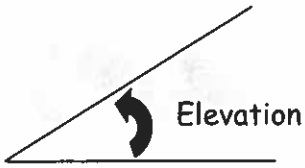
Real Word Problems with Triangles

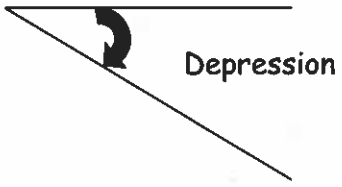
- When using trigonometry in the real-world, we must often interpret how a right-angle triangle can be applied to a given situation.

- There are 2 common situations.

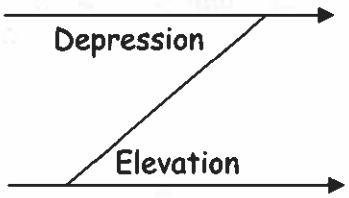
Angles of Elevation
- Angle upwards from the horizontal



Angles of Depression
- Angle downwards from the horizontal



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

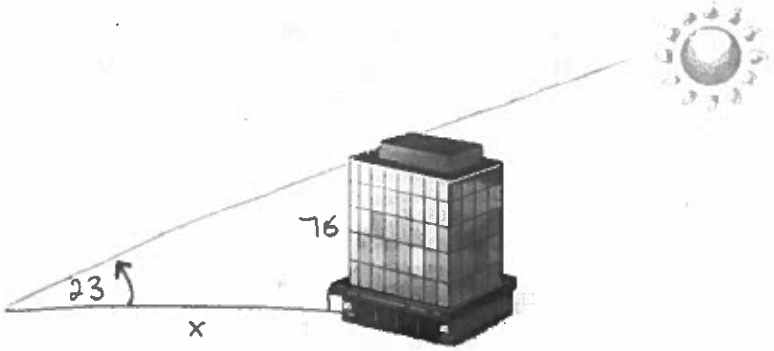


Ex/ The angle of elevation of the sun is 23°. If a building is 76 m tall, how long will its shadow be?

$\tan 23 = \frac{75}{x}$ multiply by x

$\frac{x \tan 23}{\tan 23} = \frac{75}{\tan 23}$

$x = 11.78$



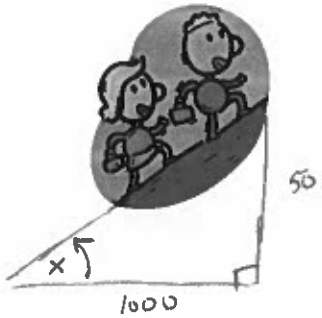
∴ The shadow is 11.78 m long

Ex/ A hill rises 50 m for every 1000 m of run. What is the angle of elevation of the hill?

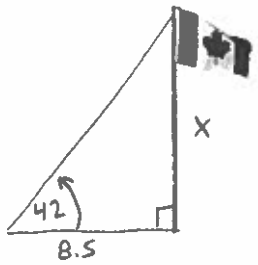
$\tan x = \frac{50}{1000}$

$x = \tan^{-1}(50/1000)$

$= 2.86°$



Ex/ From a point 8.5 m from the base of a flagpole, the angle of elevation to the top of the flagpole is 42°. Find the height of the flagpole.



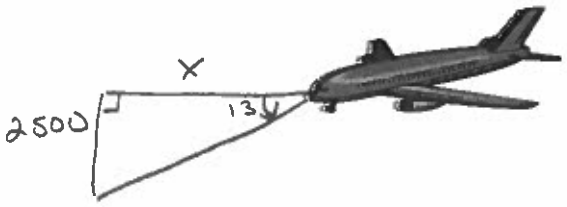
$\tan 42 = \frac{X}{8.5}$

$8.5 \tan 42 = X$

$7.65 = X$

∴ The flagpole is 7.65 m tall

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

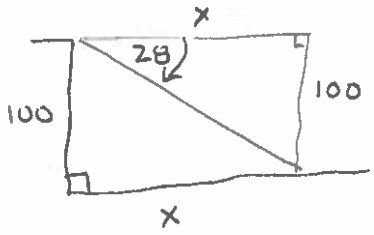


$\tan 13 = \frac{2500}{x}$

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

$x = 10,828.69$ ft

Ex/ From the top of a cliff that is 100 m high, a boat is spotted on the water below at an angle of depression of 28°. How far is the boat from the base of the cliff.



$\tan 28 = \frac{100}{x}$

$\frac{x \tan 28}{\tan 28} = \frac{100}{\tan 28}$

$x = 188.07$ m

Ex/ Two buildings are 38.0 m apart. From the top of the shorter building, the angle of elevation to the top of the taller building is 27° and the angle of depression to the base of the taller building is 35°. Determine the height of each building.

Two triangles

$\tan 27 = \frac{X}{38}$

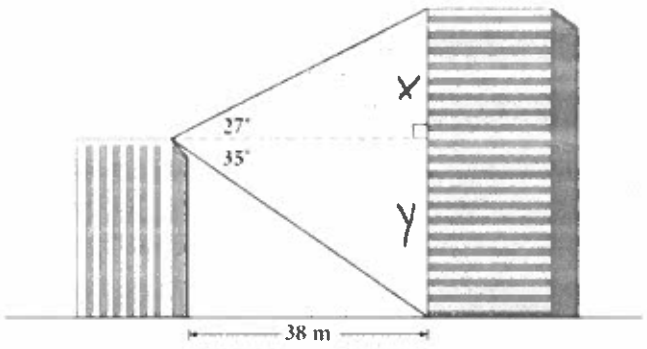
$38 \tan 27 = X$

$19.36 = X$

$\tan 35 = \frac{Y}{38}$

$38 \tan 35 = Y$

$26.61 = Y$



Short Building is 26.61 m

Tall Building is $26.61 + 19.36 = 45.97$ m

Practice: Handout - Elevation and Depression