

Homework grades this week:

01: Sign up for Khan Academy with coach code 4CG5S2.

02: Read sections 5.1 and 5.2 in your textbook and complete at least 45 minutes of exercises on Khan Academy on related topics (outside of class); in addition, complete "Mastery Challenges" as often as they become available to you.

03: Textbook problems from section 5.1 #1, 2, 7-18 all, 31-74 all. This will mostly be completed in class and will be due this Friday. See syllabus for proper formatting of written homework assignments.

Homework grades next week:

01: **Read** sections 5.3 and 5.4 in your textbook (and 5.2 if you haven't already) **by Monday 22 Aug.**

02: Complete at least 45 minutes of exercises on **Khan Academy** related to sections 5.2, 5.3, and 5.4 **by Friday, 26 Aug;** in addition, complete "Mastery Challenges" as often as they become available to you.

03: **Textbook problems**, mostly be completed in class and due **Friday, 26 Aug.**

- 5.2: #1-6 all; 15-41 odd; 59-75 odd
- 5.3: #1-35 odd; 37-48 all (NO CALCULATOR!); 61-68 all (NO CALCULATOR!)
- 5.4: #13-22 all (NO CALCULATOR!)


Khan Academy exercises for section 5.1:

 arc measure


 multiple units word problems


 arc length


 convert units (metrics)


 radians & degrees

 convert units word problems (metrics)

 radians & arc length

 convert units (US customary)

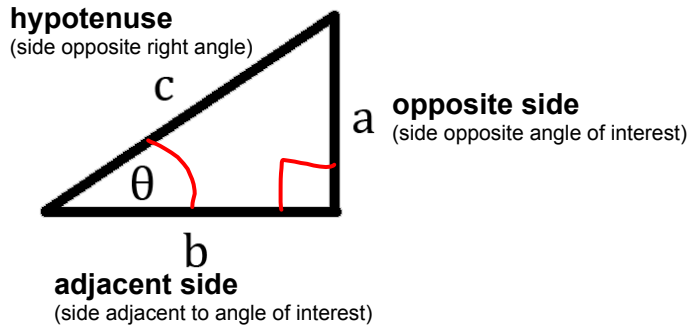
 complementary & supplementary angles

 convert units word problems (US customary)

5.2 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.



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

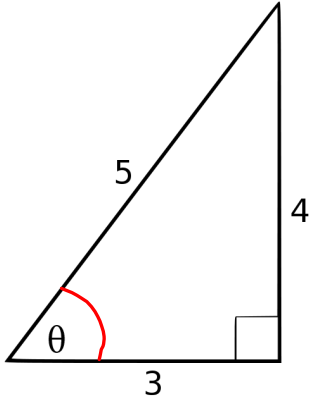
tangent $\tan \theta = \frac{\text{length of side opposite } \theta}{\text{length of side adjacent to } \theta} = \frac{\text{opp}}{\text{adj}}$

SohCahToa

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



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

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

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

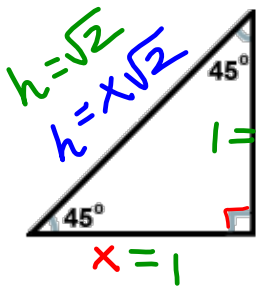
$$\sec \theta = \frac{5}{3}$$

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

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

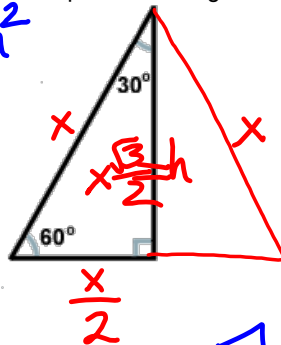
Two special right triangles:

Isosceles Right Triangle aka 45-45-90



$$\begin{aligned} x^2 + x^2 &= h^2 \\ 2x^2 &= h^2 \\ \sqrt{2x^2} &= h \\ x\sqrt{2} &= h \end{aligned}$$

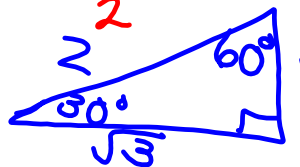
Half of an equilateral triangle aka 30-60-90



$$\begin{aligned} \left(\frac{x}{2}\right)^2 + h^2 &= x^2 \\ \frac{x^2}{4} + h^2 &= x^2 \\ h^2 &= x^2 - \frac{x^2}{4} \\ h^2 &= \frac{4x^2 - x^2}{4} \\ h^2 &= \frac{3x^2}{4} \end{aligned}$$

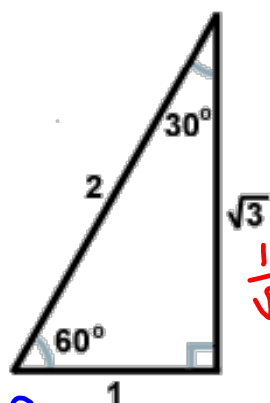
Pythagorean Theorem:

$$a^2 + b^2 = c^2$$



$$\begin{aligned} 30^\circ < 60^\circ < 90^\circ \\ 1 < \sqrt{3} < 2 \\ \sqrt{1} < \sqrt{3} < \sqrt{4} \\ 1 < \sqrt{3} < 2 \end{aligned}$$

$$\begin{aligned} h^2 &= \frac{3x^2}{4} \\ h &= \sqrt{\frac{3x^2}{4}} \\ &= x\sqrt{3}/2 \end{aligned}$$

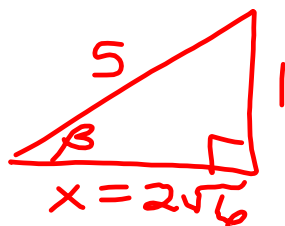


function value of an angle is equal to the cofunction value of its complement

$$\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

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

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



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

$$x^2 = 25 - 1 = 24$$

$$x = \sqrt{24}$$

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

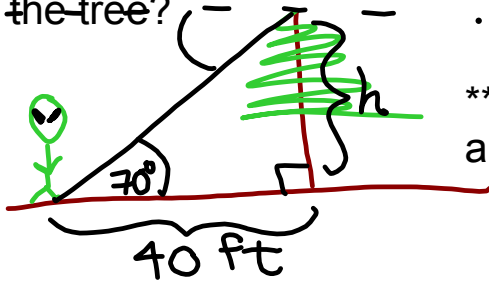
$$\cos \beta = \frac{2\sqrt{6}}{5}$$

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

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

5.2 Applications of Right Triangles

A botanist stands 40 ft. from the base of a tree and estimates the angle of elevation to the tree's peak to be 70 degrees. How tall is the tree?



** Angles of elevation and depression are always measured from the horizontal

$$\tan(70^\circ) = \frac{h}{40}$$

$$40 \tan 70^\circ = h$$

$$h \approx 110 \text{ ft}$$