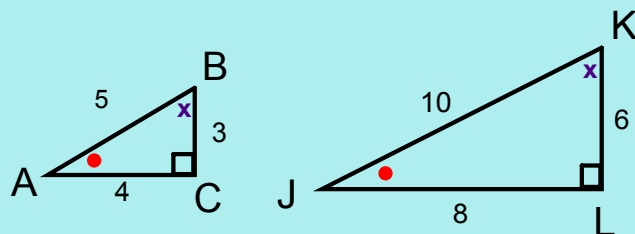


With similar triangles, the ratios of corresponding sides are equal, and corresponding angles are equal.

$$\triangle ABC \sim \triangle JKL$$



$$\frac{AB}{JK} = \frac{BC}{KL} = \frac{AC}{JL}$$

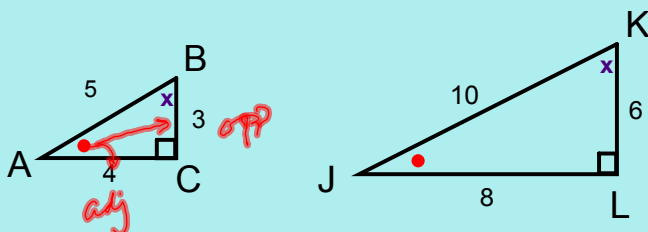
$$\angle A = \angle J$$

$$\angle B = \angle K$$

$$\angle C = \angle L$$

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With similar triangles, we work with ratios of sides between the different triangles.



What happens when we calculate ratios for sides within each triangle?

For example:  $\frac{BC}{AC} = \frac{3}{4} = 0.75$        $\frac{KL}{JL} = \frac{6}{8} = 0.75$

In right-triangles, the ratios of sides are related to the angles. When matching ratios are equal, the angles are equal.

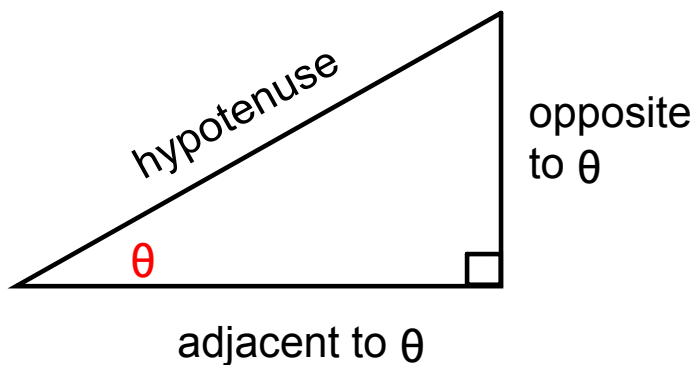
Dec 7-9:08 PM

Ratios in Right-Triangles

May 12/2011

To be consistent when finding ratios for a right-triangle, the sides have to be identified with respect to the angle of interest (**never the 90° angle**).

$\theta$  is the Greek letter "theta"



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For any angle of interest, there are three (3) primary trigonometric ratios.

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

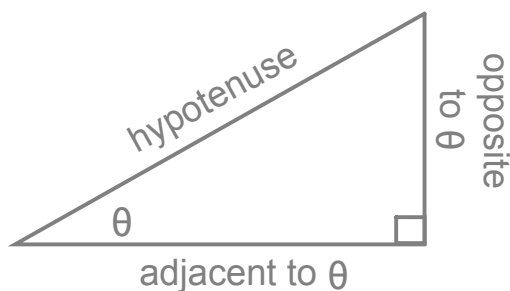
↓  
"sine of θ"

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

↓  
"cosine of θ"

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

↓  
"tangent of θ"



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To remember the trigonometric ratios:

**S o h C a h T o a**

$$\sin \theta = \frac{o}{h} \quad \cos \theta = \frac{a}{h} \quad \tan \theta = \frac{o}{a}$$



A mnemonic is a memory device

Dec 8-10:24 PM

The study of the ratios of triangle sides dates back as far as 140 BCE, with the Greek mathematician Hipparchus.

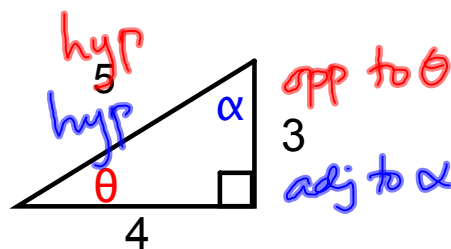
There are 6 possible ratios for each triangle. The most important form the three primary trigonometric ratios.

The decimal value of each trigonometric ratio corresponds to a particular angle.

Handout: Trigonometric Table

Dec 7-10:11 PM

Ex.1 Find all trig ratios for  $\theta$  and  $\alpha$ .  
Express as a decimal.  
Are the angles equal?



$$\sin \theta = \frac{3}{5}$$

$$= 0.6$$

$$\sin \alpha = \frac{4}{5}$$

$$= 0.8$$

$$\cos \theta = \frac{4}{5}$$

$$= 0.8$$

$$\cos \alpha = \frac{3}{5}$$

$$= 0.6$$

$$\tan \theta = \frac{3}{4}$$

$$= 0.75$$

$$\tan \alpha = \frac{4}{3}$$

$$= 1.333$$

adj to  $\theta$   
opp to  $\alpha$

$\sin^{-1}$   
Sin

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We can also determine a trigonometric ratio from a given angle.

Ex.2 Use a calculator or trig table to determine:

$$\sin 30^\circ = 0.5$$

$$\cos 30^\circ = 0.8660$$

$$\tan 30^\circ = 0.5774$$

$$\sin 57^\circ = 0.8387$$

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Ex.3 Solve

$$(\cos 70^\circ) = \frac{x}{15}$$

$$0.3420 \doteq \frac{x}{15} \quad [\times 15]$$

$$15(0.3420) = x$$

$$x \doteq 5.13$$

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You can also use a ratio to determine the angle.

Since  $\sin 30^\circ = 0.5$ , then  $\sin^{-1}(0.5) = 30^\circ$  "inverse"

Find the  $\sin^{-1}$  "sine inverse" button on the calculator

Ex.4 Solve using trig table or calculator

(a)  $\sin \theta = 0.524$

$$\theta = \sin^{-1}(0.524)$$

$$\theta \doteq 31.6^\circ$$

(b)  $\cos \theta = \frac{7}{8}$

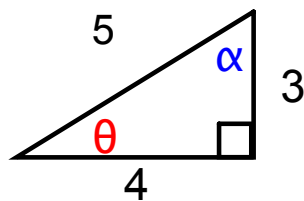
$$\theta = \cos^{-1}\left(\frac{7}{8}\right)$$

$$\theta = \cos^{-1}(0.875)$$

$$\theta \doteq 28.9^\circ$$

May 11-3:01 PM

Ex.5 Solve for  $\theta$  and  $\alpha$ .



$$\sin \theta = \frac{o}{h}$$

$$\sin \theta = \frac{3}{5}$$

$$\sin \theta = 0.6$$

$$\theta = \sin^{-1}(0.6)$$

$$\theta \doteq 37^\circ$$

$$\tan \alpha = \frac{o}{a}$$

$$\tan \alpha = \frac{4}{3}$$

$$\alpha = \tan^{-1}\left(\frac{4}{3}\right)$$

$$\alpha = \tan^{-1}(1.333)$$

$$\alpha \doteq 53^\circ$$

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Assigned Work:

p.398 # 2, 3, 6, 7, 8abc, 9, 10a, 11a, 13

Dec 8-11:10 PM

Attachments

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MPM 2D (L39- Scale Factor (GSP)).gsp

02 Scale Factor - GSP.gsp