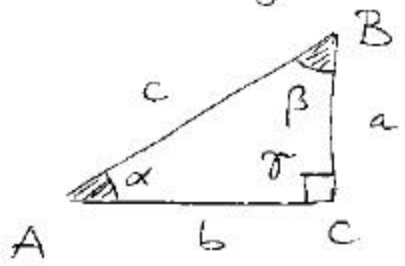
#5.7 Applied Problems

It is assumed that you know how to find trigonometric function values and angles by using either a calculator or results about special angles.



$\gamma^\circ = 90^\circ$ or $\frac{\pi}{2}$

* Ex: Solve the triangle ABC given that $\gamma = 90^\circ$ $a = 12.3$ and $b = 31.6$

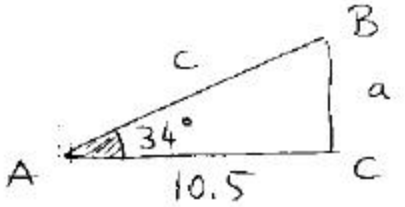
Ans: $\tan\alpha = \frac{a}{b} = \frac{12.3}{31.6} \Rightarrow \alpha = \tan^{-1}\left(\frac{12.3}{31.6}\right)$

$\Rightarrow \alpha \cong 21.3^\circ$ or $21^\circ 20'$

Thus $\beta = 90^\circ - \alpha = 68.7^\circ$

Finally $c = \sqrt{a^2+b^2} \cong 33.9$

* Ex: Solve $\overset{\frown}{ABC}$ given that $\alpha = 34^\circ$, $b = 10.5$



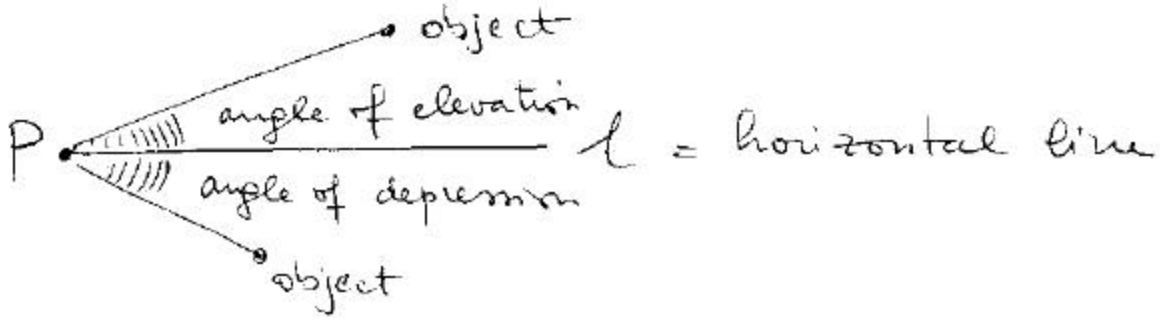
$\tan 34^\circ = \frac{a}{10.5}$

$\therefore a = 10.5 \tan 34^\circ \cong 7.1$

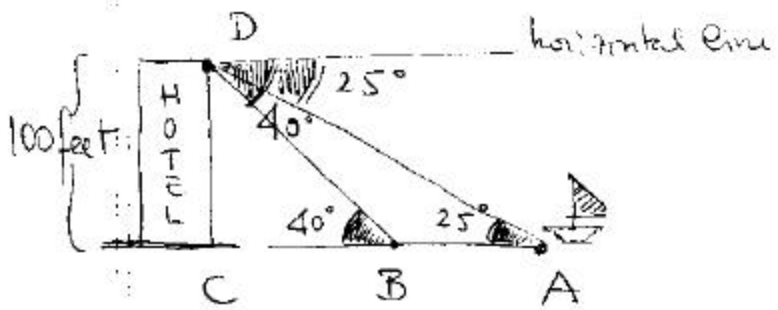
$c = \sqrt{a^2+b^2} \cong 12.7$ $\beta = 90^\circ - 34^\circ = 56^\circ$

If an observer at a point P sights an object then the angle that the line of sight makes with the horizontal line l is called

{ angle of elevation
or
angle of depression



* Ex:



An observer is at point D and C is the point 100 feet directly below. The observer watches a boat sailing directly toward the hotel and the angle of depression changes from 25° to 40° during the observation.

Approximate the distance "d" travelled by the boat.

$AB = d \qquad BC = k \qquad \Longrightarrow \qquad \overline{AC} = k + d$

Notice that $\tan 25^\circ = \frac{100}{k+d}$

$$\tan 40^\circ = \frac{100}{k}$$

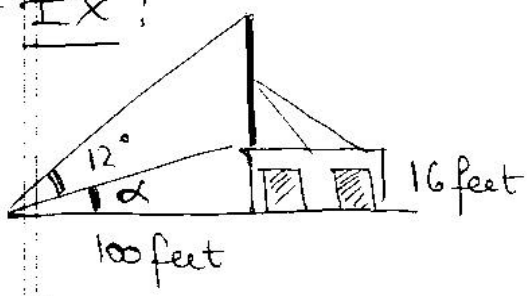
$$\therefore \quad k+d = \frac{100}{\tan 25^\circ} = 100 \cot 25^\circ$$

$$k = \frac{100}{\tan 40^\circ} = 100 \cot 40^\circ$$

$$\therefore \quad d = 100(\cot 25^\circ - \cot 40^\circ)$$

$$\downarrow \; 95 \text{ feet}$$

* Ex:



A CB antenna is located on the top of a garage that is 16 feet tall. From a point on level ground that is 100 feet from a point directly below the antenna, the antenna subtends an angle of 12°, as shown in the figure. Approximate the length of the antenna.

$\tan \alpha = 16/100 \rightsquigarrow \alpha = \tan^{-1}\left(\frac{16}{100}\right) \cong \ldots$

Thus $\tan(\alpha + 12^\circ) = \frac{h+16}{100}$ where h = height antenna

$\therefore \; h = 100 \tan(\alpha + 12^\circ) - 16 \cong 22.6$ feet.