## HEIGHT \& DISTANCE

1. Two vertical poles $\mathrm{AB}=15 \mathrm{~m}$ and $\mathrm{CD}=10$ m are standing apart on a horizontal ground with points A and C on the ground. If P is the point of intersection of $B C$ and $A D$, 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 $P, 200 \mathrm{~m}$ above a still lake is $30^{\circ}$. If the angle of depression of the image of C in the lake from the point P is $60^{\circ}$, then PC (in m ) is equal to :
(1) 400
(2) $400 \sqrt{3}$
(3) 100
(4) $200 \sqrt{3}$

## SOLUTION

1. Official Ans. by NTA (4)

Sol.

$\tan \theta=\frac{10}{\mathrm{x}}=\frac{\mathrm{h}}{\mathrm{x}_{2}} \Rightarrow \mathrm{x}_{2}=\frac{\mathrm{hx}}{10}$
$\tan \phi=\frac{15}{\mathrm{x}}=\frac{\mathrm{h}}{\mathrm{x}_{1}} \Rightarrow \mathrm{x}_{1}=\frac{\mathrm{hx}}{15}$
Now, $x_{1}+x_{2}=x=\frac{h x}{15}+\frac{h x}{10}$
$\Rightarrow 1=\frac{\mathrm{h}}{10}+\frac{\mathrm{h}}{15} \Rightarrow \mathrm{~h}=6$
2. Official Ans. by NTA (1)

Sol. Let $\mathrm{PA}=\mathrm{x}$
For $\triangle \mathrm{APC}$
$A C=\frac{P A}{\sqrt{3}}=\frac{x}{\sqrt{3}}$
$\mathrm{AC}^{1}=\mathrm{AB}+\mathrm{BC}^{1}$
$\mathrm{AC}^{1}=\mathrm{AB}+\mathrm{BC}$
$\mathrm{AC}^{1}=400+\frac{\mathrm{x}}{\sqrt{3}}$
From $\Delta \mathrm{C}^{1} \mathrm{PA}: \mathrm{AC}^{1}=\sqrt{3} \mathrm{PA}$
$\Rightarrow\left(400+\frac{x}{\sqrt{3}}\right)=\sqrt{3} x \Rightarrow x=(200)(\sqrt{3})$
from $\Delta \mathrm{APC}: \mathrm{PC}=\frac{2 \mathrm{x}}{\sqrt{3}} \Rightarrow \mathrm{PC}=400$
3. Official Ans. by NTA (80.00)

Sol.

$\tan 75^{\circ}=\frac{h}{h+40-40 \sqrt{3}}$
$\frac{2+\sqrt{3}}{1}=\frac{\mathrm{h}}{\mathrm{h}+40-40 \sqrt{3}}$
$\Rightarrow 2 \mathrm{~h}+80-80 \sqrt{3}+\sqrt{3} \mathrm{~h}+40 \sqrt{3}-120=\mathrm{h}$
$\Rightarrow \mathrm{h}(\sqrt{3}+1)=40+40 \sqrt{3}$
$\Rightarrow \mathrm{h}=40$
$\therefore$ Height of hill $=40+40=80 \mathrm{~m}$
4. Official Ans. by NTA (1)

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

$\cos 30^{\circ}=\mathrm{z} \Rightarrow \mathrm{z}=\frac{\sqrt{3}}{2}$
$\tan 45^{\circ}=\frac{h}{y+z} \Rightarrow h=y+z$
$\tan 60^{\circ}=\frac{\mathrm{h}-\mathrm{x}}{\mathrm{y}} \Rightarrow \tan 60^{\circ}=\frac{\mathrm{h}-\mathrm{x}}{\mathrm{h}-\mathrm{z}}$
$\sqrt{3}(\mathrm{~h}-\mathrm{z})=\mathrm{h}-\mathrm{x}$
$(\sqrt{3}-1) h=\sqrt{3} z-x$
$\Rightarrow(\sqrt{3}-1) \mathrm{h}=\frac{3}{2}-\frac{1}{2}$
$\Rightarrow(\sqrt{3}-1) \mathrm{h}=1$
$h=\frac{1}{\sqrt{3}-1}$

