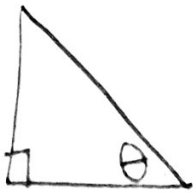
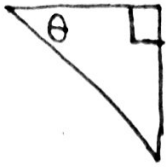
11.3 Application and Theorems

Angle of Elevation

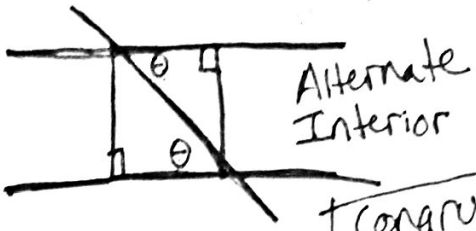


Angle of Depression

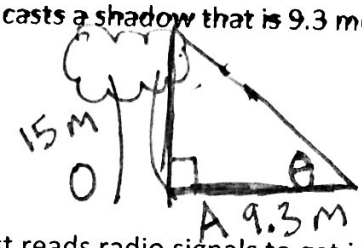


Angle of elevation/depression are basically the same thing.

Compared with Parallel Lines



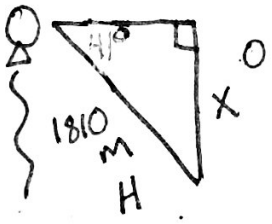
1) The height of a tree is 15 meters. To the nearest degree, what is the angle of elevation of the sun when the tree ~~casts a shadow that is~~ 9.3 meters long on ground level?



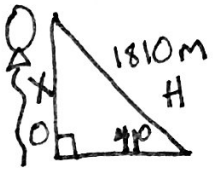
$\theta = \tan^{-1}\left(\frac{15}{9.3}\right)$

$\approx \boxed{58.20^\circ}$

2) A meteorologist reads radio signals to get information from a weather balloon. The last alert indicated that the angle of depression of the weather balloon to the meteorologist was 41° and the balloon was 1,810 meters away from his location on the diagonal. To the nearest meter, how high above the ground was the balloon?



or

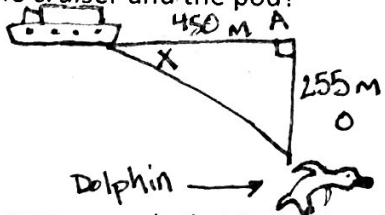


$1810 \cdot \sin 41 = \frac{x}{1810} \cdot 1810$

$x = 1810 \sin 41$

$\approx \boxed{1187.47 \text{ M}}$

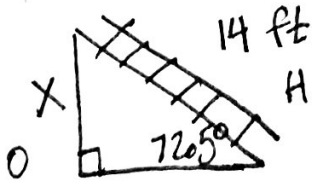
3) A sonar operator on ~~an anchored~~ cruiser detects a pod of dolphins feeding at a depth of about 255 meters directly below his ship. If the cruiser travels 450 meters west and the dolphins remain at the same depth to feed, ~~what is the~~ angle of depression, x, from the cruiser to the pod? What is the distance, y, between the cruiser and the pod?



$x = \tan^{-1}\left(\frac{255}{450}\right)$

$\approx \boxed{29.54^\circ}$

4) A ladder manufacturer recommends that its ladders be used on level ground at an angle of 72.5° to the horizontal. At that angle, how far up the side of a building will the top of a 14-foot ladder reach?



$14 \cdot \sin 72.5 = \frac{x}{14} \cdot 14$

$x = 14 \sin 72.5$

$\boxed{13.35 \text{ ft}}$

Theorems

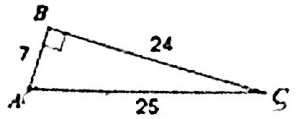
5) Identify each trig ratio.

a. $\cos(A) = \frac{7}{25}$ (C)

$\sin(B) = \frac{7}{25}$ (C)

$\cos(B) = \frac{24}{25}$ (A)

$\sin(B) = \frac{24}{25}$

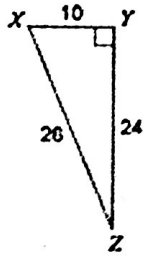


b. $\cos(X)$

$\sin(X)$

$\cos(Z)$

$\sin(Z)$



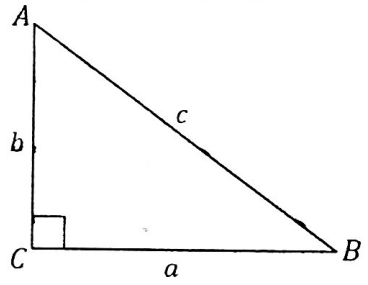
$\sin\theta = \cos(90-\theta)$	$\cos\theta = \sin(90-\theta)$

6) Find the equivalent sine or cosine.

a. $\cos(61)$ $\sin(90-61) = \sin(29)$

b. $\sin(75)$ $\cos(90-75) = \cos(15)$

c. $\sin(36)$ $\cos(54)$



$\sin(A) =$

$\cos(B) =$

$\tan(A) =$

Prove whether each statement is true or false.

$\sin(A) = \cos(90 - A)$

If needed, factor out sinx or cosx as GCF

ex: 7c

$\cos(A) = \sin(A)$

Pythagorean Identity

$\tan(A) = \frac{\sin(A)}{\cos(A)}$

If you ever see $\frac{\sin\theta}{\cos\theta}$, change it to $\tan\theta$

$\sin^2(A) + \cos^2(A) = 1$

$\sin^2\theta = 1 - \cos^2\theta$

$\cos^2\theta = 1 - \sin^2\theta$

* Anytime you see one of these, change it

7) Simplify the following.

a. $\frac{1-\cos^2 x}{\sin x} = \frac{\sin^2 x}{\sin x}$

$= \frac{\sin x \cdot \sin x}{\sin x} = \sin x$

b. $\frac{1-\cos^2 x}{1-\sin^2 x} = \frac{\sin^2\theta}{\cos^2\theta} = \tan^2\theta$

c. $\sin^3 x + \cos^2 x \cdot \sin x$

$\sin x(\sin^2 x + \cos^2 x)$

$\sin x(1) = \sin x$

d. $\frac{1-\cos^2 x}{\cos x} = \frac{\sin^2 x}{\cos x} = \frac{\sin x \cdot \sin x}{\cos x}$

$= \tan x \cdot \sin x$