

3. Through how many radians does the minute hand of a clock rotate from 12:45pm to 1:25pm?

$$\theta = ? \text{ rad} ; t = 40 \text{ min} ; \omega = \frac{360^\circ}{1 \text{ h}}$$

$$\omega = \frac{\theta}{t} \Rightarrow \theta = \omega t$$

$$\theta = \frac{360^\circ}{1 \text{ h}} \cdot \frac{40 \text{ min}}{1} \cdot \frac{1 \text{ h}}{60 \text{ min}} \cdot \frac{\pi}{180^\circ}$$

$$= \frac{4\pi}{3}$$

4. A car travels at 60 miles per hour. Its wheels have a 24 inch diameter. What is the angular speed of a point on the rim of a wheel in revolutions per minute?

$$r = 12 \text{ in} ; v = \frac{60 \text{ mi}}{\text{h}} ; \omega = ? \text{ rev/min}$$

$$\frac{v}{r} = \frac{\omega}{k} \quad \omega = \frac{v}{r} = \frac{v}{1} \cdot \frac{1}{r}$$

$$\omega = \frac{60 \text{ mi}}{\text{h}} \cdot \frac{1}{12 \text{ in}} \cdot \frac{2640 \text{ ft}}{1 \text{ mi}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{1 \text{ h}}{60 \text{ min}} \cdot \frac{1 \text{ rev}}{2\pi}$$

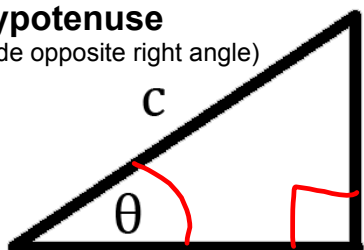
$$= \frac{2640}{\pi} \text{ rev/min}$$

5.1 Trigonometric Functions of Acute Angles

An acute angle is an angle between 0° and 90°.

A right triangle is a triangle with a 90° angle.

hypotenuse
(side opposite right angle)



opposite side
(side opposite angle of interest)

adjacent side
(side adjacent to angle of interest)

θ theta
α alpha
β beta
γ gamma

The six basic trigonometric functions are ratios of sides of a right triangle.

sine $\sin \theta = \frac{\text{length of side opposite } \theta}{\text{length of hypotenuse}} = \frac{\text{opp}}{\text{hyp}}$

cosine $\cos \theta = \frac{\text{length of side adjacent to } \theta}{\text{length of hypotenuse}} = \frac{\text{adj}}{\text{hyp}}$

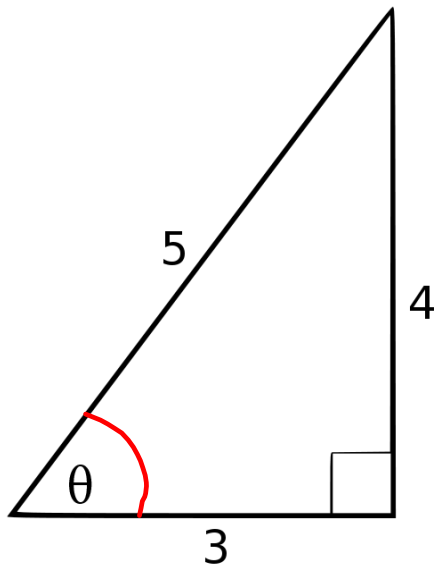
tangent $\tan \theta = \frac{\text{length of side opposite } \theta}{\text{length of side adjacent to } \theta} = \frac{\text{opp}}{\text{adj}}$

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secant $\sec \theta = \frac{\text{hyp}}{\text{adj}} = \frac{1}{\cos \theta}$

cosecant $\csc \theta = \frac{\text{hyp}}{\text{opp}} = \frac{1}{\sin \theta}$

cotangent $\cot \theta = \frac{\text{adj}}{\text{opp}} = \frac{1}{\tan \theta}$

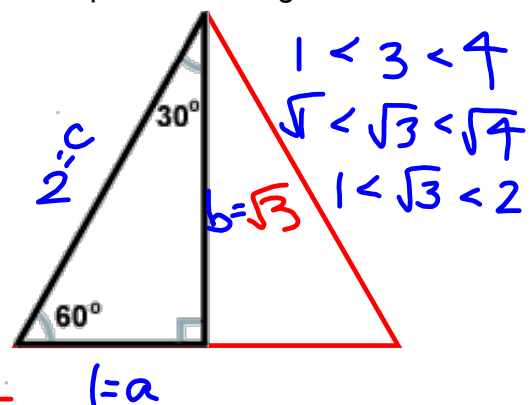
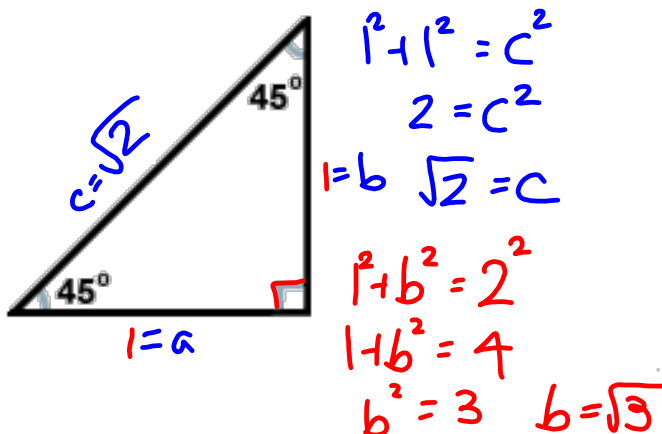


$$\begin{aligned} \sin \theta &= \frac{4}{5} \\ \cos \theta &= \frac{3}{5} \\ \tan \theta &= \frac{4}{3} \\ \sec \theta &= \frac{5}{3} \\ \csc \theta &= \frac{5}{4} \\ \cot \theta &= \frac{3}{4} \end{aligned}$$

Two special right triangles:

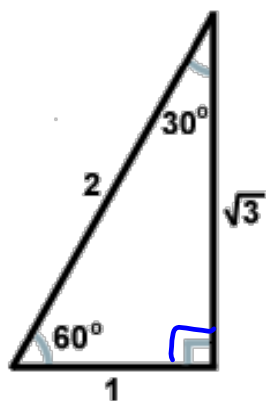
Isosceles Right Triangle aka 45-45-90

Half of an equilateral triangle aka 30-60-90



Pythagorean Theorem:

$a^2 + b^2 = c^2$, where a & b are the legs and c is the hypotenuse of a right triangle.



The function value of an angle is equal to the cofunction value of its complement

$$\begin{array}{ll}
 \sin 30^\circ = \frac{1}{2} & \sin 60^\circ = \frac{\sqrt{3}}{2} \\
 \cos 30^\circ = \frac{\sqrt{3}}{2} & \cos 60^\circ = \frac{1}{2} \\
 \tan 30^\circ = \frac{1}{\sqrt{3}} & \tan 60^\circ = \sqrt{3} \\
 \sec 30^\circ = \frac{2}{\sqrt{3}} & \sec 60^\circ = 2 \\
 \csc 30^\circ = 2 & \csc 60^\circ = \frac{2}{\sqrt{3}} \\
 \cot 30^\circ = \sqrt{3} & \cot 60^\circ = \frac{1}{\sqrt{3}}
 \end{array}$$

Cofunctions

The function of an angle is equal to the cofunction of its complement.

The complement of an angle $\theta = 90^\circ - \theta = \frac{\pi}{2} - \theta$

Examples: $\frac{1}{\sec 20^\circ}$

$$\cos(20^\circ) = \sin(90^\circ - 20^\circ) = \sin 70^\circ = \frac{1}{\csc 70^\circ}$$

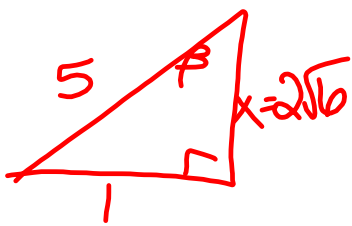
$$\csc(89^\circ) = \sec 1^\circ = \frac{1}{\cos 1^\circ} = \frac{1}{\sin 89^\circ}$$

$$\tan(7^\circ) = \cot 83^\circ = \frac{1}{\tan 83^\circ} = \frac{1}{\cot 7^\circ}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}} \cdot \frac{\frac{1}{\text{hyp}}}{\frac{1}{\text{hyp}}} = \frac{\frac{\text{opp}}{\text{hyp}}}{\frac{\text{adj}}{\text{hyp}}} = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

Given that $\csc \beta = 5$, find the other trigonometric function values of β .



$$5^2 = 1^2 + x^2$$

$$25 - 1 = x^2$$

$$24 = x^2$$

$$\sqrt{24} = x$$

$$2\sqrt{6} = x$$

$$\sin \beta = \frac{1}{5}$$

$$\cos \beta = \frac{2\sqrt{6}}{5}$$

$$\tan \beta = \frac{1}{2\sqrt{6}}$$

$$\sec \beta = \frac{5}{2\sqrt{6}}$$

$$\cot \beta = 2\sqrt{6}$$

Homework #1 due this Friday 8/15:

- 5.1 #1, 2, 7-18 all
- **5.1 #31-48 all**
- **4 problems on handout**
- **5.1 #55-74 all**

Quiz #1 Tomorrow! (Friday, 8/15)

Due next Wednesday ~~11/13~~:

"Do you know enough Algebra..." take-home quiz

HW #2 due next Friday:

- 5.2 #1-75odd

Test #1 ~ Wed, 8/27