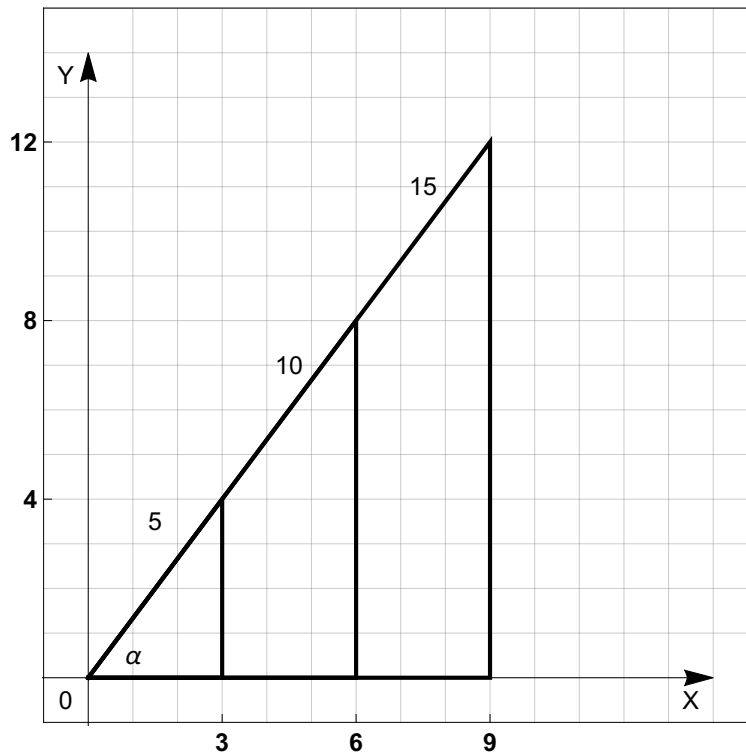# Homework 5
Basic Trigonometry: $sin(\alpha)$ and $cos(\alpha)$

Math 7a

October 25, 2017

$$sin(\alpha) = \frac{\text{opposite side}}{\text{hypotenuse}} = \frac{4}{5} = \frac{8}{10} = \frac{12}{15}$$

$$cos(\alpha) = \frac{\text{adjacent side}}{\text{hypotenuse}} = \frac{3}{5} = \frac{6}{10} = \frac{9}{15}$$

Trigonometric Functions						
Function	Notation	Definition	0	30	45	60
Sine	$sin(\alpha)$	$\frac{\text{opposite side}}{\text{hypotenuse}}$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
Cosine	$cos(\alpha)$	$\frac{\text{adjacent side}}{\text{hypotenuse}}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$

1. Which one is greater?

    (a) 0 or $sin(0)$

    (b) 1 or $sin(30)$

    (c) $sin(45)$ or $cos(45)$

    (d) $cos(60)$ or $sin(30)$

2. A tree casts a 60 m long shadow when the angle of elevation of the sun is 30°. How tall is the tree? [Angle of elevation is the angle that line from tip of shadow on ground to top of tree makes with the horizontal.]

3. A ladder of length L is resting on a ledge whose height is half of the ladder's length. The ladder makes a 45° angle with the ground.

    (a) How long is the portion of the ladder between the ground and the point of contact of ledge and ladder? [indicated by a long dashed arrow]

    (b) At what height is the top of ladder above the ledge? [indicated by short dashed arrow]
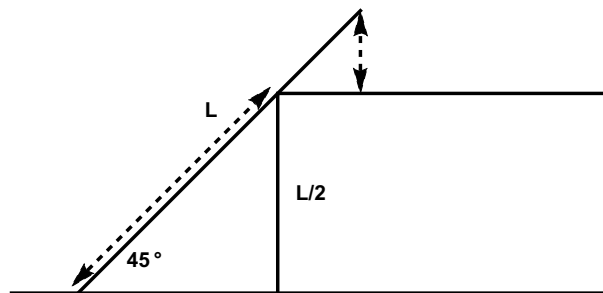
4. A cruise ship travels north for 3 miles and then north-west for another 3 miles. How far will it end up from its original position? [North-end is the direction that bisects the angle between north and east.]

5. We are given a triangle $\triangle ABC$. We know measures of two of its sides: AB and AC, and the angle between them $\angle BAC$. Can we find area of $\triangle ABC$?

6. What is the area of an equilateral triangle of side 5? [Make sure to use a trigonometric function.]

7. What is the area of a regular pentagon inscribed in a circle of radius 10? [Make sure to use a trigonometric function.]

8. Consider a parallelogram ABCD with AB $= 3$, AD $= 2$ and $\angle BAD = 30°$. Find the lengths of diagonals of this parallelogram. [Hint: introduce a coordinate system so that $\overrightarrow{AD}$ goes along the x-axis. For the diagonal AC write the vector $\overrightarrow{AC}$ as a sum of two vectors, decompose $\overrightarrow{AB}$ and $\overrightarrow{BC}$ into horizontal and vertical components.]