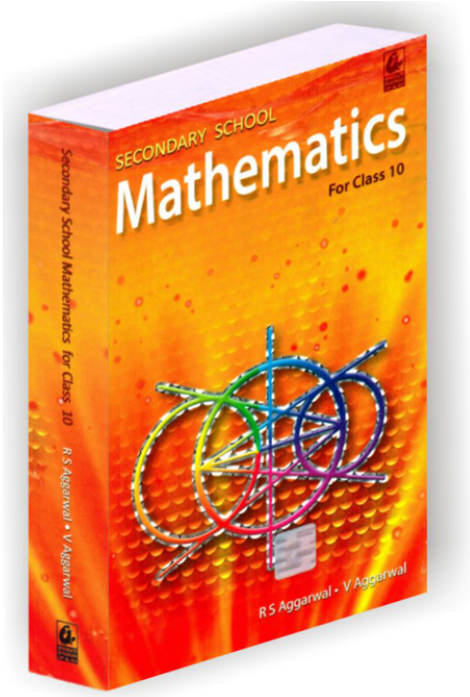
RS Aggarwal Solutions for Class 10 Maths Chapter 14–Height and Distance

Class 10 - Chapter 14 Height and Distance



For any clarifications or questions you can write to **info@indcareer.com**

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RS Aggarwal Solutions for Class 10 Maths Chapter 14–Height and Distance

Class 10: Maths Chapter 14 solutions. Complete Class 10 Maths Chapter 14 Notes.

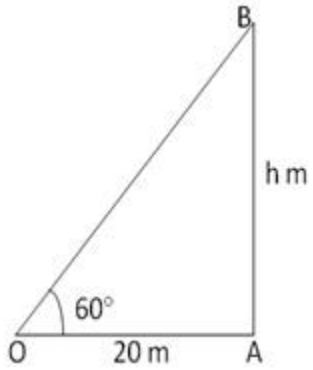
RS Aggarwal Solutions for Class 10 Maths Chapter 14–Height and Distance

RS Aggarwal 10th Maths Chapter 14, Class 10 Maths Chapter 14 solutions

Exercise 14

Question 1:

Let AB be the tower standing on a level ground and O be the position of the observer. Then OA = 20 m and ∠OAB = 90° and ∠AOB = 60°



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Let AB = h meters

From the right ΔOAB, we have

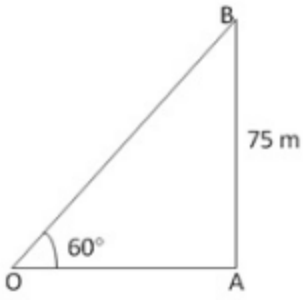
$$\frac{AB}{OA} = \tan 60^\circ = \sqrt{3}$$
$$\Rightarrow \frac{h}{20} = \sqrt{3}$$
$$\Rightarrow h = \left(20 \times \sqrt{3}\right)$$
$$\Rightarrow h = 20 \times 1.732$$
$$\Rightarrow h = 34.64m$$

Hence the height of the tower is 203–√m=34.64m

Question 2:

Let OB be the length of the string from the level of ground and O be the point of the observer, then, AB = 75m and ∠OAB = 90° and ∠AOB = 60°, let OB = l meters.

From the right ΔOAB, we have



$\frac{OB}{AB} = \text{cosec}60° = \frac{2}{\sqrt{3}}$

$\frac{l}{75} = \frac{2}{\sqrt{3}}$

$\Rightarrow l = \left(75 \times \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}\right)$

$\Rightarrow l = 25 \times 2 \times \sqrt{3}$

$\Rightarrow l = 50\sqrt{3}m$

$\Rightarrow l = 86.6m$

Hence, the length of the string 86.6 m

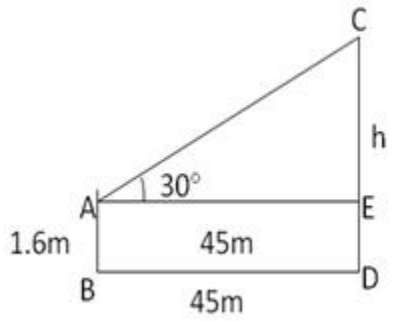
Question 3:

Let AB be the man,

AB= 1.6m, CD is the tower

AE CD, DE = AB

Let CE = h



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In ΔACE,

$\angle AEC = 90°,\ \angle CAE = 30°$

$\frac{CE}{AE} = \tan 30 \Rightarrow \frac{h}{45} = \sqrt{3}$

$\therefore h = \frac{45}{\sqrt{3}} m = \frac{45\sqrt{3}}{3} m$

$= 15\sqrt{3} m$

$= 15 \times 1.732$

$= 25.98 m$

Height of tower = DE + DC = (1.6 + 25.98)m = 27.58 m

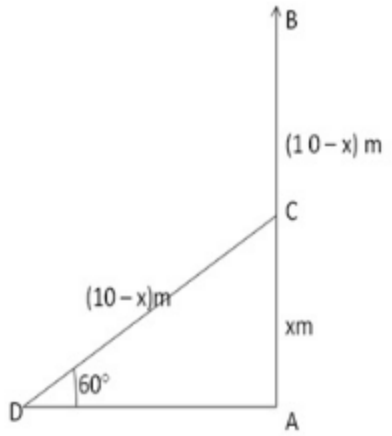
Question 4:

Let AB be the tree bent at the point C so that part CB takes the position CD, then CD = CB

Let AC = x meters

Then, CD = CB = (10 – x) m

and ∠ADC = 60°



$$\therefore \frac{AC}{CD} = \sin 60^\circ$$

$$\frac{x}{(10-x)} = \frac{\sqrt{3}}{2}$$

$$\Rightarrow 2x = 10\sqrt{3} - \sqrt{3}x$$

$$\Rightarrow x = \frac{10\sqrt{3}}{(2+\sqrt{3})} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} = (20\sqrt{3} - 30)\,m$$

$$\Rightarrow x = (20 \times 1.732 - 30)\,m = (34.64 - 30)\,m = 4.64m$$

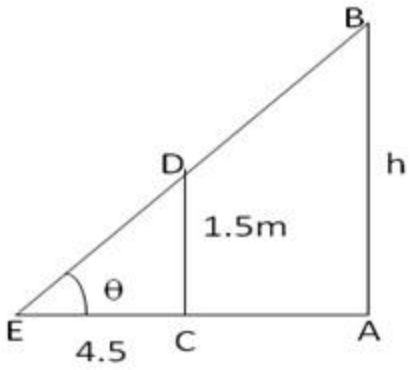
Hence, AC = 4.64m

Therefore, tree bent at the height of 4.64m from the bottom.

Question 5:

Let AB be the lamp post and CD be the boy, let CE be the shadow of CD

Let, $\angle AEB = \theta$



From right ΔECD, we get

From right ΔEAB, we get

$$\frac{AB}{EA} = \tan\theta$$
$$\Rightarrow \frac{h}{(4.5+3)} = \frac{1}{3}$$
$$\Rightarrow 3h = 7.5$$
$$\Rightarrow h = 2.5m$$

Hence, the height of the lamp post = 2.5 m

Question 6:

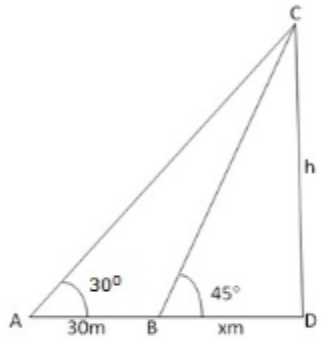
Let CD be the height of the building

Then, ∠CAB = 30°, ∠CBD = 45°,

∠ADC = 90° and AB = 30m

CD = h meters and BD = x meters

From right ΔCAD, we have



$$\frac{CD}{DA} = \tan 30^\circ = \frac{1}{\sqrt{3}}$$
$$\frac{h}{30+x} = \frac{1}{\sqrt{3}}$$
$$\Rightarrow 30 + x = h\sqrt{3}$$
$$x = (h\sqrt{3} - 30) \text{----(1)}$$

From right ΔBCD, we have

$$\frac{CD}{BD} = \tan 45^\circ$$
$$\Rightarrow \frac{h}{x} = 1$$
$$\Rightarrow h = x \text{---(2)}$$

From (1) and (2), we get

$$h\sqrt{3} - 30 = h \Rightarrow h\sqrt{3} - h = 30$$
$$\Rightarrow h = \frac{30}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)} = \frac{30\sqrt{3}+30}{3-1} = \frac{30(\sqrt{3}+1)}{2}$$
$$\Rightarrow h = 15(1.732+1) = 15 \times 2.732$$
$$\Rightarrow h = 40.98m$$

Putting h = 40.98m in (2), we get x = 40.98 m

Hence, height of building = 40.98m and

Distance of its base from the point A

= AB = (30+x) m

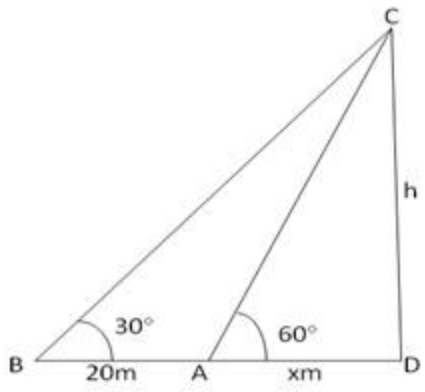
= (30+40.98) m = 70.98 m

Question 7:

Let CD be the tower and BD be the ground

Then, $\angle CBD = 30°$, $\angle CAD = 60°$

$\angle BDC = 90°$, AB = 20 m, CD = h metre and AD = x metre



From ΔBCD

$$\frac{CD}{BD} = \tan 30° = \frac{1}{\sqrt{3}}$$

$$\frac{h}{20+x} = \frac{1}{\sqrt{3}} \Rightarrow \sqrt{3}h = 20 + x$$

$$\Rightarrow \sqrt{3}h = 20 + x \Rightarrow x = \sqrt{3}h - 20 - - - - (1)$$

From right ΔCAD, we have

$$\frac{CD}{AD} = \tan 60^\circ$$
$$\Rightarrow \frac{h}{x} = \sqrt{3}$$
$$\Rightarrow h = \sqrt{3}x$$
$$\Rightarrow \frac{h}{\sqrt{3}} = x \text{----(2)}$$

from (1) & (2) we get

$$\sqrt{3}h - 20 = \frac{h}{\sqrt{3}}$$
$$\Rightarrow 3h - 20\sqrt{3} = h$$
$$\Rightarrow h = 10\sqrt{3} = 10 \times 1.732 = 17.32$$
$$BD = (20 + x)\,m = \left(20 + \frac{h}{\sqrt{3}}\right)m = 30\,m$$
$$\therefore \; h = 17.32\,m \text{ and } BD = 30\,m$$

Hence, the height of the tower = 17.32m and the distance of the tower from the point A = 30m.

Question 8:

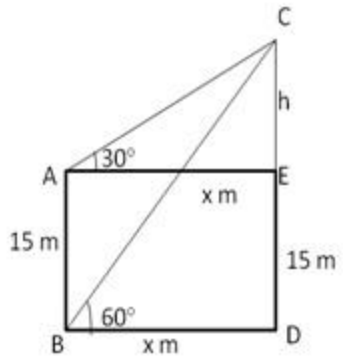
Let AB and CD be the building and the tower respectively.

AB = 15 m, AE ⊥ CD

ED = AB = 15 m

Let EC = h m

And BD = AE = x m



In CAE,

$\angle CAE = 30°$ and $\angle AEC = 90°$

$$\frac{CE}{AE} = \tan 30°$$
$$\Rightarrow \frac{h}{x} = \frac{1}{\sqrt{3}}$$
$$\therefore \sqrt{3}h = x \ldots.(1)$$

In CBD, $\angle CBD = 60°$ and $\angle CDB = 90°$

$$\therefore \frac{CD}{BD} = \tan 60° \Rightarrow \frac{h+15}{x} = \sqrt{3}$$
$$\text{or} \quad h + 15 = \sqrt{3}x \text{ - - - - - } (2)$$

Eliminating x from (1) and (2), we get

$h + 15 = \sqrt{3}(\sqrt{3})h = 3h$

$\Rightarrow 2h = 15 \quad \text{or} \quad h = 7.5$

From (1), $x = \sqrt{3}h = \sqrt{3} \times 7.5 = 12.99\,m$

Height of tower = CE + ED = (h + 15) m

= (7.5 + 15) m = 22.5m

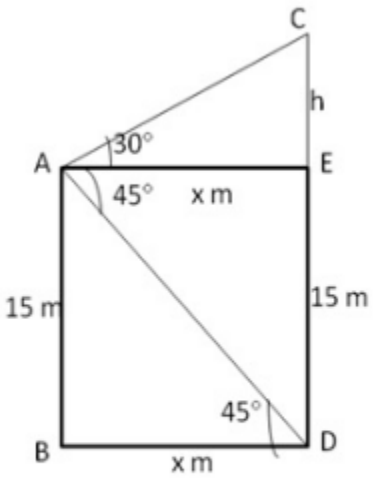
Hence, Height of the tower = 22.5 m and the distance between the tower and the building = 12.99 m

Question 9:

AB and CD are the two houses.

Window is at A.

In Δ ABD, ∠B = 90°, AB = 15m



$\frac{BD}{AB} = \cot 45° = 1$

$\therefore \quad BD = AB = 15\,m$

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AE is drawn perpendicular to CD

Therefore, AE = BD = 15 m

Let CE = h m

In Δ ACE,

∠CAE = 30°, ∠CEA = 90°

$$\therefore \frac{CE}{AE} = \tan 30^\circ$$
$$\Rightarrow \frac{h}{x} = \frac{1}{\sqrt{3}}$$
$$\therefore \sqrt{3}h = x = 15$$
$$\therefore h = \frac{15}{\sqrt{3}} = \frac{15\sqrt{3}}{3} = 5\sqrt{3} = 5 \times 1.732 = 8.66$$

Height of opposite house = CE + ED

= (h + 15) m = (8.66 + 15) m = 23.66 m

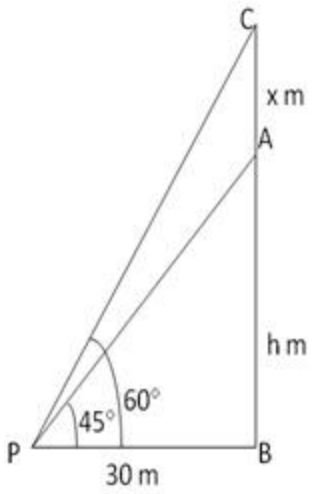
Hence proved.

Question 10:

Let AB be the tower with height = h m

AC = flag staff = x m

PB = 30 m



In Δ PBC,

$\angle CPB = 60^\circ$ and $\angle CBP = 90^\circ$

$$\frac{BC}{PB} = \tan 60^\circ$$
$$\frac{x+h}{30} = \sqrt{3}$$
$$\therefore x + h = 30\sqrt{3} \quad ----(1)$$

In ΔAPB,

$\angle APB = 45^\circ, \angle ABP = 90^\circ$

$$\frac{AB}{PB} = \tan 45^\circ$$
$$\frac{h}{30} = 1$$
$$\therefore h = 30 \quad ---(2)$$

Putting value of h in (1), we get

$x + 30 = 30\sqrt{3}$

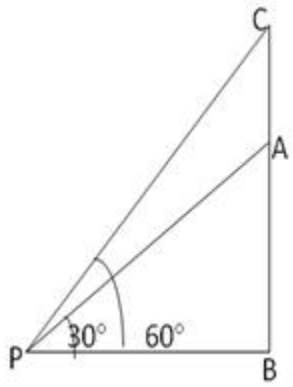
$\therefore x = 30\sqrt{3} - 30 = 30\left(\sqrt{3} - 1\right) = 21.96$

Thus, height of tower = 30m and height of flag staff = 21.96 m

Question 11:

Let AB be the tower h metre high. CA is the flag staff 5 meter high.

Let PB = x meter



In Δ PBC,

$\angle CPB = 60°$, $\angle PBC = 90°$

$\frac{BC}{PB} = \tan 60°$

$\frac{5+h}{x} = \sqrt{3}$

$\therefore 5 + h = \sqrt{3}x ----(1)$

In Δ APB,

∠APB = 30° and ∠ABP = 90°

$$\frac{AB}{PB} = \tan 30^\circ$$
$$\frac{h}{x} = \frac{1}{\sqrt{3}}$$
$$\therefore \sqrt{3}h = x$$

Putting value of x in (1), we get

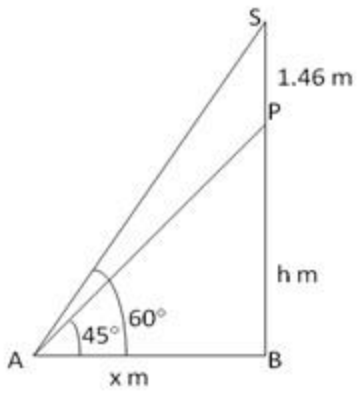
$$5 + h = \sqrt{3} \times \sqrt{3}h = 3h \quad \therefore 2h = 5$$
$$\text{or } h = \frac{5}{2}m = 2.5m$$

Thus, height of tower = 2.5m

Question 12:

Let SP be the statue and PB be the pedestal. Angles of elevation of S and P are 60° and 45° respectively.

Further suppose AB = x m, PB = h m



In right Δ ABS,

$$\frac{SB}{AB} = \tan 60^\circ = \sqrt{3}$$
$$\Rightarrow \frac{h + 1.46}{x} = \sqrt{3} ----(1)$$

In right Δ PAB,

$$\frac{PB}{AB} = \tan 45^\circ = 1$$
$$\therefore h = x ---(2)$$

Putting $x = h$ in (1)

$$\frac{h + 1.46}{h} = \sqrt{3} \Rightarrow h + 1.46 = \sqrt{3}h$$

$$\text{or } h\left(\sqrt{3} - 1\right) = 1.46 \quad \therefore h = \frac{1.46}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1}$$

$$\therefore \quad h = \frac{1.46}{2} \times \left(\sqrt{3} + 1\right) = 0.73 \times 2.732$$
$$= 2\,m\,(\text{nearly})$$

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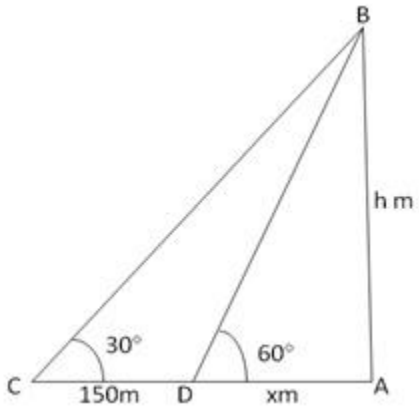
Thus, height of the pedestal = 2m

Question 13:

Let AB be the tower and let the angle of elevation of its top at C be 30°. Let D be a point at a distance 150 m from C such that the angle of elevation of the top of tower at D is 60°.

Let h m be the height of the tower and AD = x m



In Δ CAB, we have

$$\tan 30^\circ = \frac{AB}{AC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+150} \text{ -----(1)}$$

In ΔDAB, we have

$$\tan 60^\circ = \frac{AB}{AD} \Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow x = \frac{h}{\sqrt{3}} \text{ ---(2)}$$

Putting the $x = \frac{h}{\sqrt{3}}$ in (1), we get

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{\frac{h}{\sqrt{3}}+150} \Rightarrow \frac{1}{\sqrt{3}} = \frac{\sqrt{3}h}{h+150\sqrt{3}}$$

$$\Rightarrow h+150\sqrt{3} = 3h \Rightarrow 3h-h = 150\sqrt{3}$$

$$2h = 150\sqrt{3}$$

$$h = \frac{150}{2}\sqrt{3} = 75\sqrt{3}$$

$$h = (75\times 1.732)\text{m}$$

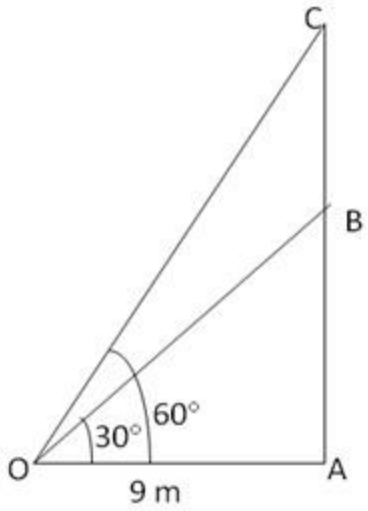
$$h = 129.9$$

Hence the height of tower is 129.9 m

Question 14:

Let AB be the tower and BC be flagpole, Let O be the point of observation.

Then, OA = 9 m, $\angle AOB = 30^\circ$ and $\angle AOC = 60^\circ$



From right angled Δ BOA

$$\frac{AB}{OA} = \tan 30°$$

$$\Rightarrow \frac{AB}{9} = \frac{1}{\sqrt{3}} \Rightarrow AB = 3\sqrt{3}$$

From right angled Δ OAC

$$\frac{AC}{OA} = \tan 60°$$

$$\frac{AC}{9} = \sqrt{3} \Rightarrow AC = 9\sqrt{3} \text{ m}$$

$$\therefore \quad BC = (AC - AB) = 6\sqrt{3} \text{ m}$$

Thus

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$AB = 3\sqrt{3}\,m = 5.196\,m$ and $BC = 6\sqrt{3}\,m = 10.392m$

Hence, height of the tower= 5.196 m and the height of the flagpole = 10.392 m

Question 15:

Let AB be the hill and let CD be the pillar. Draw DE AB, then, ∠ACB = 60° and ∠EDB = 30° and AB = 200 m

Height of the pillar = CD = 133.33 m

Distance of the pillar from the hill = ED = 2003√×3√3√ = 115.33m

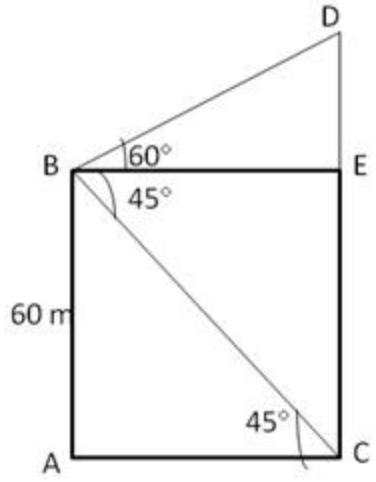
Question 16:

Let AB be the height of the window of house and CD be another house on the opposite side of the street AC

Then, AB = 60 m

Draw BE ⊥ CD and join BC

Then, ∠EBD = 60° and ∠ACB = ∠CBE = 45°



From right Δ CAB, we have

$$\frac{AC}{AB} = \cot 45° \Rightarrow \frac{AC}{60} = 1$$
$$\Rightarrow AC = 60\,m$$
$$\therefore BE = AC = 60m$$

From right Δ BED, we have

$$\frac{ED}{BE} = \tan 60°$$
$$\Rightarrow \frac{ED}{60} = \sqrt{3}$$
$$ED = 60\sqrt{3}m$$
$$\therefore CD = (CE + ED) = (AB + ED)$$
$$= \left(60 + 60\sqrt{3}\right)m$$
$$= 60\left(1 + \sqrt{3}\right)m$$

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Hence, the height of the opposite house is 60(1+3–√)

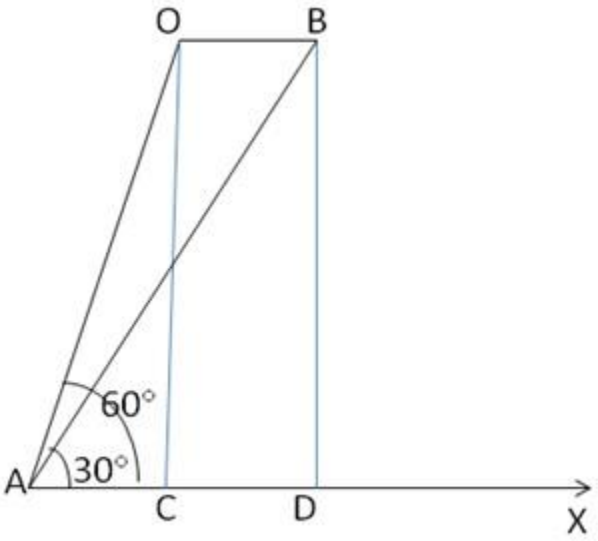
Question 17:

Let O and B the two positions of the jet plane and let A be the point of observation.

Let AX be the horizontal ground.

Draw OC ⊥ AX and BD ⊥ AX.

Then, ∠CAO = 60°, ∠DAB = 30° and OC = BD = 1500√3 m



From right Δ OCA, we have

$$\frac{AC}{OC} = \cot 60° = \frac{1}{\sqrt{3}}$$

$$\frac{AC}{1500\sqrt{3}} = \frac{1}{\sqrt{3}} \Rightarrow AC = 1500\,m \quad ---(1)$$

From right Δ ADB, we have

$$\frac{AD}{BD} = \cot 30^\circ = \sqrt{3}$$

$$\Rightarrow \frac{AD}{1500\sqrt{3}} = \sqrt{3} \Rightarrow AD = \left(1500\sqrt{3} \times \sqrt{3}\right) = 4500\,m$$

$$\therefore CD = (AD - AC) = (4500 - 1500)m = 3000\ m$$

$$\therefore \quad OB = CD = 3000\,m$$

Thus, the aeroplane covers 3000 m in 15 seconds

Hence the speed of the aeroplane is

$$= \left(\frac{3000}{15} \times \frac{60 \times 60}{1000}\right) kmph$$

$$= 720\,kmph$$

Question 18:

Let AB be the building and CD be the light house.

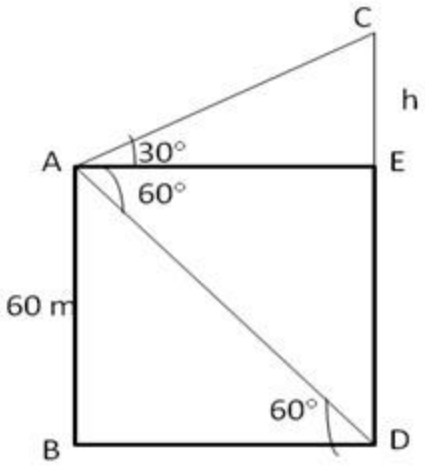
AE is drawn perpendicular to CD.

Now AB = 60 m

$\angle ADB = 60^\circ$, $\angle CAE = 30^\circ$

Let BD = x m

AE = BD = x m



In right Δ ACE, let CE = h

$$\therefore \frac{CE}{AE} = \tan 30°$$

$$\frac{h}{x} = \frac{1}{\sqrt{3}}$$

$$\therefore x = \sqrt{3}h \quad ----(1)$$

In right ΔABD,

$$\frac{AB}{BD} = \tan 60° \Rightarrow \frac{60}{x} = \sqrt{3}$$

$$\therefore x = \frac{60}{\sqrt{3}} = \frac{60\sqrt{3}}{3} = 20\sqrt{3}$$

$$= 20 \times 1.732 = 34.64 \text{m} \quad --(2)$$

From (1) and (2),

203–√=3–√h

h = 20 m

Hence,

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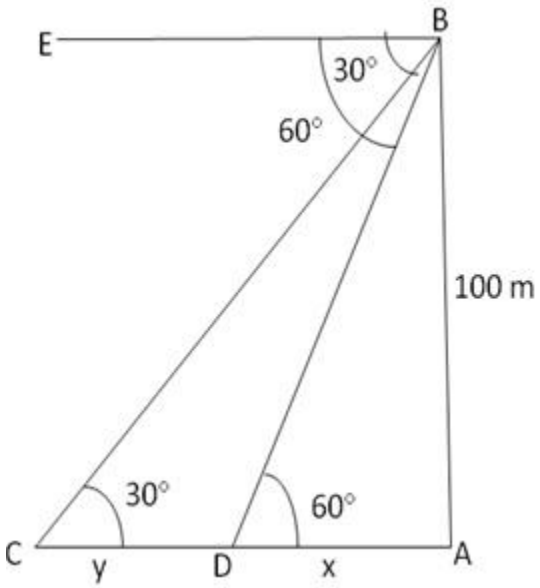
(i) Difference of heights of light house and building = 20m

(ii) The distance between light house and building = 34.64m

Question 19:

Let AB be the light house and let C and D be the positions of the ship.

Llet AD =x, CD = y



In Δ BDA,

$$\frac{x}{100} = \cot 60^\circ$$

$$x = \frac{100}{\sqrt{3}} m$$

Similarly in ΔBCA, $\frac{x+y}{100} = \cot 30^\circ$

$$\Rightarrow (x+y) = 100\sqrt{3} m$$

$$y = (x+y) - x$$

$$= \left(100\sqrt{3} - \frac{100}{\sqrt{3}}\right) m = \left(\frac{200}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}\right) m$$

$$= 115.46 m$$

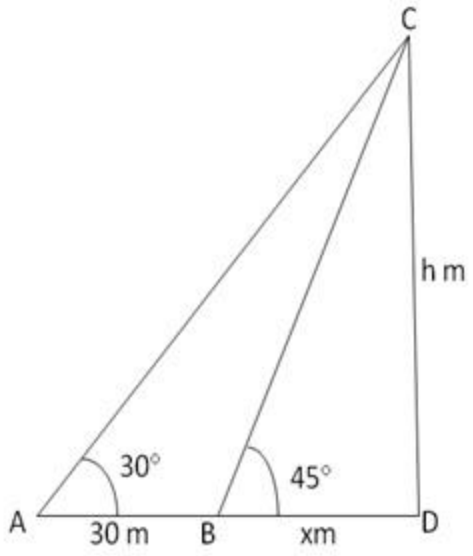
The distance travelled by the ship during the period of observation = 115.46 m

Question 20:

Let CD be the height of the building

Then, $\angle CAB = 30^\circ$, $\angle CBD = 45^\circ$, $\angle ADC = 90^\circ$ and AB = 30m

CD = h metres and BD = x metres.



From right Δ CAD, we have

$$\frac{CD}{DA} = \tan 30° = \frac{1}{\sqrt{3}}$$

$$\frac{h}{30+x} = \frac{1}{\sqrt{3}} \Rightarrow 30 + x = h\sqrt{3}$$

$$x = \left(h\sqrt{3} - 30\right)$$

From right Δ BCD, we have

$$\frac{CD}{BD} = \tan 45^\circ = 1 \Rightarrow \frac{h}{x} = 1 \Rightarrow h = x - - - (2)$$

from (1) & (2), we get

$$h\sqrt{3} - 30 = h \Rightarrow h\sqrt{3} - h = 30$$

$$\Rightarrow h = \frac{30}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)} = \frac{30\sqrt{3}+30}{3-1} = \frac{30(\sqrt{3}+1)}{2}$$

$$\Rightarrow h = 15(1.732+1) = 15 \times 2.732 = 40.98$$

Putting h = 40.98 in (2), we get x = 40.98 m

Hence height of building = 40.98 m and Distance of its base from the point

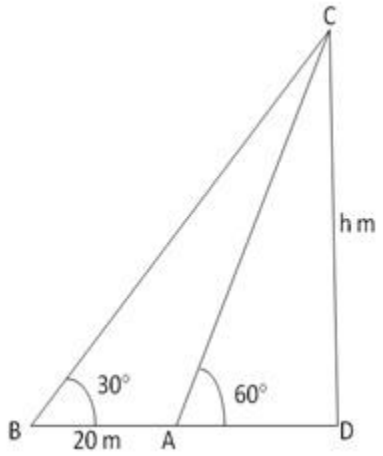
A = AB = (30 + x) m

= (30 + 40.98) m = 70.98 m

Question 21:

Let CD be a tree. Angle of elevation from A and B are 60° and 30° respectively.

Let AD = x m and CD = h m



In right Δ ACD,

$\frac{CD}{AD} = \tan 60°$

$\frac{h}{x} = \sqrt{3}$

$h = \sqrt{3}x - - - (1)$

In right ΔBCD,

$\frac{CD}{BD} = \tan 30°$

$\frac{h}{20+x} = \frac{1}{\sqrt{3}}$

$\therefore \sqrt{3}h = 20 + x - - - (2)$

Eliminating x from (1) & (2),

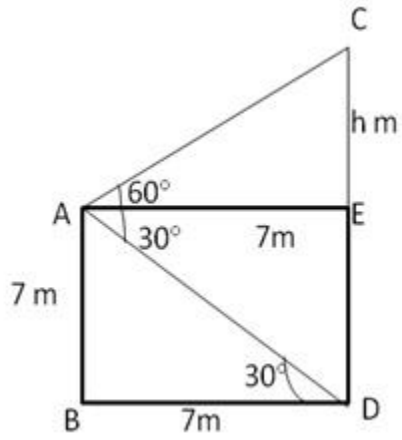
$\sqrt{3}h = 20 + \frac{h}{\sqrt{3}}$ or $3h = 20\sqrt{3} + h$

or $h = 10\sqrt{3} = 17.32$

Height of the tree = 17.32 m

Question 22:

Let AB be the building 7 meters high. AE ⊥ CD, where CD is the cable tower.



In Δ AED,

∠EAD = 30° = Angle of depression

$$\therefore \frac{AE}{ED} = \cot 30°$$
$$\Rightarrow \frac{x}{7} = \sqrt{3}$$
$$\therefore \quad x = 7\sqrt{3}\ m$$

In ΔACE,

∠CAE = 60° = Angle of elevation of C

∠AEC = 90°

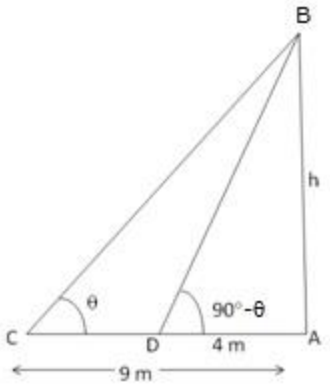
$$\therefore \frac{CE}{AE} = \tan 60°$$
$$\Rightarrow \frac{h}{x} = \sqrt{3}$$
$$\therefore h = \sqrt{3}x$$
$$h = \sqrt{3} \times 7\sqrt{3} = 21\ m$$

Height of the tower = CD = CE + ED = (21 + 7) m = 28 m

Question 23:

Let AB be the tower and let C and D be the two positions of the observer. Then, AC = 9 meters, and AD = 4 meters.

Let Δ ACB = θ



Then, $\angle ADB = (90° - \theta)$

Let AB = h meters

From right Δ CAB, we have

$$\frac{AB}{AC} = \tan\theta$$
$$\Rightarrow \frac{h}{9} = \tan\theta$$
$$\Rightarrow h = 9\tan\theta$$

From right Δ DAB, we have

$$\frac{AB}{AD} = \tan(90° - \theta) \Rightarrow \frac{h}{4} = \cot\theta$$
$$\Rightarrow \quad h = 4\cot\theta$$

from (1) & (2), we get

$$h^2 = 36 \Rightarrow h = 6$$

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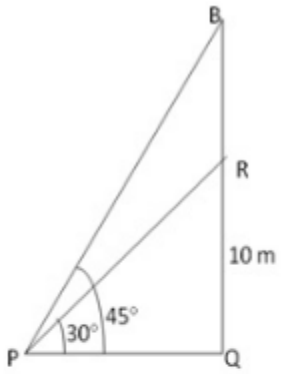
Hence, the height of tower is 6 meters.

Question 24:

Let P be the point of observation RQ is the building and BR is the flag staff of height h, $\angle BPQ = 45°$, $\angle RPQ = 30°$



$$\frac{PQ}{QR} = \cot 30° = \sqrt{3}$$

$$\frac{PQ}{10} = \sqrt{3}$$

$$\Rightarrow PQ = 10\sqrt{3}\ m ----(1)$$

from right ΔPBQ, we have

$$\frac{PQ}{QB} = \frac{PQ}{10+h} = \cot 45° = 1$$

$$PQ = 10 + h ----(2)$$

From (1) and (2), we have

$$10 + h = 10\sqrt{3}$$

$$h = 10\sqrt{3} - 10$$

$$= (10 \times 1.73 - 10)\ m$$

$$= (17.3 - 10) = 7.3m$$

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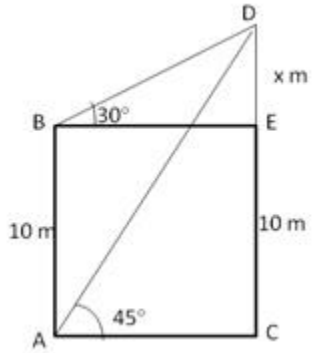
Hence distance of building is and length of the flags staff is 7.3 m

Question 25:

Let AB be the 10 m high building and let CD be the multi – storey building. Draw BE ⊥ CD

Then, ∠DBE = 30° and ∠DAC = 45°



Let ED = x meters

Then, $\frac{AC}{CD} = \cot 45°$

$\Rightarrow \frac{AC}{(10+x)} = 1$

$\Rightarrow AC = (10+x)m - - -(1)$

$\therefore BE = AC = (10+x)m$

In ΔBDE,

$\frac{DE}{BE} = \tan 30°$

$\Rightarrow \frac{x}{(10+x)} = \frac{1}{\sqrt{3}}$

$\Rightarrow \sqrt{3}x = 10 + x$

$\Rightarrow \quad x = \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = 5\left(\sqrt{3}+1\right) = 13.66$

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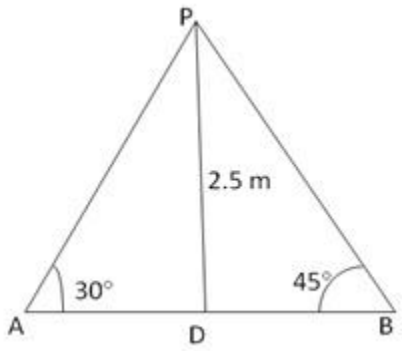
Height of the Multi – storey building = (10 + 13.66)m = 23.66 m

Distance between two building = (10 + 13.66) m = 23.66 m

Question 26:

Let A and B be two points on the bank on opposite sides of the river. Let P be a point on the bridge at a height of 2.5 m

Thus, DP = 2.5 m



Then, $\angle BAP = 30°$, $\angle ABP = 45°$ and PD = 2.5m

$$\frac{DB}{PD} = \cot 45° = \frac{DB}{2.5} = 1 \Rightarrow DB = 2.5\,m$$

$$\frac{AD}{PD} = \cot 30°$$

$$\frac{AD}{2.5} = \sqrt{3}$$

$$\Rightarrow AD = 2.5\sqrt{3}\,m$$

Height of the river = AB

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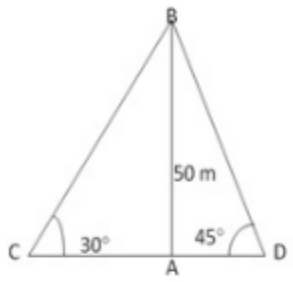
$= (AD + DB) = 2.5(\sqrt{3} + 1)\,m$

$= \frac{5}{2}(1.732 + 1)\,m = 6.83m$

Question 27:

Let AB be the tower. Let C and D be the positions of the two men.

Then, $\angle ACB = 30°$, $\angle ADB = 45°$ and AB = 50 m



$$\frac{AC}{AB} = \cot 30° = \sqrt{3}$$

$$\Rightarrow \frac{AC}{50} = \sqrt{3}$$

$$\Rightarrow AC = 50\sqrt{3}\ m$$

$$\frac{AD}{AB} = \cot 45° = 1$$

$$\Rightarrow \frac{AD}{50} = 1 \text{ or } AD = 50$$

Distance between the two man = CD = (AC + AD)

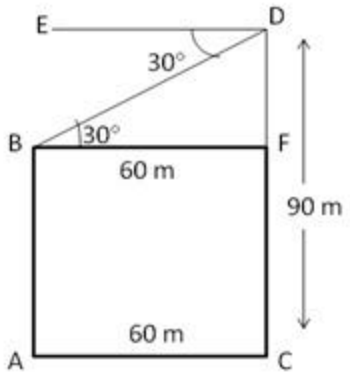
$= 50(\sqrt{3} + 1) = 136.6\,m$

Question 28:

Let AB and CD be the first and second towers respectively.

Then, CD = 90 m and AC = 60 m.

Let DE be the horizontal line through D.



Draw BF ⊥ CD,

Then, BF = AC = 60 m

∠FBD = ∠EDB = 30°

$$\text{Now, } \frac{FD}{BF} = \tan 30^\circ = \frac{FD}{60} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow FD = \left(60 \times \frac{1}{\sqrt{3}}\right) m = 20\sqrt{3}\, m$$

$$\therefore AB = FC = (CD - FD)$$

$$= \left(90 - 20\sqrt{3}\right) m = 55.36\, m$$

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He was born on January 2, 1946 in a village of Delhi. He graduated from Kirori Mal College, University of Delhi. After completing his M.Sc. in Mathematics in 1969, he joined N.A.S. College, Meerut, as a lecturer. In 1976, he was awarded a fellowship for 3 years and joined the University of Delhi for his Ph.D. Thereafter, he was promoted as a reader in N.A.S. College, Meerut. In 1999, he joined M.M.H. College, Ghaziabad, as a reader and took voluntary retirement in 2003. He has authored more than 75 titles ranging from Nursery to M. Sc. He has also written books for competitive examinations right from the clerical grade to the I.A.S. level.

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