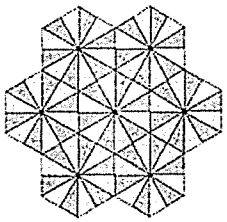
Special Right Triangles Notes Rightful Writer:

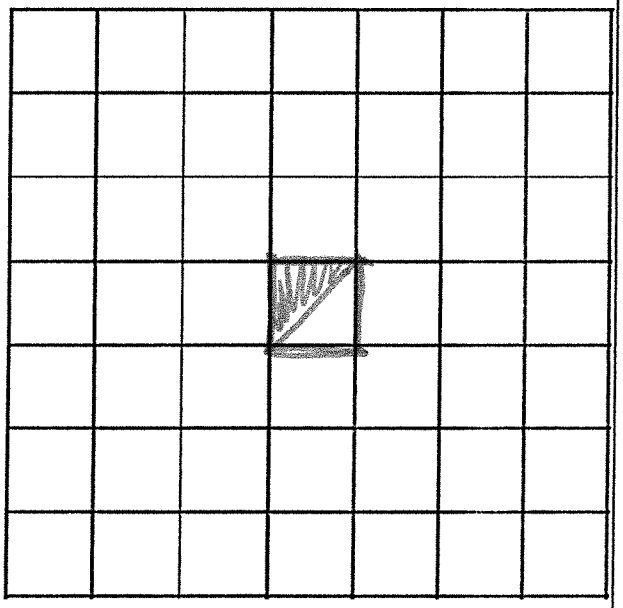
Date:



45-45-90 Triangles

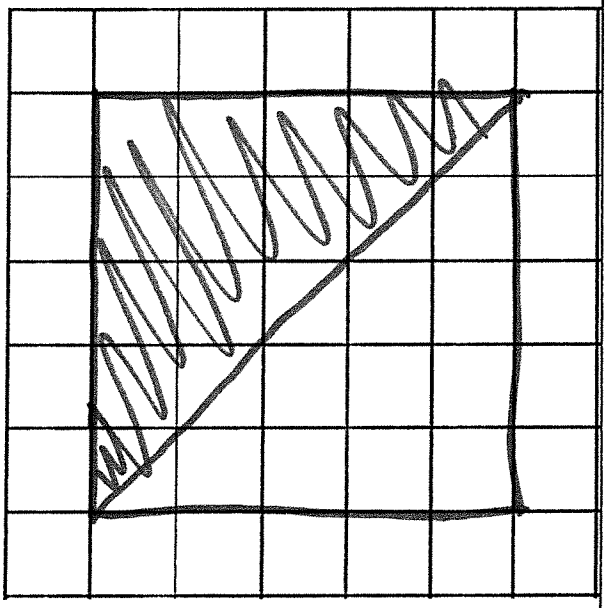
Triangle 1

- Draw a square with side length of 1
- Draw a diagonal line in this square, cutting it in half
- Shade in one of the triangles below, use this to answer questions below!

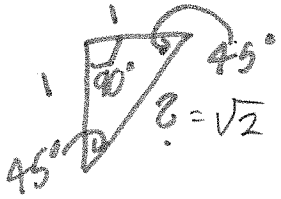


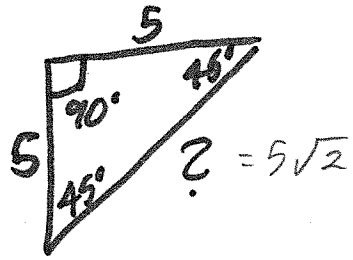
Triangle 2

- Draw a square with side length of 5
- Draw a diagonal line in this square, cutting it in half
- Shade in one of the triangles below, use this to answer questions below!



1. If all of the angle measures in a square are 90°, what are the angle measures for the triangle you made (after splitting the square in half diagonally).





2. Use the Pythagorean theorem to find the length of the hypotenuse of each triangle. <u>Leave your answer in simplified radical form (with a square root).</u>

$A^2+B^2=C^2$ (hyp)

$1^2+1^2=C^2$

$2=C^2$

$\sqrt{2}=c$

$5^2+5^2=C^2$

$50=C^2$

$\sqrt{50}=C$

$5\sqrt{2}=C$

$\sqrt{25}\ \sqrt{2}$

$5\sqrt{2}$

3. For each triangle: label one leg as "a", another leg as "b", and the hypotenuse as "c". Then fill in the tables below.

Triangle 1

Measure of largest angle	Measure of other angle	Measure of last angle	Length of side a	Length of side b	Length of side c	$\frac{Side\ c}{Side\ a}$	$\frac{Side\ c}{Side\ b}$
$90°$	$45°$	$45°$	1	1	$\sqrt{2}$	$\frac{\sqrt{2}}{1}$	$\frac{\sqrt{2}}{1}$

Triangle 2

Measure of largest angle	Measure of other angle	Measure of last angle	Length of side a	Length of side b	Length of side c	$\frac{Side\ c}{Side\ a}$	$\frac{Side\ c}{Side\ b}$
$90°$	$45°$	$45°$	5	5	$5\sqrt{2}$	$\frac{5\sqrt{2}}{5} = \frac{\sqrt{2}}{1}$	$\frac{5\sqrt{2}}{5} = \frac{\sqrt{2}}{1}$

4. What do you notice about the ratio of the length of each leg to the length of each hypotenuse?

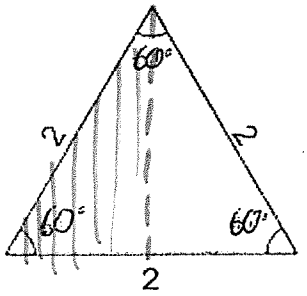
5. Do you think if we had a 3rd square with side length of 6, we would find the same ratio between the hypotenuse and side lengths? Explain using what we know about sine, cosine, and tangent ratios.

6. If we had a 3rd square with a side length of 6, what would be the length of the hypotenuse? Try finding this without using the pythagorean theorem.

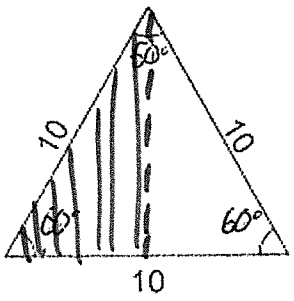
30-60-90 Triangles

An equilateral triangle is one where all sides are equal lengths and all angles are equal measures.

Triangle 3



Triangle 4



In each of the equilateral triangles above, draw a vertical line cutting the triangles in half, then shade in one half, then use that triangle for the questions below.

Label the shaded triangles like this:
The shortest side is "a", the longest side is "c", and the remaining side is "b"

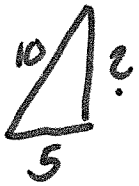
7. Find the length of side b using the pythagorean theorem. Leave your answer in simplified radical form (with a square root).

$1^2 + B^2 = 2^2$

$1 + B^2 = 4$

$B^2 = 3$

$B = \sqrt{3}$



$5^2 + B^2 = 10^2$

$25 + B^2 = 100$

$B^2 = 75$

$B = \sqrt{75}$

$B = 5\sqrt{3}$

$\sqrt{75}$

$\sqrt{25}\ \sqrt{3}$

$5\sqrt{3}$

8. Fill in the tables below about the triangles you made.

Triangle 3

Measure of largest angle	Measure of small angle	Measure of middle angle	Length of side a	Length of side b	Length of side c	$\frac{\text{Side } c}{\text{Side } a}$	$\frac{\text{Side } b}{\text{Side } a}$
90°	30°	60°	1	$\sqrt{3}$	2	$\frac{2}{1}$	$\frac{\sqrt{3}}{1}$

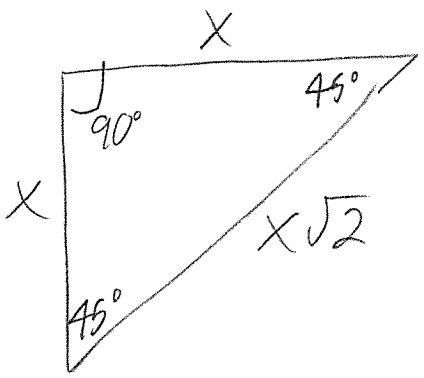
Triangle 4

Measure of largest angle	Measure of small angle	Measure of middle angle	Length of side a	Length of side b	Length of side c	$\frac{\text{Side } c}{\text{Side } a}$	$\frac{\text{Side } b}{\text{Side } a}$
90°	30°	60°	5	$5\sqrt{3}$	10	$\frac{10}{5} = \frac{2}{1}$	$\frac{5\sqrt{3}}{5} = \frac{\sqrt{3}}{1}$

9. If we had a similar triangle with a hypotenuse that is 24cm long, what would be the length of side a and side b in that triangle?

10. What can we conclude about 45-45-90 triangles and 30-60-90 triangles? Take your own notes here.

45-45-90



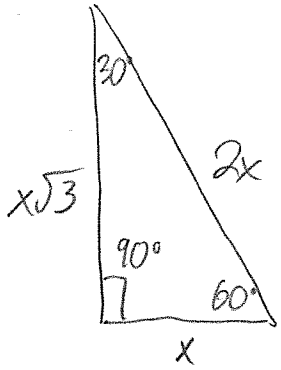
2 angles same (45°)
2 sides same (x)
hyp = side · √2 (x√2)

Ratio of sides

1 : 1 : √2

If one side is 3x larger, all sides are 3x larger → 3 : 3 : 3√2

30-60-90



Hypotenuse = 2x larger than small side (2x)
Medium side = √3x larger than small side (x√3)

Ratio of sides

1 : √3 : 2

If one side is 8x larger, all sides are 8x larger
↳ 8 : 8√3 : 16