Do Now: Decide whether the set of numbers can represent the side lengths of a triangle. If they can classify the triangle as right, acute, or obtuse.

a. 5, 5,5√2

$5+5 > 5\sqrt{2}$ ✓

$5+5\sqrt{2} > 5$ ✓

$5\sqrt{2}+5 > 5$ ✓

yes, we have a △

$(5\sqrt{2})^2 \_\_ 5^2+5^2$

$(25\cdot 2) \_\_ 25+25$

$50 = 50$

we have a right △

b. 4, 6, 12

$4+6 \not> 12$ ✗

we do not have a triangle

Homework Solutions: Let's Start with 7.1...

Page 468 #3, 4, 7, 8, 12, 15-17, 22-28 even, 31

4.) x=34, yes
8.) x=3√55=22.2, no
12.) 26 should be sub. for c. x=24
16.) no
22.) yes, right
24.) no
26.) yes, obtuse
28.) yes, right

# Unit 9 Day 3:
# Trigonometry
## 9.3: Special Right Triangles

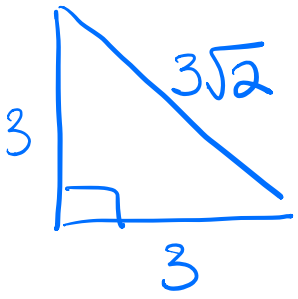
## Today's I Can Statement:

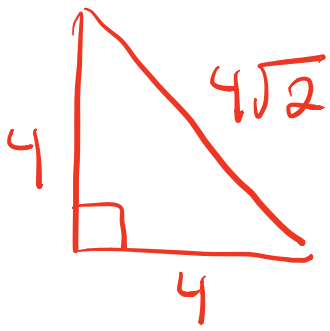
TR-5: I can use side ratios to find missing side lengths in special right triangles.

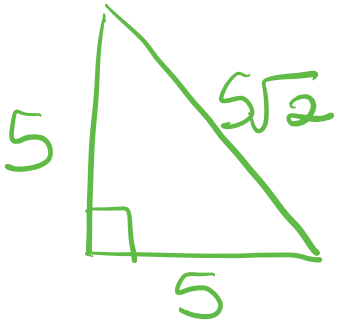
# Special Right Triangles

## $45^0 - 45^0 - 90^0$

1.) Draw an isosceles right triangle with leg length of 3, 4, or 5.
2.) Use Pythagorean theorem to find the hypotenuse.
3.) Compare the leg length to the hypotenuse in a 45-45-90 triangle and write a conclusion based on what you see.

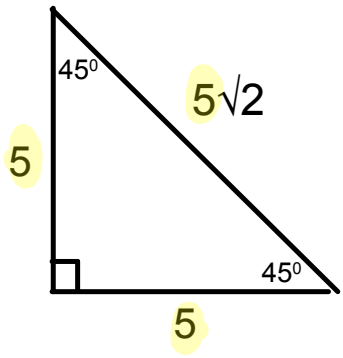


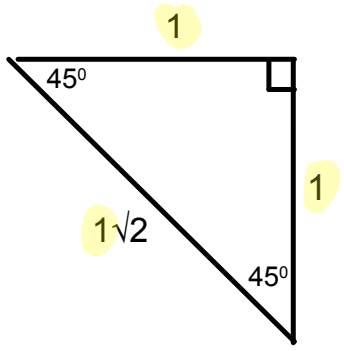



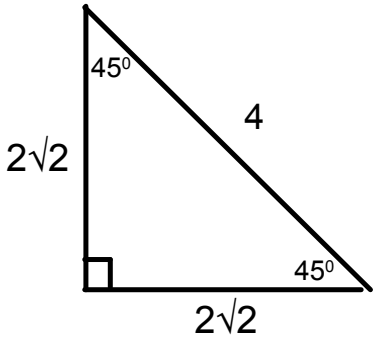



# I. 45-45-90 Triangle

Can you write a statement about the relationship between the lengths of the sides of a 45-45-90 triangle?




$2\sqrt{2} \cdot \sqrt{2} = 2 \cdot 2$

$= 4$

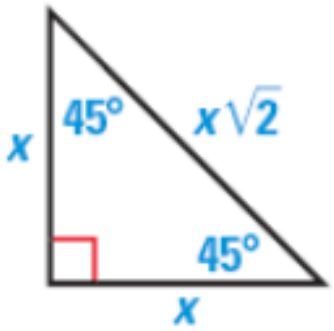
# I. 45-45-90 Triangle

## Theorem: 45°-45°-90° Triangle Theorem

In a 45°-45°-90° triangle, the hypotenuse is $\sqrt{2}$ times as long as each leg.

Hypotenuse = (leg)$\sqrt{2}$

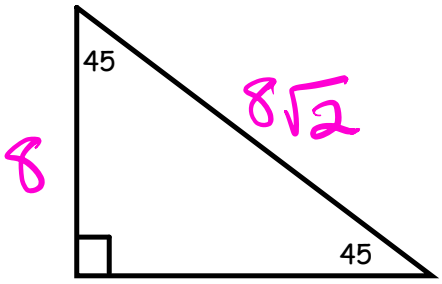
The legs are congruent.



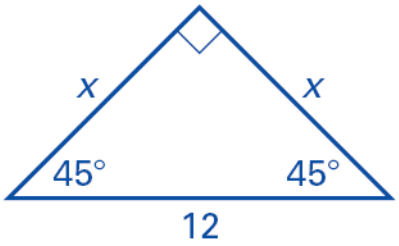
# I. 45-45-90 Triangle

Example

1.) Find the missing sides.




2.) Find the value of $x$.




$\frac{12}{\sqrt{2}} = \frac{x\sqrt{2}}{\sqrt{2}}$

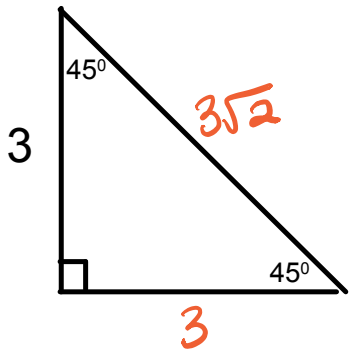
$\frac{12}{\sqrt{2}} = x$ rationalize

$x = \frac{12\sqrt{2}}{2}$

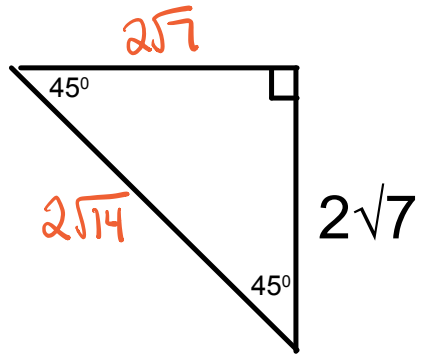
$x = 6\sqrt{2}$

# I. 45-45-90 Triangle

a.)



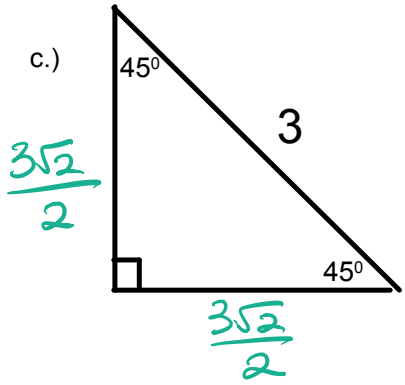

b.)




$2\sqrt{7} \cdot \sqrt{2} = 2\sqrt{14}$

## Example

c.)

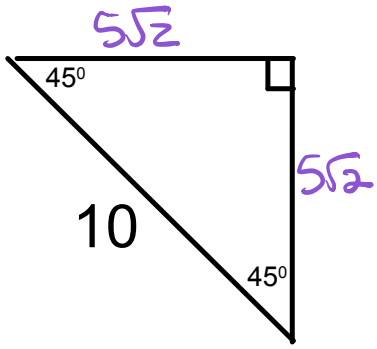



$\frac{3}{\sqrt{2}} = \frac{x\sqrt{2}}{\sqrt{2}}$

$x = \frac{3}{\sqrt{2}}$

$x = \frac{3\sqrt{2}}{2}$

d.)




$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{10}{\sqrt{2}}$

$x = \frac{10}{\sqrt{2}}$

$x = \frac{10\sqrt{2}}{2}$

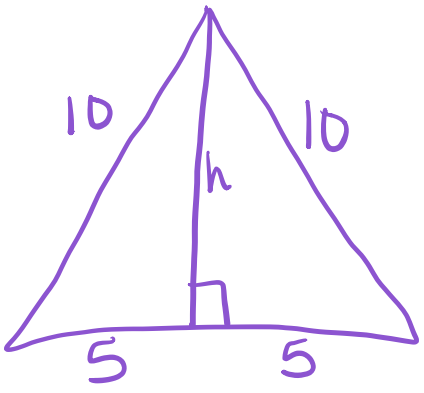
$x = 5\sqrt{2}$

II. 30-60-90 Triangle

# Special Right Triangles

## $30^0 - 60^0 - 90^0$

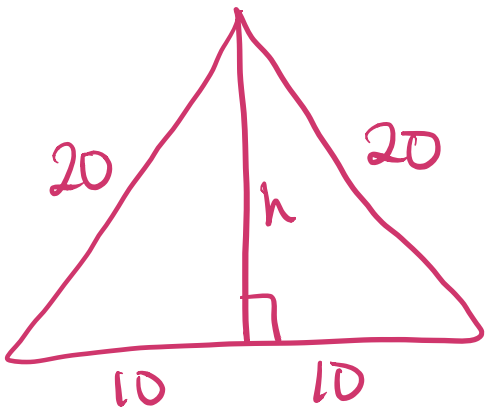
1.) Draw an equilateral triangle with side length of 10 or 20.
2.) Draw in the altitude to the base. (cuts the base in half)
3.) Use Pythagorean theorem to find the altitude.
4.) Compare the leg length to the hypotenuse in a 30-60-90 triangle and write a conclusion based on what you see.




$h^2 + 5^2 = 10^2$

$h^2 = 10^2 - 5^2$

$h = 5\sqrt{3}$



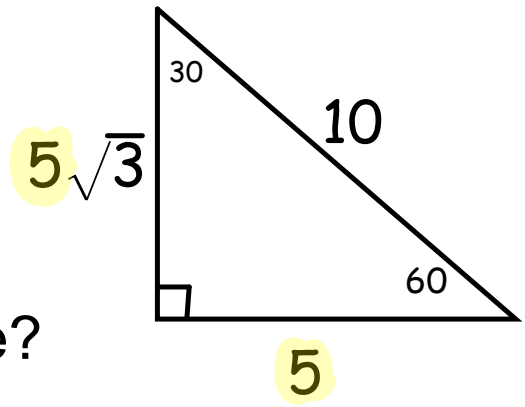

$h^2 + 10^2 = 20^2$

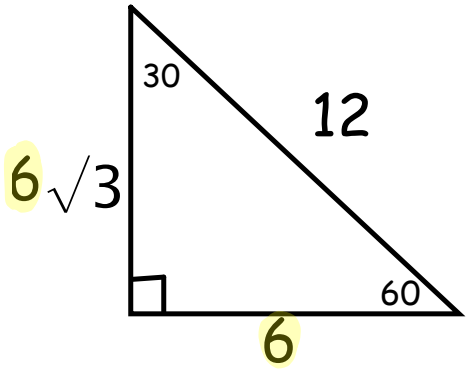
$h^2 = 20^2 - 10^2$

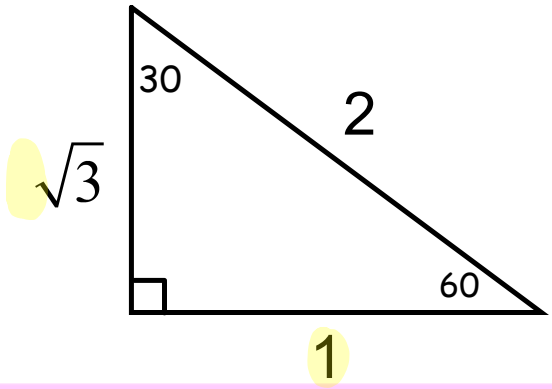
$h = 10\sqrt{3}$

## II. 30-60-90 Triangle

Can you write a statement about the relationship between the lengths of the sides of a 30-60-90 triangle?



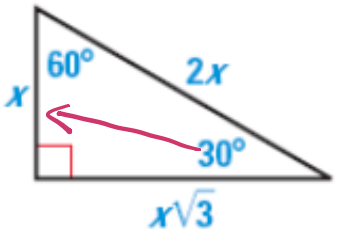



# II. 30-60-90 Triangle

## Theorem: $30^o$-$60^o$-$90^o$ Triangle Theorem

In a $30^o$-$60^o$-$90^o$ triangle, the hypotenuse is twice as long as the shorter leg, and the longer leg is $\sqrt{3}$ times as long as the shorter leg.

Hypotenuse = 2 (shorter leg)
Longer leg = (shorter leg)$\sqrt{3}$

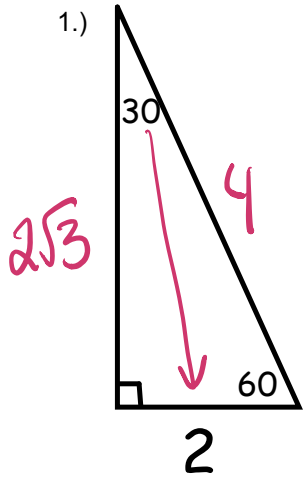



*Short leg is across from the 30
*Long leg is across from the 60

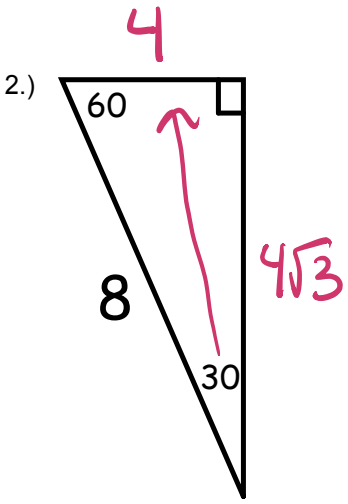
# II. 30-60-90 Triangle

## Example

1.)




2.)

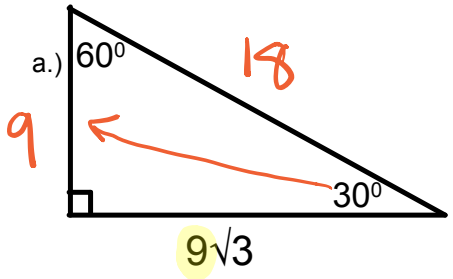



$\frac{8}{2} = \frac{2x}{2}$

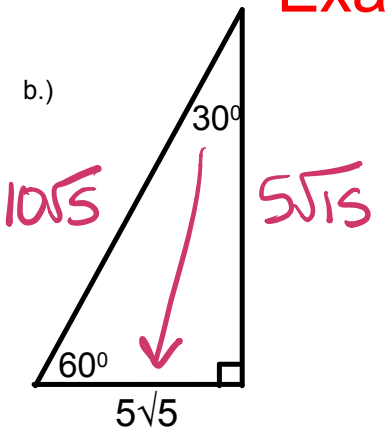
$x = 4$

# II. 30-60-90 Triangle

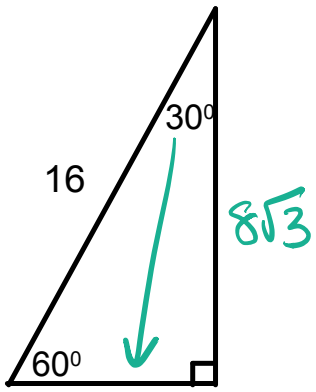
a.)



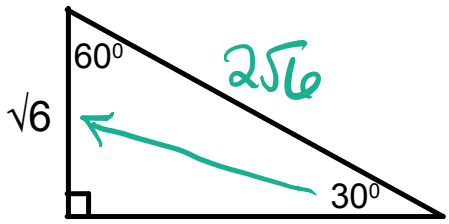

b.)




c.)




d.)




Example

$5\sqrt{5} \cdot \sqrt{3}$

$\sqrt{6} \cdot \sqrt{3}$

$= \sqrt{18}$

$9 \cdot 2$

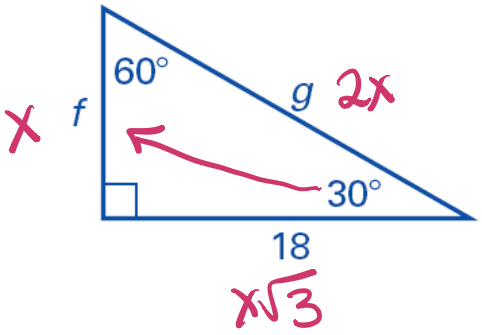
$3 \cdot 3$

$= 3\sqrt{2}$

## II. 30-60-90 Triangle

Example

Find the value of $f$ and $g$.




$x\sqrt{3} = 18$

$x = \frac{18}{\sqrt{3}}$

$x = \frac{18\sqrt{3}}{3}$

$x = 6\sqrt{3} = f$

$g = 2x$

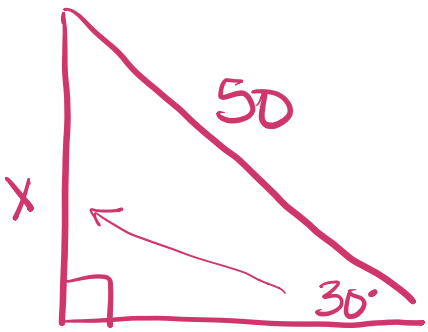
$g = 2 \cdot 6\sqrt{3}$

$g = 12\sqrt{3}$

## III. Application

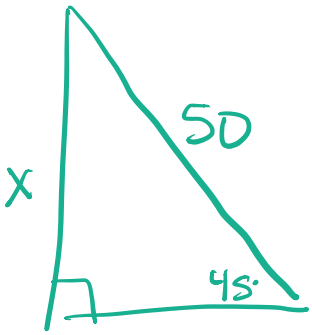
Example

A ramp is used to unload trucks. How high is the end of a 50 foot ramp when it is tipped by a 30° angle? by a 45° angle?




$\frac{50}{2} = \frac{2x}{2}$

$x = 25$ ft




$50 = x\sqrt{2}$

$\frac{50}{\sqrt{2}} = x$

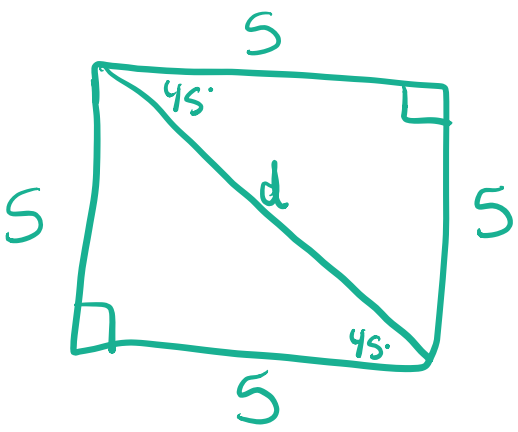
$\frac{50\sqrt{2}}{2} = x$

$x = 25\sqrt{2}$ ft

## III. Application

Example

The perimeter of a square is 20 centimeters. Find the length of a diagonal.




$20 \div 4 = 5$

$d = x\sqrt{2}$

$x = side = 5$

$d = 5\sqrt{2}$

Tonight's Assignment:

p.475 #3-10, 13-16, 22

Quiz Tuesday 2/18 Wednesday 2/19

Today's I Can Statement:

TR-5: I can use side ratios to find missing side lengths in special right triangles.