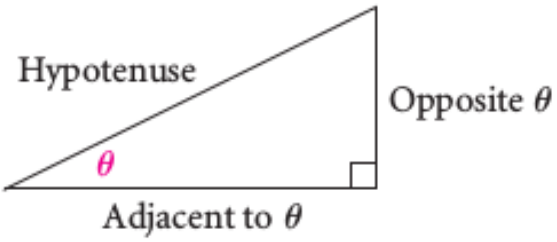
19-April-2015
Algebra and Trigonometry in-class worksheet TO BE HANDED IN AND GRADED!
Chapter 5.1: Trigonometric Functions of Acute Angles

Name:_____
Date: _____

Here's what you absolutely have to know for the next 4 weeks:

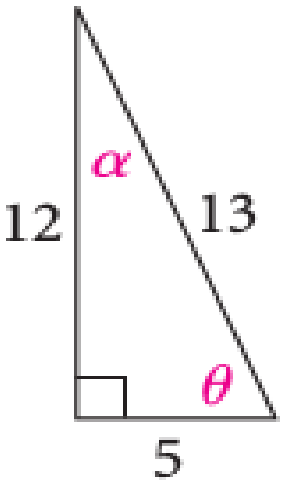


$$\sin\theta = \frac{\text{side opposite } \theta}{\text{hypotenuse}},$$

$$\cos\theta = \frac{\text{side adjacent to } \theta}{\text{hypotenuse}},$$

$$\tan\theta = \frac{\text{side opposite } \theta}{\text{side adjacent to } \theta},$$

Exercise:
Find the ratio for each function evaluated for each angle:



$$\sin\theta = \frac{\text{opp}}{\text{hyp}} =$$

$$\cos\theta = \frac{\text{adj}}{\text{hyp}} =$$

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

$$\sin\alpha = \frac{\text{opp}}{\text{hyp}} =$$

$$\cos\alpha = \frac{\text{adj}}{\text{hyp}} =$$

$$\tan\alpha = \frac{\text{opp}}{\text{adj}} =$$

Calculator exercises:
1) verify these lengths satisfy The Pythagoras' Theorem:
2) Find the the actual value (in degrees) for each of the two angles:

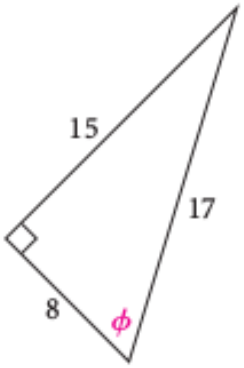
Here's an incredibly helpful (and possibly culturally insensitive) mnemonic:

"Chief SOH CAH TOA"

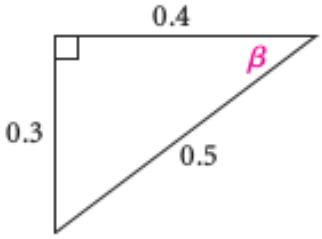
Exercise:
Without peeking back, write out the definitions of *Sine*, *Cosine*, and *Tangent* using this mnemonic

Find the *Sine*, *Cosine*, and *Tangent* for every one of the specified angles:

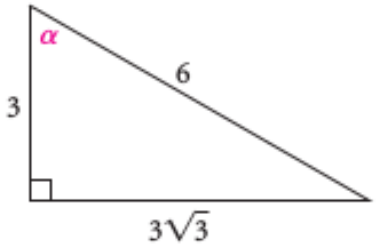
1.



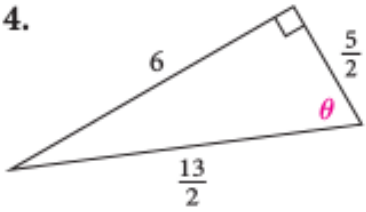
2.



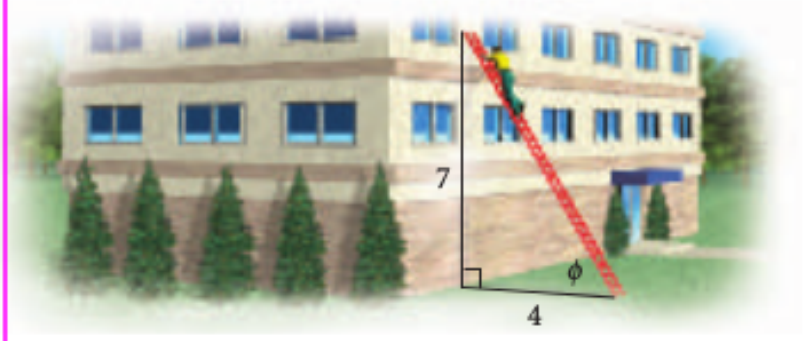
3.



4.



5.



6.

Some additional facts you'll need to know how to use, but you do not have memorize for this class

Reciprocal Functions

$$\csc\theta = \frac{1}{\sin\theta}, \qquad \sec\theta = \frac{1}{\cos\theta}, \qquad \cot\theta = \frac{1}{\tan\theta}$$

Do the odd-numbered problems

Given a function value of an acute angle, find the other five trigonometric function values.

9. $\sin\theta = \frac{24}{25}$

10. $\cos\sigma = 0.7$

11. $\tan\phi = 2$

12. $\cot\theta = \frac{1}{3}$

13. $\csc\theta = 1.5$

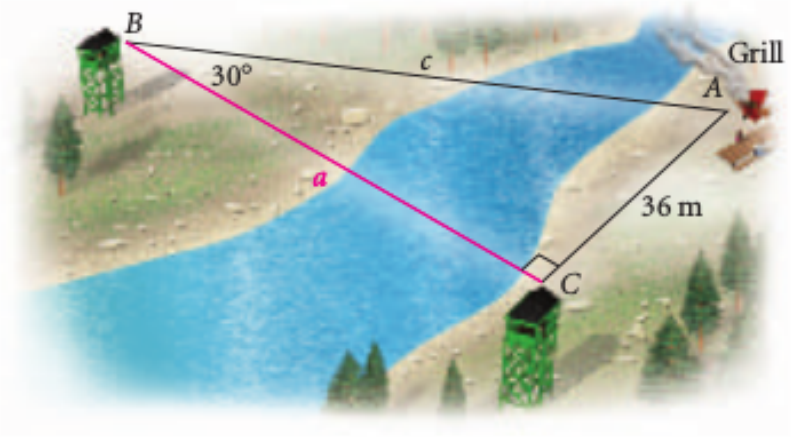
14. $\sec\beta = \sqrt{17}$

15. $\cos\beta = \frac{\sqrt{5}}{5}$

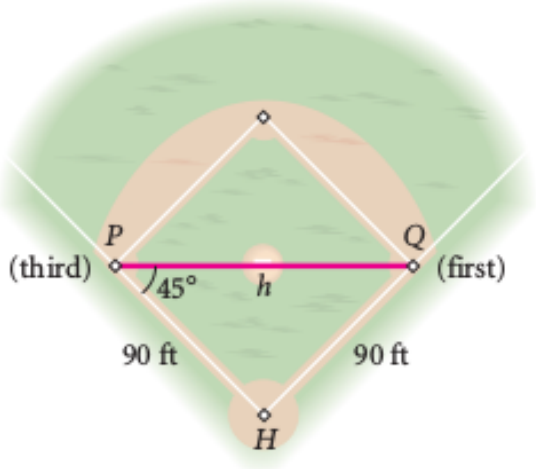
16. $\sin\sigma = \frac{10}{11}$

Do these two problems:

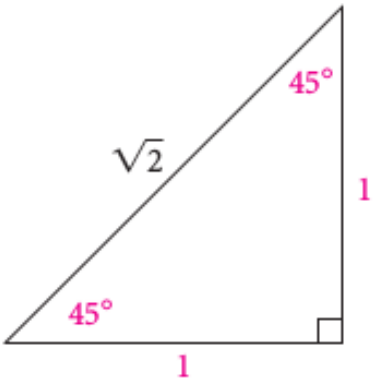
29. *Distance Across a River.* Find the distance a across the river.



30. *Distance Between Bases.* A baseball diamond is actually a square 90 ft on a side. If a line is drawn from third base to first base, then a right triangle QPH is formed, where $\angle QPH$ is 45°. Using a trigonometric function, find the distance from third base to first base.



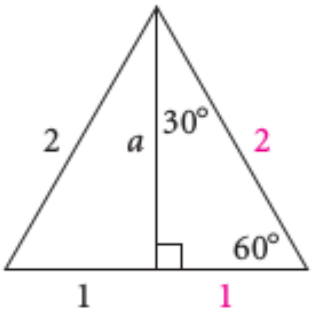
Here's some special angles that are extremely common on exams: 30, 45, and 60 degrees



$$\sin 45^\circ = \frac{\text{opp}}{\text{hyp}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \approx 0.7071,$$

$$\cos 45^\circ = \frac{\text{adj}}{\text{hyp}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \approx 0.7071,$$

$$\tan 45^\circ = \frac{\text{opp}}{\text{adj}} = \frac{1}{1} = 1$$



$$a^2 + 1^2 = 2^2$$
$$a^2 + 1 = 4$$
$$a^2 = 3$$
$$a = \sqrt{3}.$$

We can now determine the function values of 30° and 60°:

$$\sin 30^\circ = \frac{1}{2} = 0.5, \qquad \sin 60^\circ = \frac{\sqrt{3}}{2} \approx 0.8660,$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2} \approx 0.8660, \qquad \cos 60^\circ = \frac{1}{2} = 0.5,$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3} \approx 0.5774, \qquad \tan 60^\circ = \frac{\sqrt{3}}{1} = \sqrt{3} \approx 1.7321.$$

Solve the odd problems without a calculator. It helps to draw a triangle for each problem

Find the exact function value.

17. cos 45°	**18.** tan 30°
19. sec 60°	**20.** sin 45°
21. cot 60°	**22.** csc 45°
23. sin 30°	**24.** cos 60°
25. tan 45°	**26.** sec 30°
27. csc 30°	**28.** cot 60°

Exercise Set 5.1

1. $\sin\phi = \frac{15}{17}$, $\cos\phi = \frac{8}{17}$, $\tan\phi = \frac{15}{8}$, $\csc\phi = \frac{17}{15}$, $\sec\phi = \frac{17}{8}$, $\cot\phi = \frac{8}{15}$

3. $\sin\alpha = \dfrac{\sqrt{3}}{2}$, $\cos\alpha = \dfrac{1}{2}$, $\tan\alpha = \sqrt{3}$, $\csc\alpha = \dfrac{2\sqrt{3}}{3}$, $\sec\alpha = 2$, $\cot\alpha = \dfrac{\sqrt{3}}{3}$

5. $\sin\phi = \dfrac{7\sqrt{65}}{65}$, $\cos\phi = \dfrac{4\sqrt{65}}{65}$, $\tan\phi = \dfrac{7}{4}$, $\csc\phi = \dfrac{\sqrt{65}}{7}$, $\sec\phi = \dfrac{\sqrt{65}}{4}$, $\cot\phi = \dfrac{4}{7}$

7. $\csc\alpha = \dfrac{3}{\sqrt{5}}$, or $\dfrac{3\sqrt{5}}{5}$; $\sec\alpha = \dfrac{3}{2}$; $\cot\alpha = \dfrac{2}{\sqrt{5}}$, or $\dfrac{2\sqrt{5}}{5}$

9. $\cos\theta = \frac{7}{25}$, $\tan\theta = \frac{24}{7}$, $\csc\theta = \frac{25}{24}$, $\sec\theta = \frac{25}{7}$, $\cot\theta = \frac{7}{24}$

11. $\sin\phi = \dfrac{2\sqrt{5}}{5}$, $\cos\phi = \dfrac{\sqrt{5}}{5}$, $\csc\phi = \dfrac{\sqrt{5}}{2}$, $\sec\phi = \sqrt{5}$, $\cot\phi = \dfrac{1}{2}$

13. $\sin\theta = \dfrac{2}{3}$, $\cos\theta = \dfrac{\sqrt{5}}{3}$, $\tan\theta = \dfrac{2\sqrt{5}}{5}$, $\sec\theta = \dfrac{3\sqrt{5}}{5}$, $\cot\theta = \dfrac{\sqrt{5}}{2}$

15. $\sin\beta = \dfrac{2\sqrt{5}}{5}$, $\tan\beta = 2$, $\csc\beta = \dfrac{\sqrt{5}}{2}$, $\sec\beta = \sqrt{5}$, $\cot\beta = \dfrac{1}{2}$

17. $\dfrac{\sqrt{2}}{2}$ **19.** 2 **21.** $\dfrac{\sqrt{3}}{3}$ **23.** $\frac{1}{2}$ **25.** 1 **27.** 2

29. 62.4 m **31.** 9.72° **33.** 35.01° **35.** 3.03°

37. 49.65° **39.** 0.25° **41.** 5.01° **43.** 17°36′

45. 83°1′30″ **47.** 11°45′ **49.** 47°49′36″ **51.** 54′

53. 39°27′ **55.** 0.6293 **57.** 0.0737 **59.** 1.2765

61. 0.7621 **63.** 0.9336 **65.** 12.4288 **67.** 1.0000

69. 1.7032 **71.** 30.8° **73.** 12.5° **75.** 64.4°

77. 46.5° **79.** 25.2° **81.** 38.6° **83.** 45° **85.** 60°

87. 45° **89.** 60° **91.** 30°