



*Precalculus  
Math Instructors*

***Bartlett High School***

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Precalculus Students,

Welcome! We are looking forward to spending the next year with you in math class, and hope that you will enjoy the course as much as we enjoy teaching it. There are many challenges, and you will find numerous opportunities to explore new and diverse topics. You are required to have a graphing calculator for this class. Classroom demonstrations will be presented on the TI 83 or TI 84 Plus. You are permitted to use most any graphing calculator that you may select, but be aware that you may not be permitted to use a TI 89, TI 92 or similar Casio or HP Calculator on classroom tests, as well as, standardized tests such as the ACT. If you have any questions about the calculator or the course please contact any of the teachers listed below.

Attached you will find your summer packet. The purpose of this experience is not to be intrusive on your summer, but to assure that you return in the fall reinforced with those skills necessary to begin PreCalculus. Topics are not placed in order of difficulty. Do not quit if you find a problem that you do not know how to solve. Try the next one, and the next one. Work is expected to be shown; answers only are unacceptable. You can find many internet sites that will review any of the topics on the list of prerequisite topics(in case you forgot or can't find previous class notes as a reference)

This packet will be used the first week of school. To improve the quality of your education, we must sometimes go outside the normal parameters of schooling. We want you to have a quality experience.

Have a great summer. If you have any questions, you may contact any precalculus teacher by email at [ShaneKinikin@u-46.org](mailto:ShaneKinikin@u-46.org), [DanKallenbach@u-46.org](mailto:DanKallenbach@u-46.org), [KenKubycheck@u-46.org](mailto:KenKubycheck@u-46.org), [MeghanStanley@u-46.org](mailto:MeghanStanley@u-46.org), or [LindaGartner@u-46.org](mailto:LindaGartner@u-46.org)

See you in August,

Precalculus Math Instructors

**TOPICS TO KNOW BEFORE PRECALCULUS** – These need to be reviewed before the start of class.

**ALGEBRA TOPICS**

Properties of Exponents and Simplifying expressions

Solving Linear Equations

Solving Systems of Linear Equations

Solving Inequalities

Finding Slope of a Line

Finding Equation of a Line given 2 points; given 1 point and slope; given 1 point and a parallel or perpendicular line

Factoring Polynomials (GCF, Trinomials, Difference of 2 Squares, Sum/Difference of 2 cubes)

Completing the Square

Solving Quadratic Equations by factoring, completing the square and Quadratic Formula.

Simplify Complex Numbers

Perform Operations with Complex Numbers

**GEOMETRY TOPICS**

MidPoint and Distance Formula

Pythagorean Theorem

Special Right Triangles ( $30^\circ$ - $60^\circ$ - $90^\circ$  and  $45^\circ$ - $45^\circ$ - $90^\circ$ )

Six Basic Trigonometric Function Ratios

Using Trig Functions to Solve Right Triangles

PRECALCULUS REVIEW QUESTIONS

SHOW ALL WORK

1.  $\frac{2}{5} + \frac{3}{4}$

2.  $\frac{5}{12} \cdot \frac{18}{25}$

3.  $\frac{8}{9} - \frac{2}{3}$

4.  $\frac{\frac{3}{5}}{\frac{7}{10}}$

5.  $\frac{\frac{2}{3}}{2}$

6. Solve:  $3(x - 4) = 12$

7. Solve:  $2x + y = 3$   
 $-4x + 3y = -1$

8. Simplify:  $(2x^3y^2)^2$

9.  $(3x^3y)(2xy^4)$

10. Simplify:  $4x + 5x$

11. Simplify:  $\sqrt{24} + 7\sqrt{6}$

12. Find slope of  $2x - 5y = 15$

13. Find equation of line containing (1, 1) and (4, 7)

14. Solve:  $1 - 2x < 15$

15. Simplify:  $(2x + 1)^2$

16. Simplify:  $(3 + 5x) - (2 + 3x)$

17. Simplify:  $(3 + 5x)(2 + 3x)$

18. Factor:  $x^2 + 8x + 12$

19. Factor:  $25x^2 - 9y^2$

20. Factor:  $2x^2 + 9x - 35$

21. Factor:  $8m^3 - 24m^2$

22. Solve by factoring:  $x^2 - 2x - 35 = 0$

23. Solve by quadratic formula:  $2x^2 - 5x + 1 = 0$

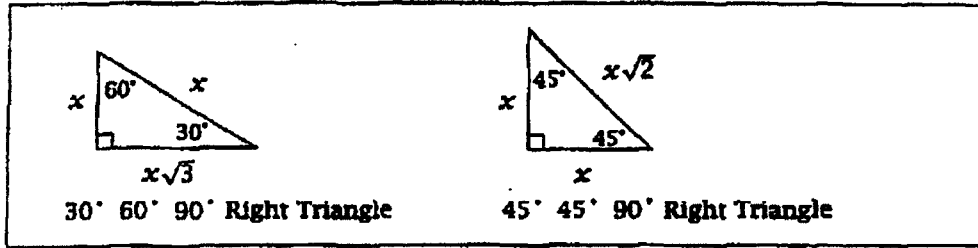
24. Simplify:  $3(-5 + 2i) + 2(-3 + 2i)$

25. Simplify:  $(3 + 2i)(4 - i)$

26. Solve:  $3x^2 + x + 5 = 0$

27. Graph:  $y = (x - 1)^2 + 4$

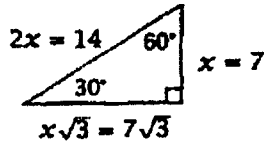
## Manipulating Special Right Triangles



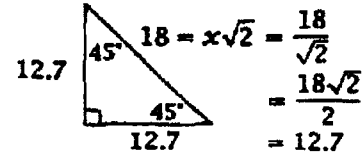
**Example:** Find the missing sides of each triangle. Leave in radical form.

**Note:** Since these are right triangles, you can check your answer using the Pythagorean theorem.

1.



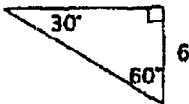
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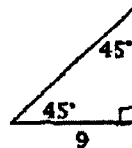
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1.

Find the missing sides of each triangle. Check your answers using the Pythagorean theorem.

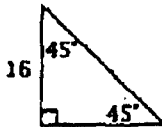
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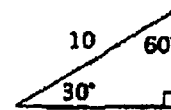
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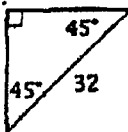
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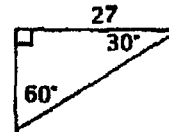
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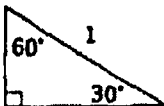
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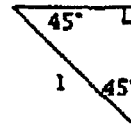
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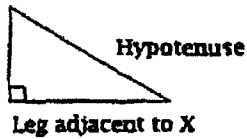


Name \_\_\_\_\_ Period \_\_\_\_\_

## Trigonometric Ratios

Use this helpful mnemonic to remember the following ratios: Oscar Has A Heap Of Apples.

Leg opposite to X



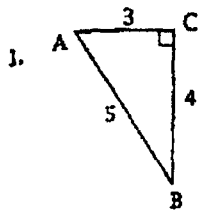
$$\text{Sine } x = \frac{\text{Opposite leg}}{\text{Hypotenuse}}$$

$$\text{Cosine } x = \frac{\text{Adjacent leg}}{\text{Hypotenuse}}$$

$$\text{Tangent } x = \frac{\text{Opposite leg}}{\text{Adjacent leg}}$$

Note: The trigonometric ratios hold only for right triangles.

Given a right triangle, find each trigonometric ratio. Leave your answer as a fraction. The first one has been started for you.

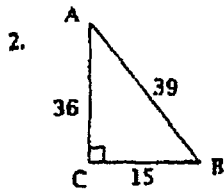


$$\begin{aligned} \sin A &= \frac{4}{5} \\ \cos A &= \frac{3}{5} \\ \tan A &= \frac{4}{3} \end{aligned}$$

$$\sin B =$$

$$\cos B =$$

$$\tan B =$$



$$\sin A =$$

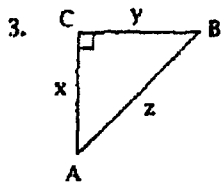
$$\sin B =$$

$$\cos A =$$

$$\cos B =$$

$$\tan A =$$

$$\tan B =$$



$$\sin A =$$

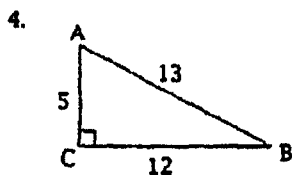
$$\sin B =$$

$$\cos A =$$

$$\cos B =$$

$$\tan A =$$

$$\tan B =$$



$$\sin A =$$

$$\sin B =$$

$$\cos A =$$

$$\cos B =$$

$$\tan A =$$

$$\tan B =$$

What did you notice about the  $\sin A$  and  $\cos B$ ?

## Evaluating Trigonometric Functions

Evaluate each trigonometric function. Round to the nearest hundredth. You will need a scientific calculator.

Example:  $\sin 60^\circ$

The calculator key sequence is  $\boxed{\sin} \boxed{60} \boxed{=} .8660254 = .87$

Note: If you do not get the above answer, check the mode on your calculator. The mode should be in degrees. If you still do not get the correct answer, try  $\boxed{60} \boxed{\sin} \boxed{=}$ .

1.  $\tan 45^\circ$

2.  $\cos 10^\circ$

3.  $\cos 220^\circ$

4.  $\sin 80^\circ$

5.  $\sin 23^\circ$

6.  $\tan 135^\circ$

Find the angle with the given trigonometric ratio. Round your answer to the nearest degree.

Example:  $\cos x = \left(\frac{6}{11}\right)$

calculator key sequence:  $\boxed{2nd} \boxed{\cos} \boxed{6} \boxed{\div} \boxed{11} \boxed{=} 56.94426885^\circ = 57^\circ$

Note: The mode on your calculator should still be in degrees. If you are not getting the correct answer, try

$\boxed{6} \boxed{\div} \boxed{11} \boxed{2nd} \boxed{\cos} \boxed{=}$ .

1.  $\cos x = \left(\frac{7}{19}\right)$

2.  $\tan x = \left(\frac{101}{90}\right)$

3.  $\sin x = \left(\frac{20}{21}\right)$

4.  $\cos x = \left(\frac{45}{76}\right)$

5.  $\tan x = \left(\frac{15}{4}\right)$

6.  $\sin x = \left(\frac{8}{99}\right)$

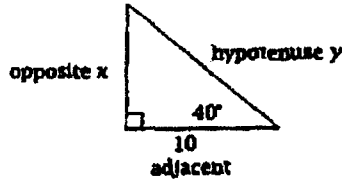
Note: The inverse trigonometric function is only used when finding an angle.

Name \_\_\_\_\_ Period \_\_\_\_\_

## Applying Trigonometric Ratios

Using the trigonometric ratios, solve for the missing sides  $x$  and  $y$  of each right triangle. Round your answers to the nearest tenth.

**Example:**



Ratios:  $\sin 40 = \left(\frac{x}{y}\right)$  — Note: having two variables in one ratio means it can not be solved.  
 $\cos 40 = \left(\frac{10}{y}\right)$   
 $\tan 40 = \left(\frac{x}{10}\right)$

Use the tan and the cos to solve for  $x$  and  $y$ .

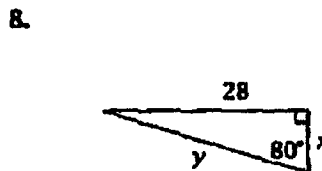
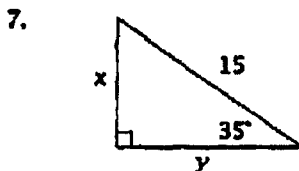
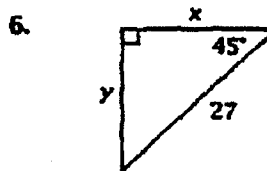
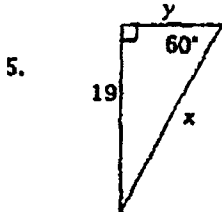
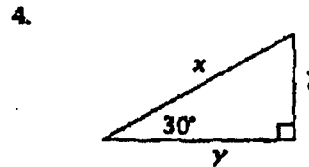
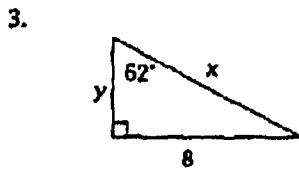
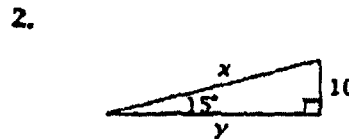
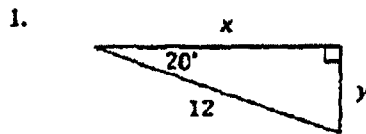
$$\cos 40^\circ = \frac{10}{y} \qquad \tan 40^\circ = \frac{x}{10}$$

$$y \cos 40^\circ = 10 \qquad x = 10 \tan 40^\circ = 8.39099$$

$$y = \frac{10}{\cos 40^\circ} = 13.05407 \qquad x = 8.4$$

$$y = 13.1$$

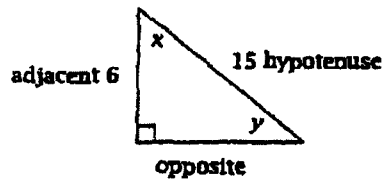
Note: Since these are right triangles you can check your answer using the Pythagorean theorem. The answers will not be exact due to rounding.



## Using Trigonometric Ratios to Find Angles

Using the trigonometric ratios, solve for the missing angles  $x$  and  $y$  of each right triangle. Round your answers to the nearest degree.

Example:

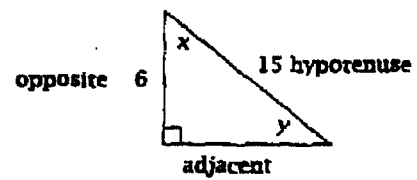


Solving for angle  $x$ :

$$\cos x = \left(\frac{6}{15}\right)$$

$$x = \cos^{-1}\left(\frac{6}{15}\right)$$

$$x = 66.421 = 66^\circ$$



Solving for angle  $y$ :

$$\sin y = \left(\frac{6}{15}\right)$$

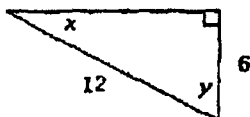
$$y = \sin^{-1}\left(\frac{6}{15}\right)$$

$$y = 23.578 = 24^\circ$$

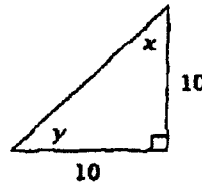
Check:  $66^\circ + 24^\circ = 90^\circ$

Check: The three angles of a triangle always add up to 180 degrees. Since these are right triangles, one angle must equal 90 degrees. Therefore the other two must add up to 90 degrees. Remember, rounding may cause the answers to be slightly off.

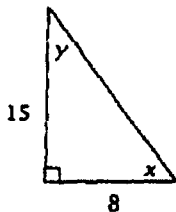
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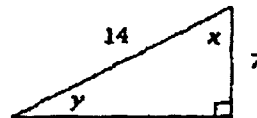
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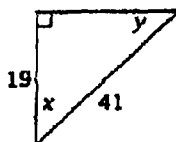
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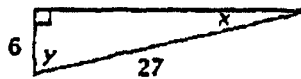
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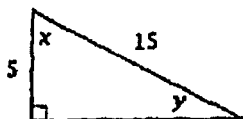
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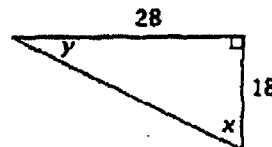
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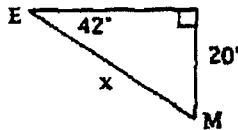


Name \_\_\_\_\_ Period \_\_\_\_\_

## Trigonometric Ratios

Draw a picture and solve the story problem using trigonometric ratios.

**example:** An eagle spotted a mouse 20 feet below at an angle of 42 degrees with the horizon. If the eagle flies along its line of sight, how far will it have to fly to reach its prey?



$$\sin 42^\circ = \frac{20}{x}$$

$$x = \frac{20}{\sin 42} = 29.889 = 29.9 \text{ feet}$$

1. A 20-foot ladder is leaning against a wall. The base of the ladder is 3 feet from the wall. What angle does the ladder make with the ground?
2. How tall is a bridge if a 6-foot-tall person standing 100 feet away can see the top of the bridge at an angle of 30 degrees to the horizon?
3. An air force pilot must descend 1500 feet over a distance of 9000 feet to land smoothly on an aircraft carrier. What is the plane's angle of descent?
4. In a movie theater 150 feet long, the floor is sloped so there is a difference of 30 feet between the front and back of the theater. What is the angle of depression?
5. A bow hunter is perched in a tree 15 feet off the ground. If he sees his prey on the ground at an angle of 30 degrees, how far will the arrow have to travel to hit his target?