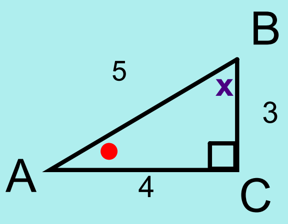
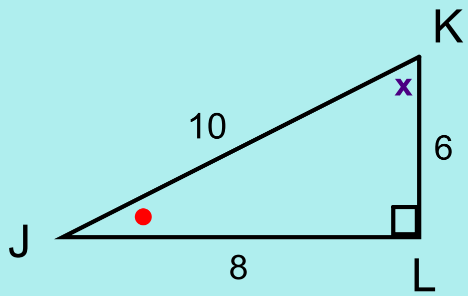
With similar triangles, the ratios of corresponding sides are equal, and corresponding angles are equal.

$\Delta ABC \sim \Delta JKL$



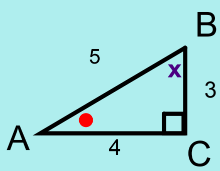




$$\frac{AB}{JK} = \frac{BC}{KL} = \frac{AC}{JL}$$

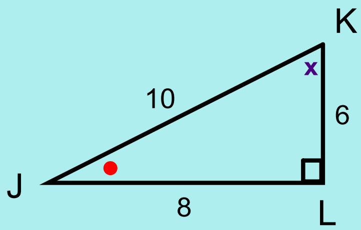
$$\angle A = \angle J$$
$$\angle B = \angle K$$
$$\angle C = \angle L$$

Dec 8-9:57 PM

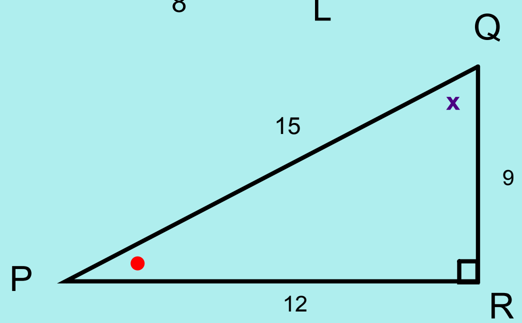
What about ratios of sides <u>within</u> triangles?




$$\frac{BC}{AC} = \frac{3}{4} = 0.75$$



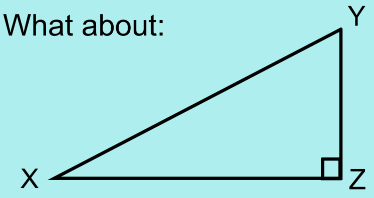

$$\frac{KL}{JL} = \frac{6}{8} = 0.75$$



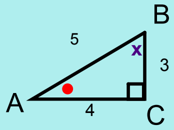

$$\frac{QR}{PR} = \frac{9}{12} = 0.75$$

Dec 7-9:08 PM

What about:




$$\frac{YZ}{XZ} = 0.75$$

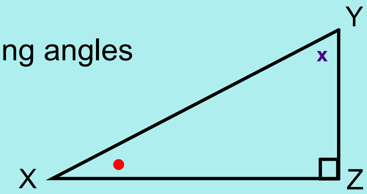



$$\frac{BC}{AC} = 0.75$$

Are these triangles similar?

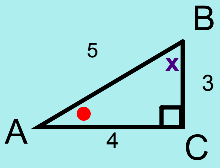
If they are similar, what does that tell us?

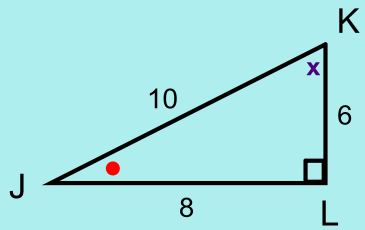
The corresponding angles must be equal.




Dec 7-9:08 PM

With similar triangles, we work with ratios of sides <u>between</u> the different triangles.




What happens when we calculate ratios for sides <u>within</u> each triangle?

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

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

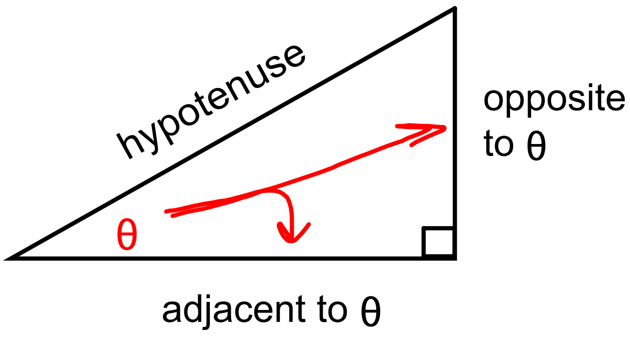
Dec 7-9:08 PM

Ratios in Right-Triangles

May 11, 2016

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).

θ is the Greek letter "theta"

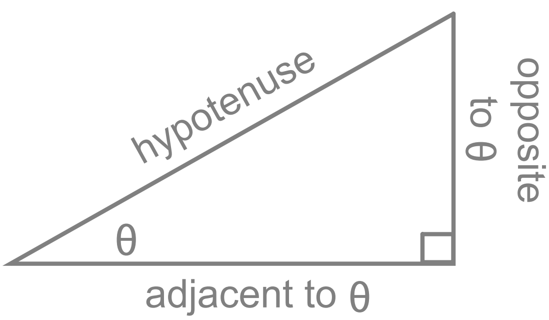



Dec 7-9:58 PM

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

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

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

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To remember the trigonometric ratios:

S o h C a h T o a

A mnemonic is a memory device

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

$S\frac{o}{h}C\frac{a}{h}T\frac{o}{a}$

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.

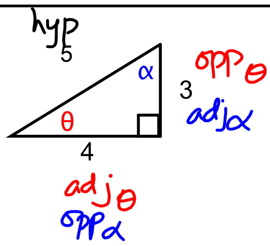
There are 6 possible ratios for each triangle. The most important form the three primary trigonometric ratios.

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 $\theta$ and $\alpha$ equal?




SohCahToa

$\sin\theta = \frac{opp}{hyp}$ $\quad \cos\theta = \frac{adj}{hyp}$ $\quad \tan\theta = \frac{opp}{adj}$

$= \frac{3}{5}$ $\quad = \frac{4}{5}$ $\quad = \frac{3}{4}$

$= 0.6$ $\quad = 0.8$ $\quad = 0.75$

$\sin\alpha = \frac{4}{5}$ $\quad \cos\alpha = \frac{3}{5}$ $\quad \tan\alpha = \frac{4}{3}$

$= 0.8$ $\quad = 0.6$ $\quad \doteq 1.333$

$\because \sin\theta \neq \sin\alpha \quad \therefore \theta \neq \alpha$

or $\cos\theta \neq \cos\alpha$

or $\tan\theta \neq \tan\alpha$

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Ex.2 Solve $\cos 70° = \frac{x}{15}$

$0.342 \doteq \frac{x}{15}$

$x \doteq 15(0.342)$

$x \doteq 5.13$

✓ deg ~~rad~~

D ~~R~~

$x = 15\cos 70°$

$x \doteq 5.1303$

Dec 8-11:09 PM

You can also use a ratio to determine the angle.

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

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

Ex.3 Solve using trig table or calculator

(a) $\sin \theta = 0.524$

$\theta \doteq 32°$ (table)

$\theta \doteq 31.6°$ (calc)

| | |
|---|---|
| 31 | 0.515 |
| 32 | 0.530 |

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

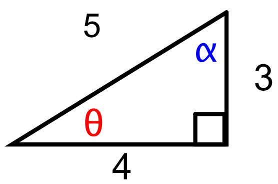
$\theta = \cos^{-1}\left(\frac{7}{8}\right)$

$\theta \doteq 28.95$

$\theta \doteq 29.0°$

May 11-3:01 PM

Ex.4 Solve for $\theta$ and $\alpha$.




$\sin\theta = 0.6$

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

$\theta \doteq 36.9°$

$\tan\alpha = 1.333\overline{3}$

$\alpha = \tan^{-1}(1.333\overline{3})$

$\alpha \doteq 53.1°$

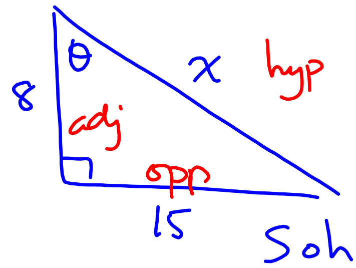
$\tan^{-1}\left(\frac{4}{3}\right)$

May 11-3:06 PM

Assigned Work:

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

10(a)




SohCahToa

$x^2 = 8^2 + 15^2$

$x^2 = 64 + 225$

$x^2 = 289$

$x = 17$

$\sin\theta = \frac{15}{17}$

$\cos\theta = \frac{8}{17}$

$\tan\theta = \frac{15}{8}$

Dec 8-11:10 PM

11(a) $\sin\theta = \frac{15}{17} \rightarrow \theta = \sin^{-1}\left(\frac{15}{17}\right)$

$\doteq 61.9^\circ$

$\cos\theta = \frac{8}{17} \rightarrow \theta = \cos^{-1}\left(\frac{8}{17}\right)$

$\doteq 61.9^\circ$

$\tan\theta = \frac{15}{8} \rightarrow \theta = \tan^{-1}\left(\frac{15}{8}\right)$

$\doteq 61.9^\circ$

angle $\xrightarrow{\sin,\ \cos,\ \tan}$ ratio

$\sin 30^\circ = 0.5$

$\cos\theta = 0.5 \longrightarrow \theta = \cos^{-1}(0.5)$

$\theta = 60^\circ$

ratio $\rightarrow$ angle

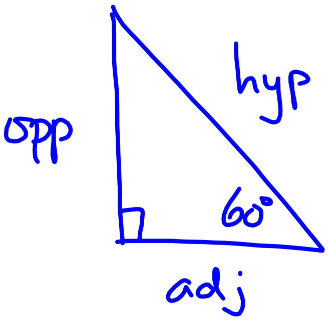
$\sin^{-1}$
$\cos^{-1}$
$\tan^{-1}$

$x^2 = 9$

$x = \pm\sqrt{9}$

May 12-12:37 PM

13. $\cos 60^\circ = \frac{1}{2}$




Soh<u>Cah</u>Toa

$$\cos 60^\circ = \frac{adj}{hyp}$$

$$\frac{1}{2} = \frac{adj}{hyp}$$

May 12-12:43 PM

Attachments

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

02 Scale Factor - GSP.gsp