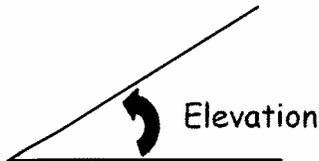


# Applications of Trigonometry

- When using trigonometry in the real-world, we must often interpret how a right angle triangle can be applied to a given situation.
- There are 2 common situations.

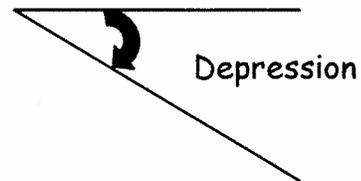
## Angles of Elevation

- Angle upwards from the horizontal

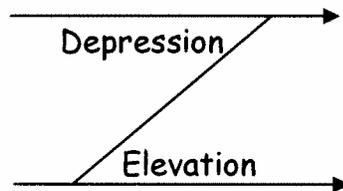


## Angles of Depression

- Angle downwards from the horizontal



- The angles of elevation and depression are related by the z-pattern, and are therefore equal.



Ex/ The angle of elevation of the sun is  $23^\circ$ . If a building is 76m tall, how long will its shadow be?

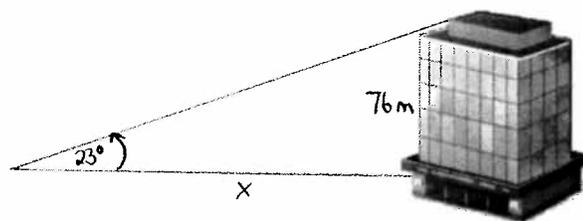
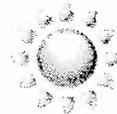
$$\tan 23 = \frac{76}{x}$$

$$x \tan 23 = 76$$

$$\tan 23$$

$$x = 179$$

$\therefore$  The shadow will be 179m long.



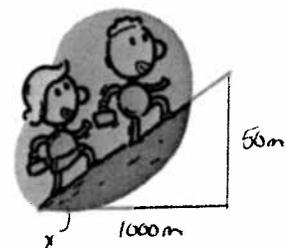
Ex/ A hill rises 50m for every 1000m of run. What is the slope angle (inclination) of the hill?

$$\tan x = \frac{50}{1000}$$

$$x = \tan^{-1} \left( \frac{50}{1000} \right)$$

$$= 2.86^\circ$$

$\therefore$  The hill has a slope angle of  $2.86^\circ$



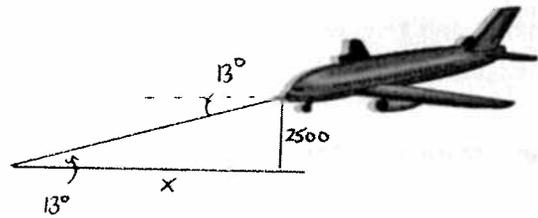
Ex/ A plane approaching a runway is at an elevation of 2500 feet. The plane is descending at an angle of  $13^\circ$ . How far is the plane horizontally from the airport?

$$\tan 13 = \frac{2500}{x}$$

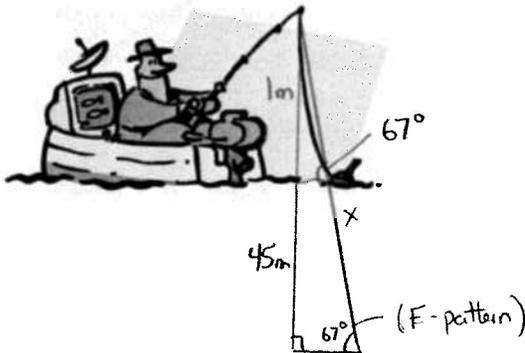
$$x \tan 13 = \frac{2500}{\tan 13}$$

$$x = 10828.689$$

$\therefore$  The plane is 10,800 feet from the airport.



Ex/ The tip of a fishing rod is 1 m above the water. The fish finder has identified fish at a depth of 45 m. How much line is needed to catch the fish if the line is at an angle of  $67^\circ$  to the surface?



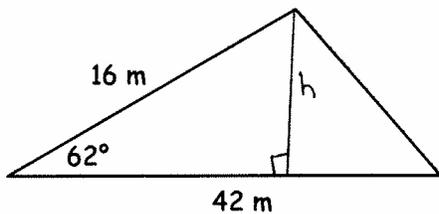
$$\sin 67 = \frac{46}{x} \quad \leftarrow \text{above/below water}$$

$$\frac{x \sin 67 = 46}{\sin 67}$$

$\therefore$  Will need 50m of line

$$x = 50.0 \text{ m}$$

Ex/ Determine the area of the triangle.



base and height must meet at a  $90^\circ$ .

$$\sin 62 = \frac{h}{16}$$

$$h = 16 \sin 62$$

$$= 14.127$$

$$A = \frac{bh}{2}$$

$$= \frac{42(14.127)}{2}$$

$$= 296.67 \text{ m}^2$$

$$= 297 \text{ m}^2$$

In general, the area of triangle is given by  $A = \frac{1}{2} ac \sin B$  where sides a and c contain angle B.

*faster!*  $\rightarrow$

$$A = \frac{1}{2} (16)(42) \sin 62$$

$$= 296.67$$