HEIGHT & DISTANCE

1. Two vertical poles AB = 15 m and CD = 10 m are standing apart on a horizontal ground with points A and C on the ground. If P is the point of intersection of BC and AD, then the height of P (in m) above the line AC is :

(1) 20/3 (2) 5

(3) 10/3 (4) 6

2. The angle of elevation of a cloud C from a point P, 200 m above a still lake is 30º. If the angle of depression of the image of C in the lake from the point P is 60º, then PC (in m) is equal to :

(1) 400 (2) $400\sqrt{3}$

(3) 100 (4) $200\sqrt{3}$

3. The angle of elevation of the top of a hill from a point on the horizontal plane passing through the foot of the hill is found to be 45°. After walking a distance of 80 meters towards the top, up a slope inclined at an angle of 30° to the horizontal plane, the angle of elevation of the top of the hill becomes 75°. Then the height of the hill (in meters) is_.

4. The angle of elevation of the summit of a mountain from a point on the ground is 45°. After climding up one km towards the summit at an inclination of 30° from the ground, the angle of elevation of the summit is found to be 60°. Then the height (in km) of the summit from the ground is :

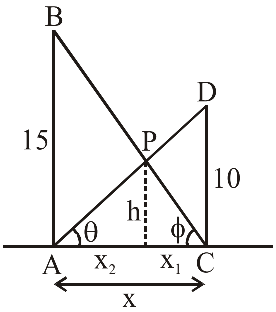
(1) $\frac{1}{\sqrt{3}-1}$ (2) $\frac{1}{\sqrt{3}+1}$

(3) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$ (4) $\frac{\sqrt{3}+1}{\sqrt{3}-1}$

SOLUTION

1. Official Ans. by NTA (4)

Sol.



$$\tan\theta = \frac{10}{x} = \frac{h}{x_2} \Rightarrow x_2 = \frac{hx}{10}$$

$$\tan\phi = \frac{15}{x} = \frac{h}{x_1} \Rightarrow x_1 = \frac{hx}{15}$$

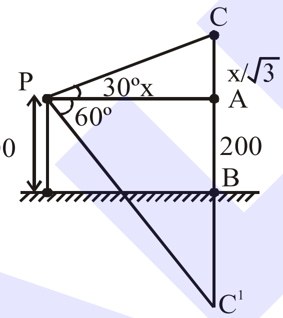
Now, $x_1 + x_2 = x = \frac{hx}{15} + \frac{hx}{10}$

$\Rightarrow 1 = \frac{h}{10} + \frac{h}{15} \quad \Rightarrow h = 6$

2. Official Ans. by NTA (1)

Sol. Let PA = x

For ΔAPC



$AC = \frac{PA}{\sqrt{3}} = \frac{x}{\sqrt{3}}$

$AC^1 = AB + BC^1$

$AC^1 = AB + BC$

$AC^1 = 400 + \frac{x}{\sqrt{3}}$

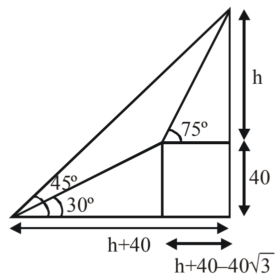
From ΔC^1PA : $AC^1 = \sqrt{3}\,PA$

$$\Rightarrow \left(400 + \frac{x}{\sqrt{3}}\right) = \sqrt{3}x \Rightarrow x = (200)(\sqrt{3})$$

from Δ APC : $PC = \frac{2x}{\sqrt{3}} \Rightarrow PC = 400$

3. Official Ans. by NTA (80.00)

Sol.



$$\tan 75^\circ = \frac{h}{h + 40 - 40\sqrt{3}}$$

$$\frac{2+\sqrt{3}}{1} = \frac{h}{h + 40 - 40\sqrt{3}}$$

$$\Rightarrow 2h + 80 - 80\sqrt{3} + \sqrt{3}h + 40\sqrt{3} - 120 = h$$

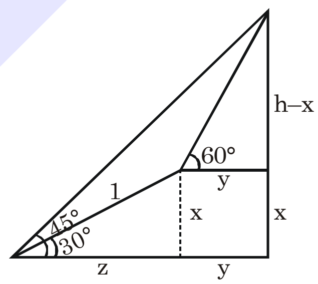
$$\Rightarrow h\left(\sqrt{3}+1\right) = 40 + 40\sqrt{3}$$

$$\Rightarrow h = 40$$

$\therefore$ Height of hill $= 40 + 40 = 80$m

4. Official Ans. by NTA (1)

Sol. $\sin 30^\circ = x \Rightarrow x = \frac{1}{2}$



$\cos 30^\circ = z \Rightarrow z = \frac{\sqrt{3}}{2}$

$\tan 45^\circ = \frac{h}{y+z} \Rightarrow h = y + z$

$\tan 60^\circ = \frac{h-x}{y} \Rightarrow \tan 60^\circ = \frac{h-x}{h-z}$

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

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

$$\Rightarrow \left(\sqrt{3}-1\right)h = \frac{3}{2} - \frac{1}{2}$$

$$\Rightarrow \left(\sqrt{3}-1\right)h = 1$$

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