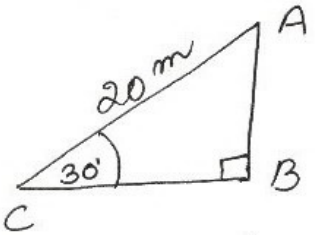
① 

let AB represents pole and AC wire.

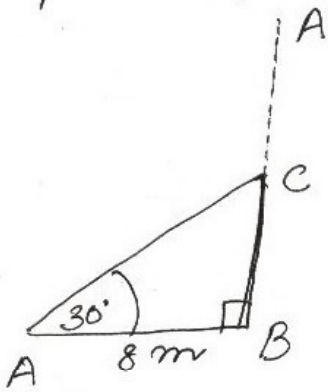
In rt △ CBA

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

$\frac{1}{2} = \frac{AB}{20}$ 10

$\Rightarrow AB = 10$

∴ reqd. height = 10 m

② 

let A'B represents unbroken tree

In rt △ ABC

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

$\frac{1}{\sqrt{3}} = \frac{BC}{8}$

$\Rightarrow BC = \frac{8}{\sqrt{3}} \quad \cdots (1)$

$\sin 30^\circ = \frac{BC}{AC}$

$\frac{1}{2} = \frac{8}{\sqrt{3}} \div AC$

$\Rightarrow AC = \frac{8}{\sqrt{3}} \times \frac{2}{1}$

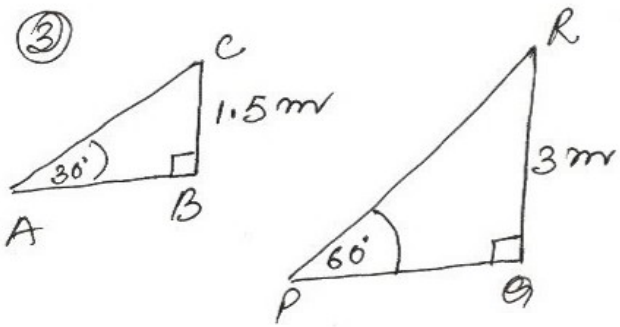
$\Rightarrow AC = \frac{16}{\sqrt{3}} \quad \cdots (11)$

height of tree

$= \frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}}$

$= \frac{24}{\sqrt{3}}$

$= 8\sqrt{3}$ m

③ 

In rt △ ABC

$\sin 30^\circ = \frac{BC}{AC}$

$\frac{1}{2} = \frac{1.5}{AC}$

$\Rightarrow AC = 3$

In rt △ PQR

$\sin 60^\circ = \frac{RQ}{PR}$

$\frac{\sqrt{3}}{2} = \frac{3}{PR}$

$PR = 2\sqrt{3}$

∴ lengths are 3 m, $2\sqrt{3}$ m