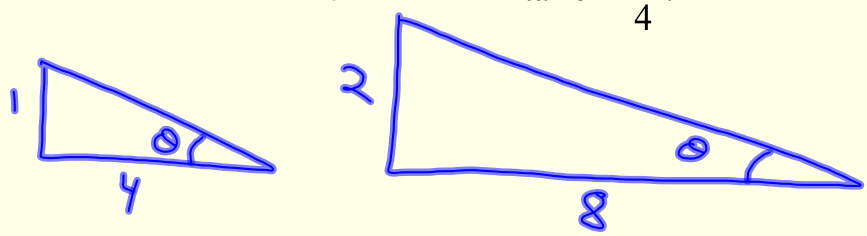
C2 - Trig Ratios (Part 2)

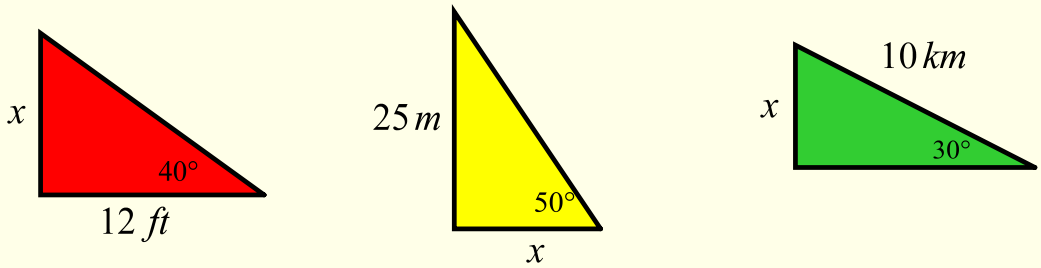
- ✓ Understand what the trig ratios sine, cosine and tangent represent.
- ✓ Use the trig ratios sine, cosine and tangent to determine an unknown side of a right triangle when given an angle and a side
- ✓ Use the trig ratios sine, cosine and tangent to determine an unknown angle of a right triangle when given two sides

Warm Up (Board Work)

1. Draw two different triangles that show $\tan\theta = \frac{1}{4}$.



2. Solve for the missing side in each triangle.

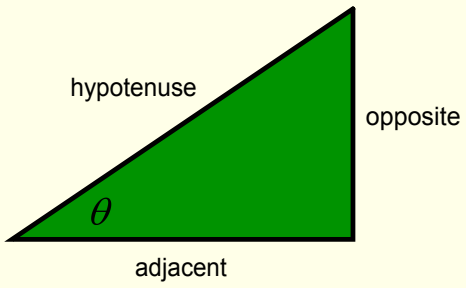


Primary Trig Ratios

We know that

$$\tan(\theta) = \frac{opposite}{adjacent}$$

tangent ratio



but what if we have other sides?

We also need:

$$\sin(\theta) = \frac{opposite}{hypotenuse}$$

sine ratio

$$\cos(\theta) = \frac{adjacent}{hypotenuse}$$

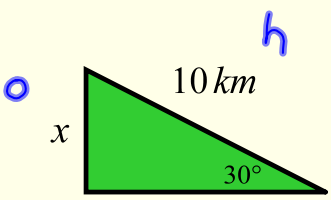
cosine ratio

To help remember these ratios:

use SohCahToa

Example

Determine the value of x.



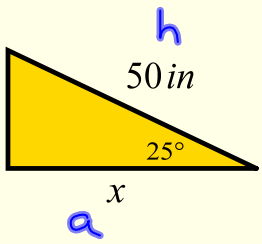
$$\sin 30^\circ = \frac{x}{10}$$

$$0.5 = \frac{x}{10}$$

$$x = 5\text{ km}$$

Practice

1. Determine the value of x.



$\cos 25° = \frac{x}{50}$

$0.91 = \frac{x}{50}$

$x = 45.3$ in

2. For each question draw two different triangles that show the given ratio.

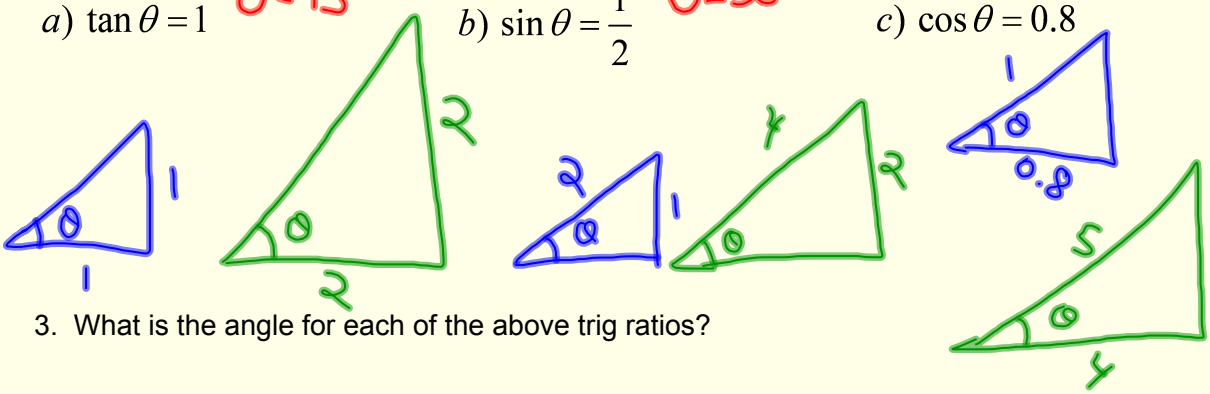
Trig Table

$\theta = 37°$

$a)\ \tan\theta = 1$ $\theta = 45°$

$b)\ \sin\theta = \frac{1}{2}$ $\theta = 30°$

$c)\ \cos\theta = 0.8$



3. What is the angle for each of the above trig ratios?

Trigonometry with a Calculator

You can think of your calculator as storing a massive trig table.

Ratios tangent of an angle gives the $\frac{opposite}{adjacent}$ ratio for the angle.

$$\tan(\theta) = \frac{opposite}{adjacent}$$

sine of an angle gives the $\frac{opposite}{hypotenuse}$ ratio for the angle.

$$\sin(\theta) = \frac{opposite}{hypotenuse}$$

cosine of an angle gives the $\frac{adjacent}{hypotenuse}$ ratio for the angle.

$$\cos(\theta) = \frac{adjacent}{hypotenuse}$$

Trigonometry with a Calculator

If you know a ratio you can find the angle by using the inverse trig function.

Angles

If you know the $\frac{opposite}{adjacent}$ ratio, then $\boxed{\tan^{-1}\left(\frac{opposite}{adjacent}\right) = angle}$

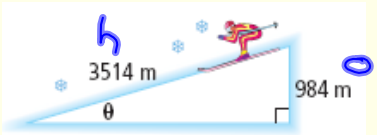
If you know the $\frac{opposite}{hypotenuse}$ ratio, then $\boxed{\sin^{-1}\left(\frac{opposite}{hypotenuse}\right) = angle}$

If you know the $\frac{adjacent}{hypotenuse}$ ratio, then $\boxed{\cos^{-1}\left(\frac{adjacent}{hypotenuse}\right) = angle}$

Example

In the World Cup Downhill held at Panorama Mountain Village in British Columbia, the skiers raced 3514 m down the mountain. If the vertical height of the course was 984 m, determine the average angle of the ski course with the ground. Express your answer to the nearest degree. MHR pg. 118

$\sin\theta = \frac{984}{3514}$



$\theta = \sin^{-1}\left(\frac{984}{3514}\right)$

$\theta = 16^\circ$

Example

A pilot starts his takeoff and climbs steadily at an angle of 12.2°. Determine the horizontal distance the plane has travelled when it has climbed 5.4 km along its fl ight path. Express your answer to the nearest tenth of a kilometre.

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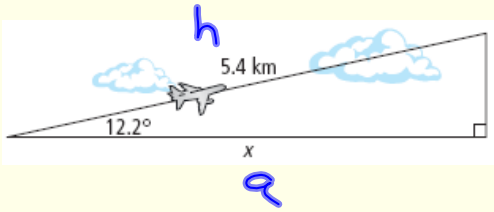

$$\cos 12.2° = \frac{x}{5.4}$$

$$0.977 = \frac{x}{5.4}$$

$$x = 5.3\text{km}$$

Practice

Text pg. 41: #4, 5, 8b
Text pg. 44: 1, 3, 7, 8, 9