

# Notes: Introduction to Pythagorean Theorem

Previous Knowledge:

- 1) The largest side of a triangle is across (opposite) from the \_\_\_\_\_.
- 2) The \_\_\_\_\_ of a right triangle is always across from the \_\_\_\_\_.
- 3) The Pythagorean Theorem is \_\_\_\_\_. And c is always used for the \_\_\_\_\_.

Ex. 1) What variable represents the hypotenuse?

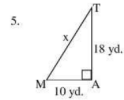
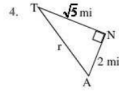
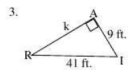


b) If  $p = 8$  and  $r = 15$  then  $w =$  \_\_\_\_\_.

Ex. 2) What variable represents the hypotenuse?

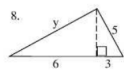
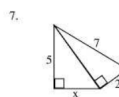
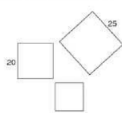


b) If  $p = 25$  and  $r = 24$  then  $w =$  \_\_\_\_\_.

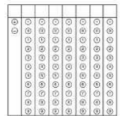


- A) 424      B)  $4\sqrt{106}$   
C)  $2\sqrt{106}$       D)  $106\sqrt{2}$

6. Find the missing side



8. The slide at the playground is 12 feet tall. If the bottom of the slide is 15 feet from the base of the ladder, how long is the slide?



Page 1 of 2 (continue on)

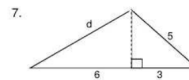
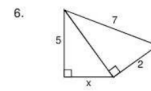
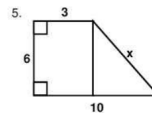
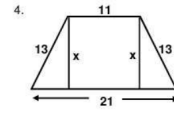
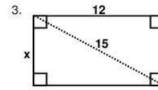
NAME \_\_\_\_\_ DATE \_\_\_\_\_ PER. \_\_\_\_\_  
Introduction to Pythagorean Theorem Assignment

Use the Pythagorean Theorem to find the missing length. Give answers to nearest hundredth.

1.  $a = 8$  and  $b = 6$ .

2.  $a = 24$  and  $c = 28$ .

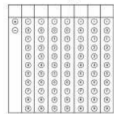
Solve each problem. Round to the nearest hundredths.



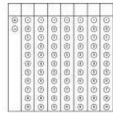
9. If you place a 16 ft ladder 6 feet from a wall, how high up the wall will it go?

10. A tree broke 6 feet from the bottom. If the top landed 12 feet from the base, how tall was the tree before it broke?

11. Jim headed south 5 miles from his house to the cleaners. From there he headed west to meet his friends. They were at a park 3 miles away. How far would he have to go if he went straight home?



12. There is a restaurant diagonally across a rectangular field from Jeff's dorm. If he followed the roads, he would have to go 2 blocks north and 3 blocks east. Each block is 100 ft long. How much shorter would it be for him if he walked diagonally across the field instead?



**MULTIPLE CHOICE:** Find the correct answer for each of the following. Clearly circle your answers. **WORK MUST BE SHOWN IN ORDER TO RECEIVE CREDIT.**

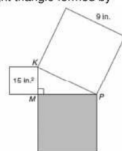
13. If  $\triangle KMP$  is a right triangle formed by

A.  $159 \text{ in.}^2$

B.  $129 \text{ in.}^2$

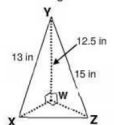
C.  $66 \text{ in.}^2$

D.  $24 \text{ in.}^2$



14. The figure below shows three right triangles joined at their right-angle vertices to form a triangular pyramid. Which of the following is the closest to the length of XZ?

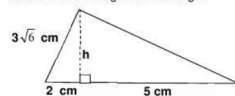
- A. 7 inches  
B. 20 inches  
C. 12 inches  
D. 9 inches



15. The legs of a right triangle are 4 cm and 7 cm long. To the nearest cm, how long is the hypotenuse?

- A. 11 cm  
B. 10 cm  
C. 14 cm  
D. 8 cm

16. What is the height of the triangle?



- A. 2 cm  
B. 1 cm  
C.  $5\sqrt{2}$  cm  
D.  $5\sqrt{10}$  cm

Page 2 of 2 (STOP)

NAME \_\_\_\_\_ DATE \_\_\_\_\_ PER. \_\_\_\_\_  
Pythagorean Theorem Converse and Inequalities Assignment

Determine if a triangle can be formed with the given lengths. If so, classify the triangle by angles.

1. 7, 20, and 12      YES or NO      Classify:

2. 15, 8, and 17      YES or NO      Classify:

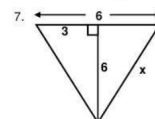
3. 12, 10, and 8      YES or NO      Classify:

4. 20, 8, and 19      YES or NO      Classify:

5. 16, 30, 34      YES or NO      Classify:

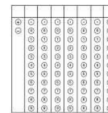
6. 80, 71, and 5      YES or NO      Classify:

Find the indicated length.

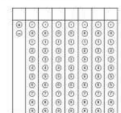


8. A rectangle has a diagonal of 2 and a length of  $\sqrt{3}$ . Find its width.

9. Find the length of a diagonal of a square with perimeter 16.



10. If you had a 20 ft ladder, how far away from a building would you have to place the bottom to reach a window 15 feet up?



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# NOTES: Isosceles Right Triangles

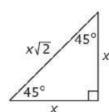
FROM STAAR CHART

A diagonal of a square divides it into two congruent

45° - 45° - 90° triangle

\_\_\_\_\_. Since the base angles of an isosceles triangle are \_\_\_\_\_, the measure of each acute angle is \_\_\_\_\_. So another name for an isosceles right triangle is a 45°-45°-90° triangle.

A 45°-45°-90° triangle is one type of \_\_\_\_\_.



**Example 1A:** Finding Side Lengths in a 45°-45°-90° Triangle

Find the value of  $x$ .



**Example 1B:**

Find the value of  $x$ .



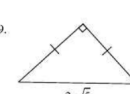
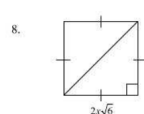
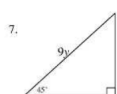
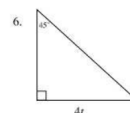
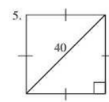
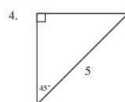
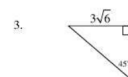
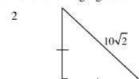
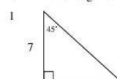
**Example 2:**

Jana is cutting a square of material for a tablecloth. The table's diagonal is 36 inches. She wants the diagonal of the tablecloth to be an extra 10 inches so it will hang over the edges of the table. What size square should Jana cut to make the tablecloth? Round to the nearest inch.

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

## Isosceles Right Triangles Assignment

I. Fill in the length of each segment in the following figures.

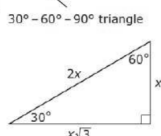


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Notes: 30°-60°-90°

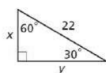
A 30°-60°-90° triangle is another

\_\_\_\_\_. You can use an \_\_\_\_\_ triangle to find a relationship between the lengths.



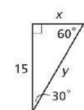
**Example 1A:** Finding Side Lengths in a 30°-60°-90° Triangle

Find the values of  $x$  and  $y$ . Give your answers in simplest radical form.



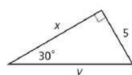
**Example 1B:**

Find the values of  $x$  and  $y$ . Give your answers in simplest radical form.



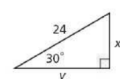
**Example 1C:**

Find the values of  $x$  and  $y$ . Give your answers in simplest radical form.



**Example 1D:**

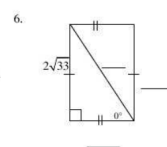
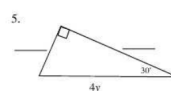
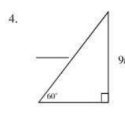
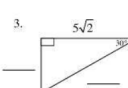
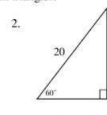
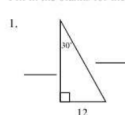
Find the values of  $x$  and  $y$ . Give your answers in simplest radical form.



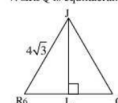
Name: \_\_\_\_\_ Period: \_\_\_\_\_

## 30°-60°-90° Triangles Assignment

Fill in the blanks for the special right triangles.

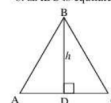


7.  $\triangle RJQ$  is equilateral.



JQ = \_\_\_\_\_  
RL = \_\_\_\_\_  
LQ = \_\_\_\_\_  
JL = \_\_\_\_\_

8.  $\triangle ABC$  is equilateral.



AD = \_\_\_\_\_  
DC = \_\_\_\_\_  
AB = \_\_\_\_\_  
BC = \_\_\_\_\_

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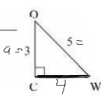
Name: \_\_\_\_\_ Period: \_\_\_\_\_

### Mixed Practice Assignment

1. For each problem:

- Determine if you should use Pythagorean Theorem,  $30^\circ$ - $60^\circ$ - $90^\circ$ , or  $45^\circ$ - $45^\circ$ - $90^\circ$
- Show work and find all the missing segment lengths

1. Use:  $30^\circ$ - $60^\circ$ - $90^\circ$



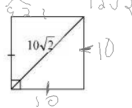
2. Use:  $45^\circ$ - $45^\circ$ - $90^\circ$



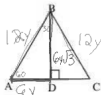
3. Use:  $30^\circ$ - $60^\circ$ - $90^\circ$



4. Use:  $45^\circ$ - $45^\circ$ - $90^\circ$



5.  $\triangle ABC$  is equilateral with perimeter  $36y$  units. Find the length of each side and the height.

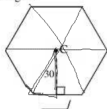


Use:  $30^\circ$ - $60^\circ$ - $90^\circ$

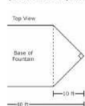
$$\frac{36y}{3} = 12y = x$$

6.  $P$  is the center of a regular hexagon. Find the length of each side.

Use:  $30^\circ$ - $60^\circ$ - $90^\circ$



posed of a square and 2



Page 1 of 3 (continue on)

### Notes Introduction to Trig

The mathematics field called Trigonometry is the study of right triangles and the ratios of the sides.

Each angle of a right triangle has a unique decimal value for each trigonometric ratio. Your calculator has these tables memorized for you. Find the SINE, COSINE and TANGENT buttons on your calculator.

1) Press MODE and make sure the DEGREE selection is highlighted. Always check that your calculator is in DEGREE mode. You are responsible to check.

2) Press the Trigonometric function you would like followed by the measure of the angle. **Round to the nearest hundredth.**

Ex 1.  $\sin 35^\circ = 0.57$

Ex 2.  $\cos 18^\circ = 0.95$

Ex 3.  $\tan 87^\circ = 19.08$

If you are given the ratio and asked for the angle, you just use the ratio backwards. Your calculator needs to be told to do this.

Write the keys you will press and then write the angle to the nearest degree.

Ex 7.  $\sin x^\circ = \frac{8}{17}$   $x^\circ = 28$  Ex 8.  $\tan x^\circ = 1.875$   $x^\circ = 62$  Ex 9.  $\cos x^\circ = \frac{1}{3}$   $x^\circ = 60$

$\sin^{-1}(\frac{8}{17})$

$\tan^{-1} 1.875$

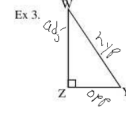
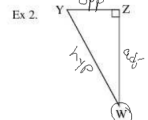
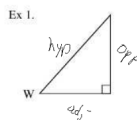
$\cos^{-1} \frac{1}{3}$

There are 3 trigonometric relationships that we study.

- Sine is the ratio of the opp side to the hyp
- Cosine is the ratio of the adj side to the hyp
- Tangent is the ratio of the opp side to the adj side.

The hypotenuse NEVER changes, but opposite and adjacent are dependent on the angle used. The right angle is NEVER used.

The three sides of the triangles are referred to as Hypotenuse (H), Adjacent (A), and Opposite (O). Label each side of each triangle using angle W as your reference.

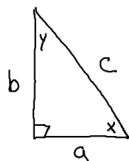


## SOH CAH TOA

$$\sin x = \frac{\text{opp}}{\text{hyp}} = \frac{b}{c}$$

$$\cos x = \frac{\text{adj}}{\text{hyp}} = \frac{a}{c}$$

$$\tan x = \frac{\text{opp}}{\text{adj}} = \frac{b}{a}$$



To help you remember these relationships, you can use the phrase SOH CAH TOA.

The trigonometric ratios are written in an equation form. (\*\*Hint: Write these ratios at the top of EVERY page you are working on.)

Sine  $x^\circ = \frac{\text{opp}}{\text{hyp}}$

Cosine  $x^\circ = \frac{\text{adj}}{\text{hyp}}$

Tangent  $x^\circ = \frac{\text{opp}}{\text{adj}}$

USE THE TRIANGLE AT THE RIGHT to determine the following trigonometric ratios.

Ex 4.  $\sin 40^\circ = \frac{10}{n}$

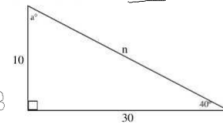
Ex 5.  $\sin a^\circ = \frac{30}{n}$

Ex 6.  $\cos 40^\circ = \frac{30}{n}$

Ex 7.  $\cos a^\circ = \frac{10}{n}$

Ex 8.  $\tan 40^\circ = \frac{10}{30} = \frac{1}{3}$

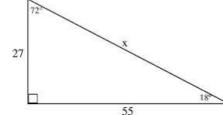
Ex 9.  $\tan a = \frac{30}{10} = 3$



Use the triangle at the right to write all of the following trigonometric equations.

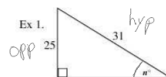
From  $72^\circ$

From  $18^\circ$

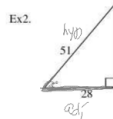


### Use Trigonometric Ratios to Solve for Missing Sides and Angles

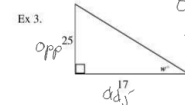
- Determine which Trig Ratio will fit your information.
- Set up the Trig Ratio
- Round to the nearest degree if it is an angle and round to the nearest hundredth for sides.



$\sin a = \frac{25}{31}$   
 $\sin^{-1}(\frac{25}{31}) = 54^\circ$



$\cos 2 = \frac{28}{51}$   
 $\cos^{-1}(\frac{28}{51}) = 57^\circ$



$\tan w = \frac{25}{17}$   
 $\tan^{-1}(\frac{25}{17}) = 56^\circ$

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

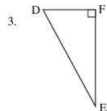
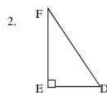
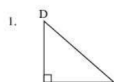
# Introduction to Trig Worksheet

Write down what buttons you would push to get the answer for the following problems. Do not forget to include checking the mode. Then answer the problems.

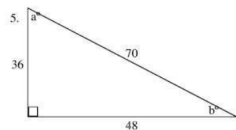
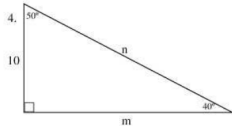
1.  $\sin 40^\circ =$  \_\_\_\_\_

2.  $\tan x^\circ = \frac{5}{7.5}$   $x^\circ =$  \_\_\_\_\_

The three sides of the triangles are referred to as Hypotenuse (H), Adjacent (A), and Opposite (O). Label each side of each triangle using angle D as your reference.

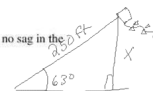


Use the triangles below to write all 6 trig equation from the two acute angles.



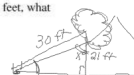
1. A kite is flying at an angle of  $63^\circ$  with the ground. If all 250 feet of string are out, and there is no sag in the string, how high is the kite?

*Sin*



2. A 30 foot tree broke from its base and fell against a house. If the tree touches the house at 21 feet, what angle is the tree forming with the house?

*cos^-1*



3. A tree casts a shadow of 28 ft. The elevation of the sun is  $49^\circ$ . How tall is the tree?

*tan*

4. Joey is putting up an antenna. At the 30 foot mark, he attaches a 50 foot guy wire. What angle does the guy wire form with the antenna?



5. A freeway entrance ramp has an elevation of  $15^\circ$ . If the vertical lift is 22 feet, what is the distance up the ramp?

6. A person at the top of a cliff 100 feet tall sees Gilligan's boat. His sighting of the boat is at an angle of depression of  $10^\circ$ . How far is the boat from the base of the cliff?

*tan*



7. A 24 foot ladder is placed against a wall at  $55^\circ$  with the ground. How far away from the wall is the base of the ladder?

8. A 32 in. bat is leaning against a fence. If the bat is 15 in. away from the base of the fence, what angle is formed between the ground and the bat?

9. Ana knows that she is one mile from the base of a tower. Using a protractor she estimates an angle of elevation to be  $3^\circ$ . How tall is the tower to the nearest foot? (1 mile = 5280 feet)

10. A plane takes off at an elevation of  $20^\circ$ . In its path is the tower of 170 feet. If the plane at takeoff is 500 feet away from the tower. What is the altitude of plane? Will it clear the height of the tower? If yes, by how much?