Homework grades this 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 (NO CALCULATOR!)
- 5.3: #1-35 odd; 37-48 all (NO CALCULATOR!); 61-68 all (NO CALCULATOR!)
- 5.4: #13-22 all (NO CALCULATOR!)

Expect a **quiz** sometime this week on some combination of radians & degrees, arc length & angular speed, trigonometric functions, 30-60-90 & 45-45-90 triangles.

**Khan Academy exercises for section 5.1:**

- arc measure
- arc length
- radians & degrees
- radians & arc length
- complementary & supplementary angles
- multiple units word problems
- convert units (metrics)
- convert units word problems (metrics)
- convert units (US customary)
- convert units word problems (US customary)

**Khan Academy exercises for section 5.2:**

- Trigonometric ratios in right triangles
- Solve for a side in right triangles
- Solve for an angle in right triangles
- Right triangle word problems

**Khan Academy exercises for section 5.3-5.4:**

- Trig values of special angles
- Use the Pythagorean identity

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?

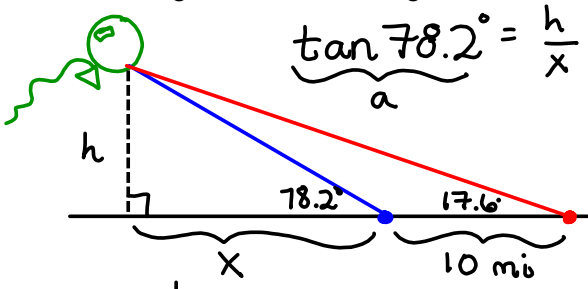
$V = \frac{60\ mi}{h}$ $d = 24\ in$ $r = 12\ in$ $\omega = ?\ \frac{rev}{min}$

$V = r\omega \rightarrow \omega = \frac{V}{r} = \frac{V}{1} \cdot \frac{1}{r}$

$\omega = \frac{60\ mi}{h} \cdot \frac{1}{12\ in} \cdot \frac{1\ h}{60\ min} \cdot \frac{12\ in}{1\ ft} \cdot \frac{5280\ ft}{1\ mi} \cdot \frac{1\ rev}{2\pi}$

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

A weather balloon is directly west of two observing stations that are 10 miles apart. The angles of elevation of the balloon from the two stations are 17.6 degrees and 78.2 degrees. How high is the balloon?




$\underbrace{\tan 78.2^\circ}_{a} = \frac{h}{x}$ ; $\underbrace{\tan 17.6^\circ}_{b} = \frac{h}{x+10}$

$a = \frac{h}{x}$ ; $b = \frac{h}{x+10}$

$xa = h$

$x = \frac{h}{a}$

$b = \frac{h}{\frac{h}{a}+10}$

$b\left(\frac{h}{a}+10\right) = h$

$\frac{bh}{a} + 10b = h$

$\frac{bh}{a} - h = -10b$

$h\left(\frac{b}{a}-1\right) = -10b$

$h = \frac{-10b}{\frac{b}{a}-1} = \frac{-10\tan 17.6^\circ}{\frac{\tan 17.6^\circ}{\tan 78.2^\circ} - 1}$

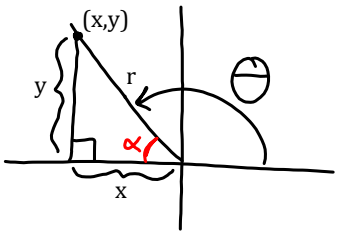
(-10 tan(17.6)) / (tan(17.6)/tan(78.2) − 1)

$h \approx 3.4$ mi

## 5.3 - Trigonometric Functions of Any Angle

For an angle in standard position, the reference angle ($\alpha$) is the acute angle between the terminal side of the angle and the x-axis.

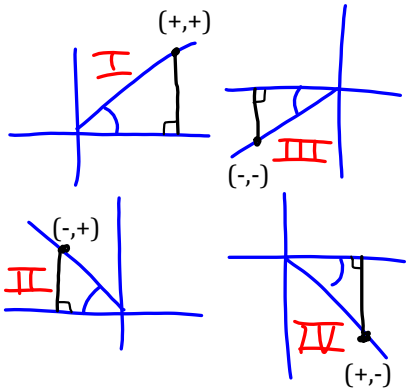
reference triangle




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

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

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



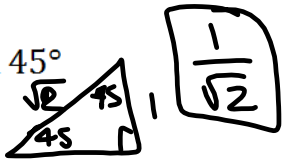

* note that the hypotenuse r is always positive, so that the x- and y-coordinates determine whether the trig function is positive or negative

Review:

A reference angle for an angle whose initial side is on the positive x-axis and terminal side may lie in any of the four quadrants is the acute angle between the terminal side of the angle and the x-axis

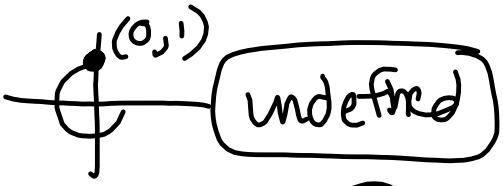
Evaluate the following trigonometric expressions. Give exact answers. You do not have to rationalize. Draw a picture if this helps you.

$\sin 45°$



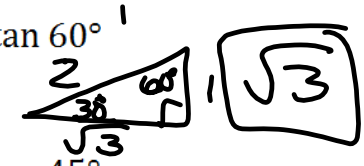

$\frac{1}{\sqrt{2}}$

$\sec(-270°)$

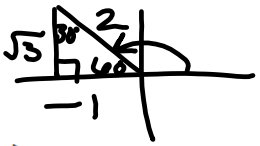



$\frac{1}{0}$

$\tan 60°$




$\cot(120°)$




$\frac{-1}{\sqrt{3}}$

$\sec 45°$

$\sqrt{2}$

$\csc(-135°)$

$-\sqrt{2}$

$\csc 30°$

2

$\tan(540°)$

0