 100 kilometres (62 mi) southeast of the city of Vadodara and 150 kilometres (93 mi) from Surat.



Question 1

Circle 'Yes' or 'No' for each of the following;

Can we find the height of statue from the distance 182m without any other information? Yes /No

Question 2

What information is required to find the height of statue if not given in the passage?

- A. Angle of elevation from a point on ground
- B. Distance of point of angle of elevation from the bottom of statue
- C. Both A & B
- D. Data insufficient

Question 3

Find the angle of elevation of top of the statue from a point on ground at 182 m .

Question 4

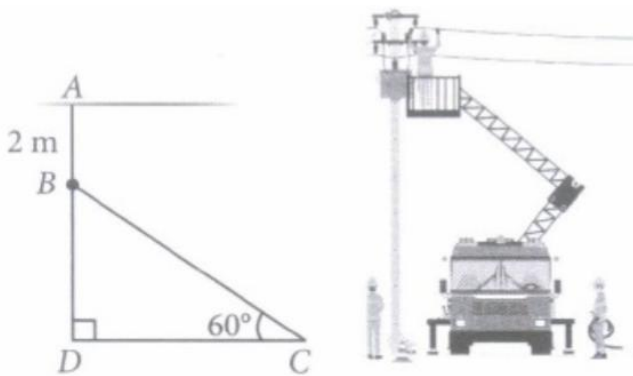
A person of height of 2 m makes an angle of 60° from the top of statue, then the distance of that person from the bottom of statue is :

- A. More than the height of statue

- B. Less than the height of statue
- C. Equal to the height of statue
- D. Can't say

16. An electrician has to repair an electric fault on the pole of height of 8 m. He

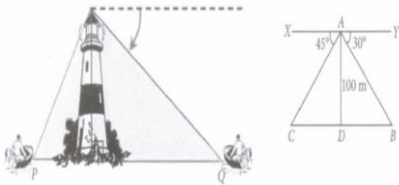
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needs to reach a point 2 m below the top of the pole to undertake the repair work.

Based on the above information, answer the following questions.

- (i) Length of BD is
a. 10 m (b) 6 m (c) 5 m (d) 4 m
- (ii) The distance between the foot of ladder and Pole is
(a) $6\sqrt{3}$ m
(b) $4\sqrt{3}$ m
(c) $2\sqrt{3}$ m
- (iii) What will be the Measure of angle BCD when BD and CD are equal?
(a) 30° (b) 45° (c) 60°
(d) 75°
- (iv) Find the measure of angle DBC
(a) 15°
(b) 60°
(c) 30°

	(d) 45°	
17.	 <p>A boy is standing on the top of light house. He observed that boat P and boat Q are approaching to light house from opposite directions. He finds that angle of depression of boat P is 45° and angle of depression of boat Q is 30°. He also knows that height of the light house is 100 m.</p> <p>Based on the above information, answer the following questions.</p> <p>(i) Measure of angle ACD is Equal to (a) 30° (b) 45° (c) 60° (d) 90°</p> <p>(ii) Length of CD is equal To (a) 90 m (b) 60 m (C) 100 m</p> <p>(iii) Length of BD is equal To (a) 50 m (b) 100 m (c) $100\sqrt{3}$ m</p> <p>(iv) Length of AC is equal To (a) $100\sqrt{2}$ m (b) $100\sqrt{3}$ m (C) 50 m</p>	4
18.	<p>Lakshaman Jhula is located 5 kilometres north-east of the city of Rishikesh in the Indian state of Uttarakhand. The bridge connects the villages of Tapovan to Jonk. Tapovan is in Tehri Garhwal district, on the west bank of the river, while Jonk is in Pauri Garhwal district, on the east bank. Lakshman Jhula is a pedestrian bridge also used by motorbikes. It is a landmark of Rishikesh. A group of Class X students visited Rishikesh in Uttarakhand on a trip. They observed from a point (P) on a river bridge that the angles of depression of opposite banks of the river are 60° and 30° respectively. The height of the bridge is about 18 meters from the river.</p>	4



Based on the above information answer the following questions.

i). Find the distance PA.

II. Find the distance PB

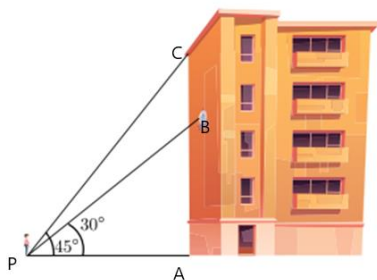
III. Find the width AB of the river.

IV) Find the height BQ if the angle of the elevation from P to Q be 30° .

19. Clinometer : A clinometer is a tool that is used to measure the angle of elevation, or angle from the ground, in a right - angled triangle. We can use a clinometer to measure the height of tall things that you can't possibly reach to the top of, flag poles, buildings, trees.



Ravish got a clinometer from school lab and started the measuring elevation angle in surrounding. He saw a building on which society logo is painted on wall of building.



From a point P on the ground level, the angle of elevation of the roof of the building is 45° . The angle of elevation of the centre of logo is 30° from same point. The point P is at a distance of 24 m from the base of the building.

- What is the height of the building logo from ground ?
- What is the height of the building from ground ?
- What is the aerial distance of the point P from the top of the building ?
- If the point of observation P is moved 9 m towards the base of the building, then find the angle of elevation θ of the logo on building ?

20. A bird is sitting on the top of a 80 m high tree. From a point on the ground, the angle of elevation of the bird is 45° . The bird flies away horizontally in such a way that it remained at a constant height from the ground. After 2 seconds, the angle of elevation of the bird from the same point is 30° . Find the speed of flying of the bird.

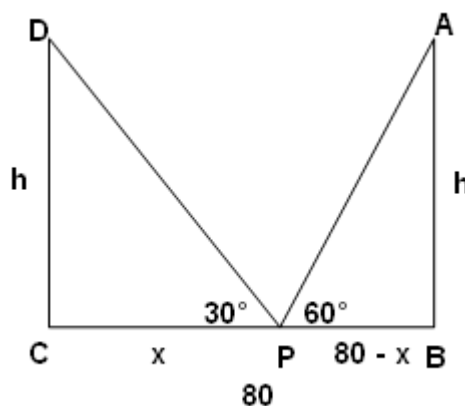
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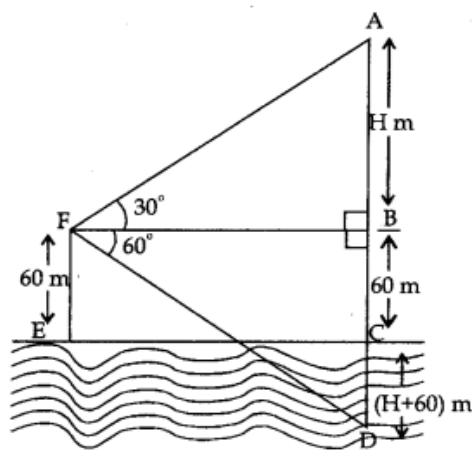
21.	The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60° . From a point Y, 40 m vertically above X, the angle of elevation of the top Q of tower is 45° . Find the height of the tower PQ and the distance PX.	4
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ANSWERS:

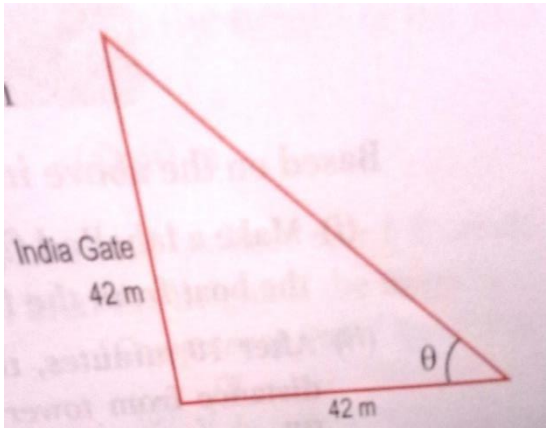
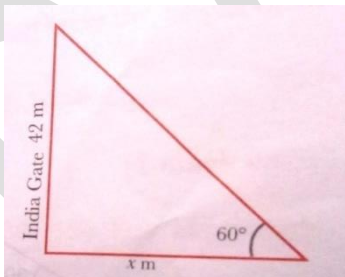
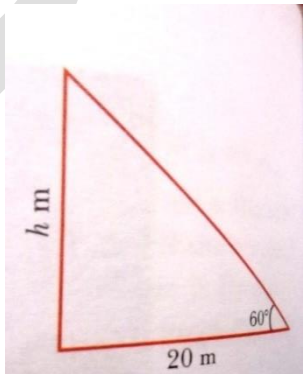
Q. NO	ANSWER	MARKS
1.	<p>Let AB and CD be the two poles of equal height and their heights be h m. BC be the 80 m wide road. P be any point on the road. Let CP be x m, therefore BP = (80 - x) .</p> <p>Also, $\angle APB = 60^\circ$ and $\angle DPC = 30^\circ$</p> <p>In right angled triangle DCP,</p> $\tan 30^\circ = \frac{CD}{CP} \Rightarrow \frac{h}{x} = \frac{1}{\sqrt{3}}$ $\Rightarrow h = \frac{x}{\sqrt{3}} \text{-----(1)}$ <p>In right angled triangle ABP,</p> $\tan 60^\circ = \frac{AB}{BP} \Rightarrow \frac{h}{80-x} = \sqrt{3}$ $\Rightarrow h = \sqrt{3}(80-x) \text{----- (2)}$ <p>From equation (1) and (2)</p> $\Rightarrow \frac{x}{\sqrt{3}} = \sqrt{3}(80-x) \Rightarrow x = 3(80-x) \Rightarrow x = 240 - 3x \Rightarrow x + 3x = 240 \Rightarrow 4x = 240 \Rightarrow x = 60$ <p>Height of the pole, $h = \frac{x}{\sqrt{3}} = \frac{60}{\sqrt{3}} = 20\sqrt{3}$.</p> <p>Thus, position of the point P is 60 m from C and height of each pole is $20\sqrt{3}$ m.</p>	

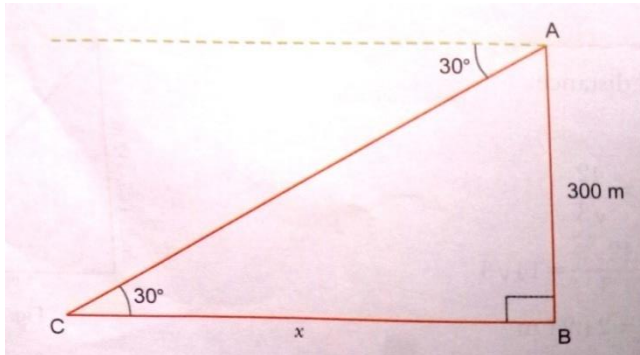


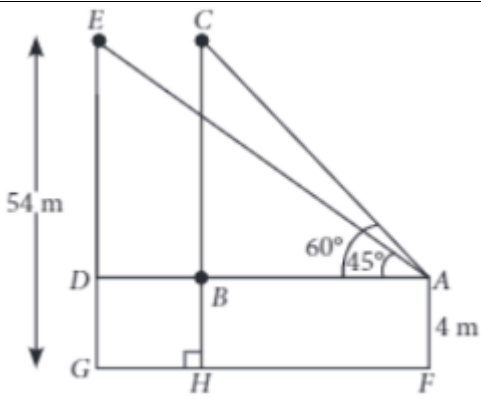
2.	<p>Let F be the point at height of 60 m from the surface of lake. The angle of elevation and depression are 30° and 60° respectively. Various arrangements are as shown in figure.</p> <p>According to law of reflection, $CD = AC = AB + BC = (H + 60)$ m $\therefore BD = BC + CD = (60 + H + 60)$ m $= (H + 120)$ m</p> $\frac{AB}{BF} = \tan 30^\circ \Rightarrow \frac{H}{BF} = \frac{1}{\sqrt{3}}$ $\Rightarrow BF = H\sqrt{3} \text{ ----- (1)}$ <p>In right $\triangle DBF$</p> $\frac{BD}{BF} = \tan 60^\circ \Rightarrow \frac{H+120}{BF} = \sqrt{3}$ $\frac{H+120}{\sqrt{3}} = BF \text{ ----- (2)}$ <p>From (1) and (2)</p> $H\sqrt{3} = \frac{H+120}{\sqrt{3}}$ <p>In right $\triangle DBF$,</p> <p>or $3H = H + 120$ or $2H = 120$ or $H = 120/2 = 60$ m Now, height of cloud = AC $= (H + 60)$ m $= (60 + 60)$ m $= 120$ m.</p>	
3.	315.33 m	4
4.	43.25 m	4
5.	<p>Given,</p> <p>AB is the height of the chimney.</p> <p>DC = 20 m (given)</p> <p>In right $\triangle ABD$,</p> $\tan 30^\circ = AB/BD$ $1/\sqrt{3} = AB/(20 + BC)$ $AB = (20 + BC)/\sqrt{3} \dots (i)$ <p>In right $\triangle ABC$,</p>	4



	<p>$\tan 60^\circ = AB/BC$</p> <p>$\sqrt{3} = AB/BC$</p> <p>$AB = \sqrt{3} BC \dots (ii)$</p> <p>From (i) and (ii),</p> <p>$\sqrt{3} BC = (20 + BC)/\sqrt{3}$</p> <p>$3 BC = 20 + BC$</p> <p>$2 BC = 20$</p> <p>$BC = 10$</p> <p>Substituting the value of BC in equation (ii),</p> <p>$AB = (20 + 10)/\sqrt{3} = 30/\sqrt{3} = 10\sqrt{3}$</p> <p>Therefore, the height of the chimney is $10\sqrt{3}$ m, and the width of the building is 10 m.</p>	
6.	<p>Using given instructions, draw a figure. Let AC be the broken part of the advertising pole. Angel C = 30 degrees.</p> <p>$BC = 8$ m</p> <p>To Find: Height of the pole, which is AB From figure: Total height of the pole is the sum of AB and AC i.e. AB+AC</p> <p>In right $\triangle ABC$,</p> <p>Using cosine and tangent of angles,</p> <p>$\cos 30^\circ = BC/AC$</p> <p>We know that, $\cos 30^\circ = \sqrt{3}/2$</p> <p>$\sqrt{3}/2 = 8/AC$</p> <p>$AC = 16/\sqrt{3} \dots (1)$</p> <p>Also,</p> <p>$\tan 30^\circ = AB/BC$</p> <p>$1/\sqrt{3} = AB/8$</p> <p>$AB = 8/\sqrt{3} \dots (2)$</p> <p>From (1) and (2),</p> <p>Total height of the advertising tower = $AB + AC = 16/\sqrt{3} + 8/\sqrt{3} = 24/\sqrt{3} = 8\sqrt{3}$ m.</p>	4

7.	60 meter	4
8.	34.6m , 20m	4
9.	<p>(i) Let θ be the angle of elevation. $\tan \theta = \frac{42}{42} = 1 = \tan 45^\circ$ $\theta = 45^\circ$</p>  <p>Angle of elevation is 45°.</p> <p>(ii) Let x m be the required distance. $\tan 60^\circ = \frac{42}{x}$</p>  $\sqrt{3} = \frac{42}{x}$ $x = \frac{42}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{42\sqrt{3}}{3} = 14\sqrt{3} = 14 \times 1.732 = 24.24 \text{ m}$ <p>(iii) Let h m be the height of the vertical tower. $\tan 60^\circ = \frac{h}{20}$</p>  $\sqrt{3} = \frac{h}{20}$ $h = 20\sqrt{3} \text{ m}$ <p>(iv) Let θ be the angle of elevation.</p>	

	$\tan \theta = \frac{1}{1} = 1 = \tan 45^\circ$ $\theta = 45^\circ$	
10.	<p>(i) In $\triangle ABC$, $\tan 30^\circ = \frac{300}{x}$</p>  <p>$x = 300\sqrt{3}$ m.</p> <p>(ii) Distance of boat from tower = $300\sqrt{3} - 300(\sqrt{3} - 1) = 300$ m Let the angle of depression = θ $\tan \theta = \frac{300}{300} = 1$ $\theta = 45^\circ$</p>	
11.	<p>(i) In $\triangle OPQ$ $\tan 60^\circ = \frac{PQ}{OP}$ $\sqrt{3} = \frac{20}{OP}$ $OP = \frac{20}{\sqrt{3}} \text{ m}$</p> <p>(ii) i) In $\triangle ORS$ $\tan 30^\circ = \frac{RS}{OR}$ $\frac{1}{\sqrt{3}} = \frac{20}{OR}$ $OR = 20\sqrt{3} \text{ m}$</p> <p>(iii) Width of the road = PR $PO + OR = \frac{20}{\sqrt{3}} + 20\sqrt{3} = \frac{80\sqrt{3}}{3} \text{ m}$</p> <p>(iv) In $\triangle OPQ$ if $\angle POQ = 45^\circ$ $\tan 45^\circ = \frac{PQ}{OP}$ $1 = \frac{20}{OP}$ $OP = 20 \text{ m}$</p>	4

12.	 <p>(i) Distance of first position of the pigeon from the eyes of boy = AC In $\triangle ABC$ $\sin 60^\circ = \frac{BC}{AC}$</p> $\frac{\sqrt{3}}{2} = \frac{CH - BH}{AC}$ $\frac{\sqrt{3}}{2} = \frac{54 - 4}{AC}$ $AC = \frac{100}{\sqrt{3}} \text{ m}$ <p>(ii) distance between boy and pole = AB</p> $\cos 60^\circ = \frac{AB}{AC}$ $\frac{1}{2} = \frac{AB \sqrt{3}}{100}$ $AB = \frac{50}{\sqrt{3}} \text{ m}$ <p>(iii) 4.3m (iv) b If the distance increases, then the angle of elevation decreases.</p>	4
13.	<p>(i)(b) 45° (ii)(a) 25.24 m (iii) (a) $20\sqrt{3}$ m (iv) (b) 45°</p>	4
14.	<p>(i)(a) 1139.4 km (ii)(c) 1937 km (iii) (b) 577.52 km (iv) (b) 45°</p>	4
15.	<p>1.No 2. C 3. Use tan , angle = 45° 4. Use tan $60^\circ = 180/x$, $x = 180/\sqrt{3}$,Ans B</p>	4
16.	<p>I - b II - c III - b IV - c</p>	4
17.	<p>I - b II - c III - c IV - a</p>	4
18.	<p>$\sin 60^\circ = \frac{PC}{PA}$</p>	4

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{18}{PA}$$

$$\Rightarrow PA = 12\sqrt{3} \text{ m}$$

$$\text{II) } \sin 30^\circ = \frac{PC}{PB}$$

$$\Rightarrow \frac{1}{2} = \frac{18}{PB}$$

$$\Rightarrow PB = 36 \text{ m}$$

$$\text{III) } \tan 60^\circ = \frac{PC}{PA}$$

$$\Rightarrow \sqrt{3} = \frac{PC}{AC}$$

$$\Rightarrow \sqrt{3} = \frac{18}{AC}$$

$$\Rightarrow AC = 6\sqrt{3} \text{ m}$$

$$\tan 30^\circ = \frac{PC}{CB}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{18}{CB}$$

$$\Rightarrow CB = 18\sqrt{3} \text{ m}$$

$$\text{Width AB} = AC + CB$$

$$= 6\sqrt{3} + 18\sqrt{3}$$

$$= 24\sqrt{3} \text{ m}$$

$$\text{IV) } RB = PC = 18 \text{ m and } PC = CB = 18\sqrt{3} \text{ m}$$

$$\tan 30^\circ = \frac{QR}{PR}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{QR}{18\sqrt{3}}$$

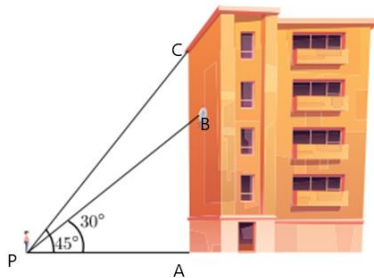
$$\Rightarrow QR = 18 \text{ m}$$

$$QB = QR + RB$$

$$= 18 + 18$$

$$= 36 \text{ m}$$

19.



i) The height of the building from the ground = AB

In $\triangle BAP$

$$\tan 30^\circ = \frac{BA}{PA}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{BA}{24}$$

$$\Rightarrow BA = 8\sqrt{3} \text{ m}$$

ii) The height of the building from the ground = CA

In $\triangle CAP$

$$\tan 45^\circ = \frac{CA}{PA}$$

$$\Rightarrow 1 = \frac{CA}{24}$$

4

	$\Rightarrow CA = 24 \text{ m}$ iii) The arial distance of point P from the top of the building = PC In ΔCAP $\cos 45^\circ = \frac{PA}{PC}$ $\Rightarrow \frac{1}{\sqrt{2}} = \frac{24}{PC}$ $\Rightarrow PC = 24\sqrt{2} \text{ m}$ iv) If the point of observation P is moved 9 m towards the base of the building then $PA = 24 - 9 = 15 \text{ m}$ In ΔBAP $\tan \theta = \frac{BA}{PA}$ $\Rightarrow \tan \theta = \frac{8\sqrt{3}}{15}$ $\Rightarrow \theta = \tan^{-1} \frac{8\sqrt{3}}{15}$	
20.	29.28 m/s	4
21.	54.6 m	4