

## 4.2 Defining the Trigonometric Functions

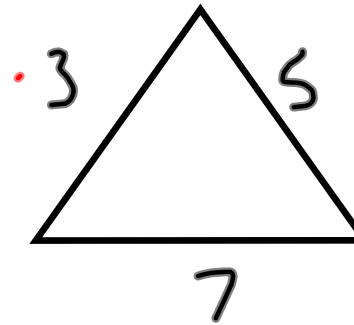
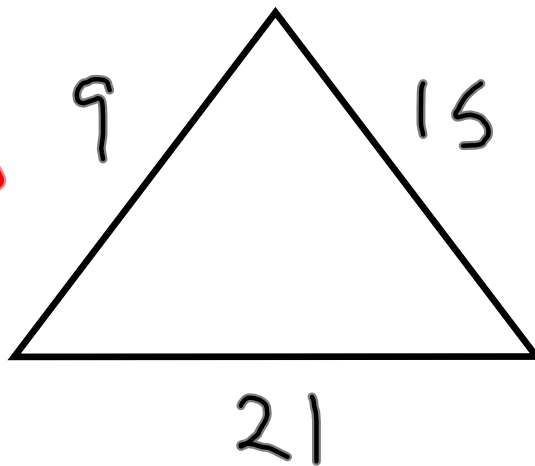
Two triangles are similar if that have the same shape. They don't have to have the same size.

### Properties of Similar Triangles

1. corresponding angles are equal.
2. corresponding sides are proportional.

$$\frac{9}{3} = \frac{15}{5}$$

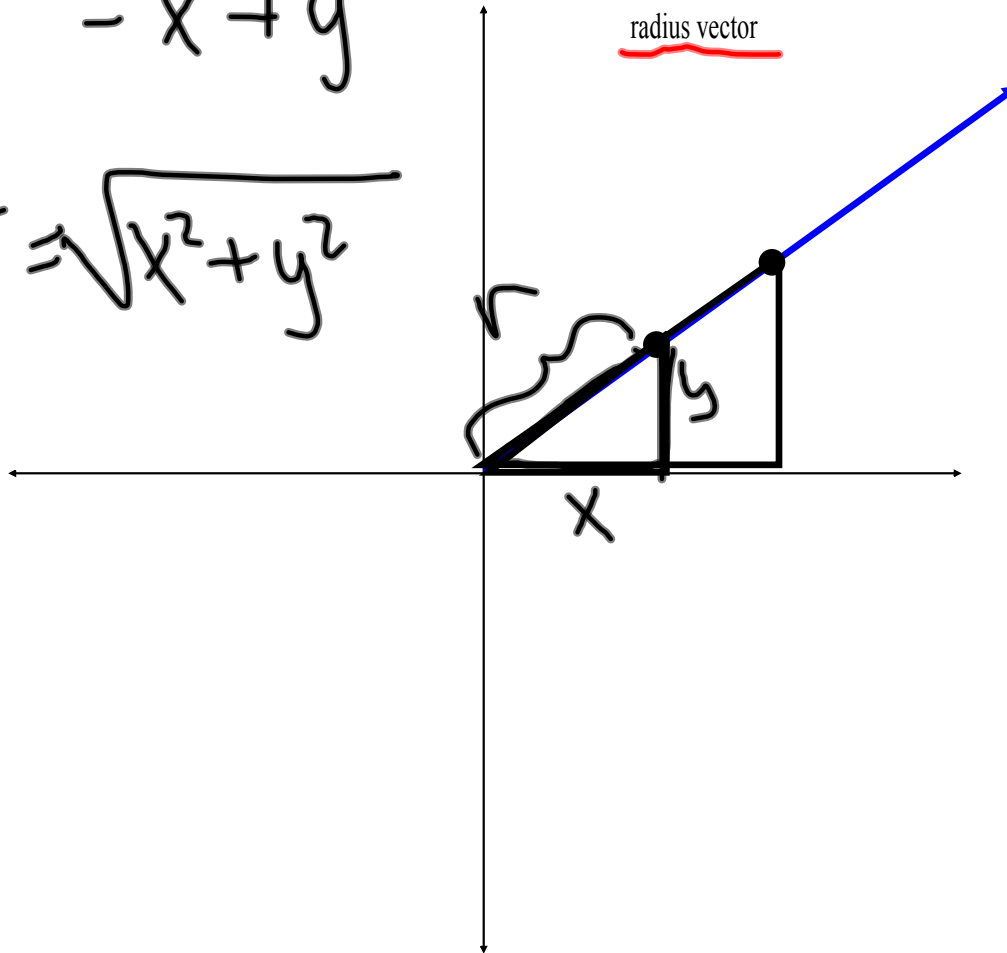
$$3 = 3$$



$$\frac{9}{21} = \frac{3}{7}$$

$$r^2 = x^2 + y^2$$

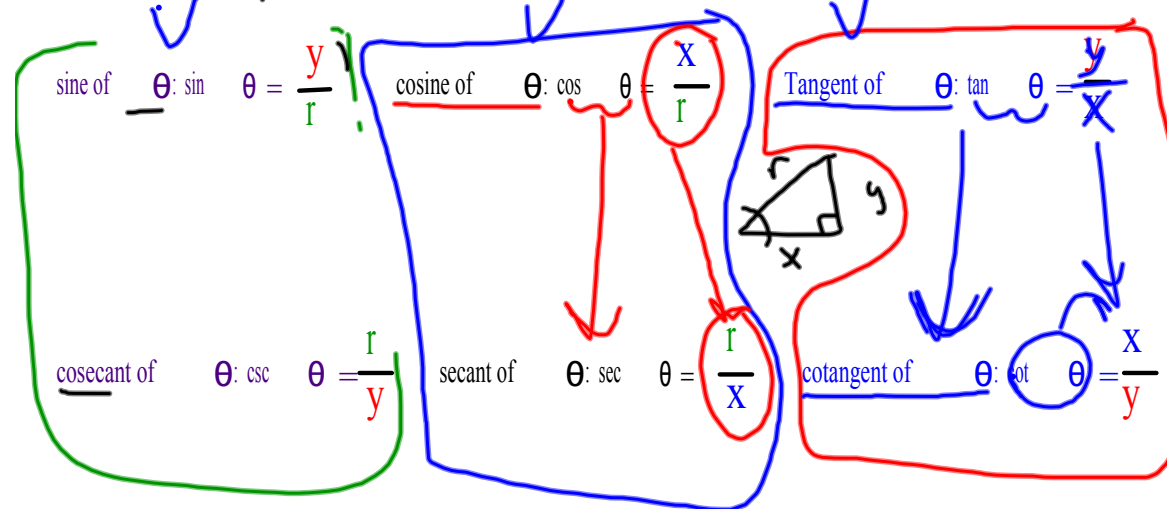
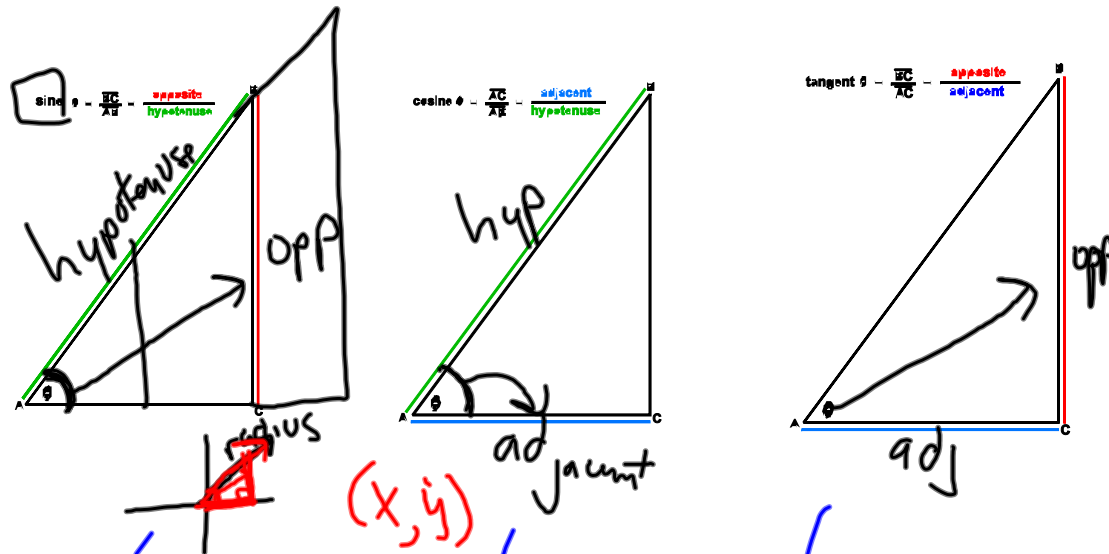
$$r = \sqrt{x^2 + y^2}$$



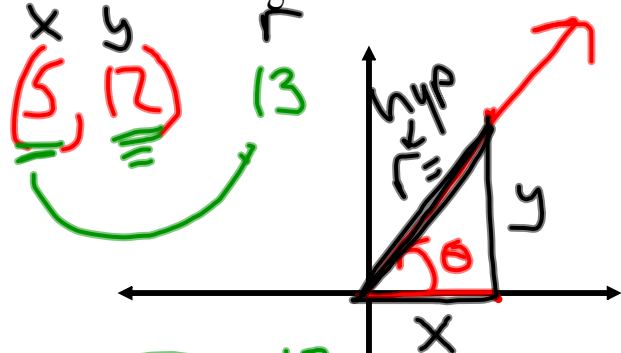
$$\frac{y}{x} = \frac{Y}{X}$$

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trigonometric ratio- a ratio of the lengths of two sides of a right triangle  
 (the ratios are functions of the angles)



evaluate the trig functions



$$\sin \theta = \frac{12}{13} \quad \csc \theta = \frac{13}{12}$$

$$\cos \theta = \frac{5}{13} \quad \sec \theta = \frac{13}{5}$$

$$\tan \theta = \frac{12}{5} \quad \cot \theta = \frac{5}{12}$$

$$r = \sqrt{x^2 + y^2}$$

$$r = \sqrt{5^2 + 12^2}$$

$$r = \sqrt{25 + 144}$$

$$r = \sqrt{169}$$

$$r = 13$$

$x, y, r$

$\sin \theta = \frac{1}{2}$

$\sin \theta = \frac{y}{r}$

$y=1 \quad r=2$

$x$

$\cos \theta =$

$\tan \theta =$

$r = \sqrt{x^2 + y^2}$

$y=1 \quad r=2 \quad x=\sqrt{3}$

$\cos \theta = \frac{x}{r}$

$\cos \theta = \frac{\sqrt{3}}{2}$

$\tan \theta = \frac{y}{x}$

$\tan \theta = \frac{1}{\sqrt{3}}$

$x^2 + y^2 = r^2$

$\sqrt{x^2} = \sqrt{r^2 - y^2}$

$x = \sqrt{r^2 - y^2}$

$x = \sqrt{2^2 - 1^2}$

$x = \sqrt{4 - 1}$

$x = \sqrt{3}$

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Try some problems

3-25 add

$$\cos \theta = \frac{y}{r}$$

$$\cos \theta = \frac{6}{10} = \frac{3}{5}$$

$$\tan \theta = \frac{y}{x}$$

$$\tan \theta = \frac{8}{6} = \frac{4}{3}$$

$$\csc \theta = \frac{r}{y}$$

$$\csc \theta = \frac{10}{8} = \frac{5}{4}$$

$$\sec \theta = \frac{r}{x}$$

$$\sec \theta = \frac{10}{6} = \frac{5}{3}$$

$$\cot \theta = \frac{x}{y}$$

$$\cot \theta = \frac{6}{8} = \frac{3}{4}$$

$$\sec \theta = \frac{\sqrt{5}}{2}$$

$$\tan \theta = \frac{1}{2}$$

$$\cos \theta = \frac{2}{\sqrt{5}}$$

$$\sin \theta = \frac{1}{\sqrt{5}}$$

