Now, $\tan 45° = \frac{AE}{DE}$

i.e, $1 = \frac{AE}{28.5}$

Therefore, $AE = 28.5$

So the height of the chimney(AB)=$(28.5 + 1.5)m$

Example 4: From a point P on the ground, the angle of elevation of the top of a 10 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff and the distance of the building from the point P. (You may take $\sqrt{3} = 1.732$)

Solution: In Fig. 9.7, AB denotes the height of the building, BD the flagstaff, and P the given point. Note that there are two right triangles PAB and PAD. We are required to find the length of the flagstaff, i.e., DB and the distance of the building from the point P, i.e.,PA.

Since we know the height of the building AB, we will first consider the right $\triangle PAB$.

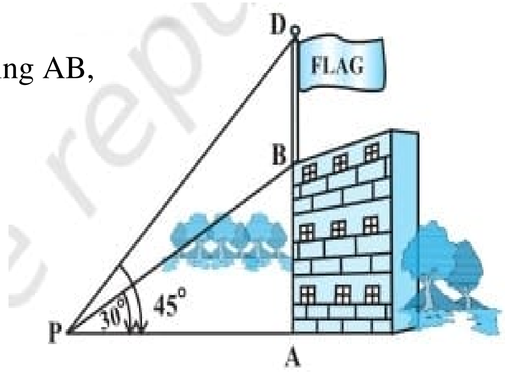

Fig. 9.8

We have $\tan 30° = \frac{AB}{AP}$

i.e, $\frac{1}{\sqrt{3}} = \frac{10}{AP}$

Therefore, $AP = 10\sqrt{3}$

i.e.,the distance of the building from P is $10\sqrt{3}m$ =$17.32m$.

Next, let us suppose $DB = xm$. Then AD = $(10 + x)m$.

Now,in right $\triangle PAD$, $\tan 45° = \frac{AD}{AP} = \frac{10+x}{10\sqrt{3}}$

Therefore, $1 = \frac{10+x}{10\sqrt{3}}$

i.e, $x = 10(\sqrt{3} - 1) = 7.32$

So,the length of the flagstaff is 7.32m.

Example 5 : The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it is 60°. Find the height of the tower.

Solution : In Fig. 9.8, AB is the tower and BC is the length of the shadow when the Sun's altitude is 60°, i.e., the angle of elevation of the top of the tower from the tip of the shadow is 60° and DB is the length of the shadow, when the angle of elevation is 30°.

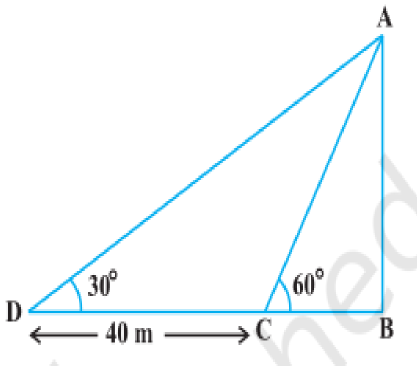

Fig. 9.8

Now, let AB be h m and BC be x m. According to the question, DB is 40 m longer than BC.

So, $DB = (40 + x)m$

Now,we have two right triangles ABC and ABD.

In $\triangle ABC$, $\tan 60° = \frac{AB}{BC}$

or, $\sqrt{3} = \frac{h}{x}$ (1)

In $\triangle ABD$, $\tan 30° = \frac{AB}{BC}$

i.e, $\frac{1}{\sqrt{3}} = \frac{h}{x+40}$ (2)

From (1),We have $h = x\sqrt{3}$

Putting this value in (2), we get $(x\sqrt{3})\sqrt{3} = x + 40, i.e., 3x = x + 40$

i.e, $x = 20$

So, $h = 20\sqrt{3}$ [From(1)]

Therefore, the height of the tower is$20\sqrt{3}m$.