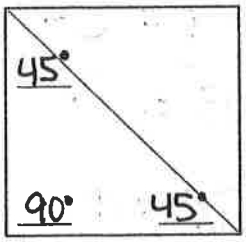
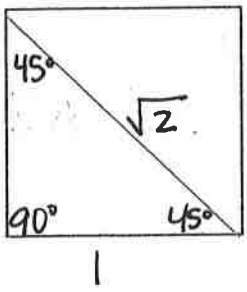
Discovering Special Right Triangles - 45-45-90 Triangle

In this discovery activity, we will be looking at one special type of right triangles. Through this process, you will be able to discover the rules for a 45-45-90 Triangle.

1. Start with a square that measures 1 unit on each side and draw the diagonal to this square. Fill in the blanks below to identify the measures of each angle.



2. Label the two sides of the square by its length of 1 unit. Use Pythagorean Theorem to find the length of the diagonal of the square (hypotenuse of the triangle). Express this measure in simplest radical form. Label all angle measures below as shown in #1.



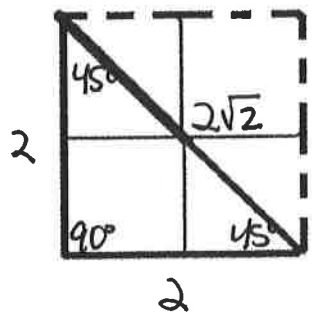
$1^2 + 1^2 = c^2$

$1 + 1 = c^2$

$2 = c^2$

$\sqrt{2} = c$

3. Use a square that is 2 units on the side and draw the diagonal. Label each leg as 2 units in length and use Pythagorean Theorem to find the length of the hypotenuse. Express the measure of the hypotenuse in simplest radical form. Label all angle measures below as shown in #1.



$2^2 + 2^2 = c^2$

$4 + 4 = c^2$

$\sqrt{8} = \sqrt{c^2}$

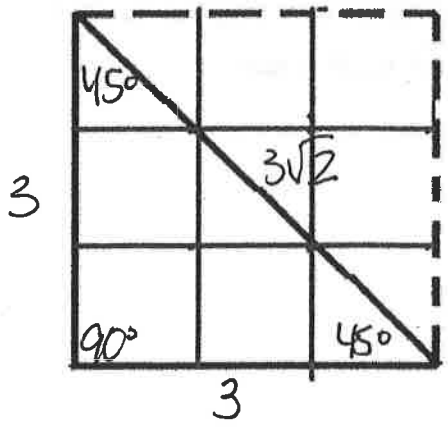
$2\sqrt{2} = c$

$2\overline{)8}$

$2\overline{)4}$

2

4. Use a square that is 3 units on the side and draw the diagonal. Label each leg as 3 units in length and use Pythagorean Theorem to find the length of the hypotenuse. Express the measure of the hypotenuse in simplest radical form. Label all angle measures below as shown in # 1.



$3^2 + 3^2 = c^2$

$9 + 9 = c^2$

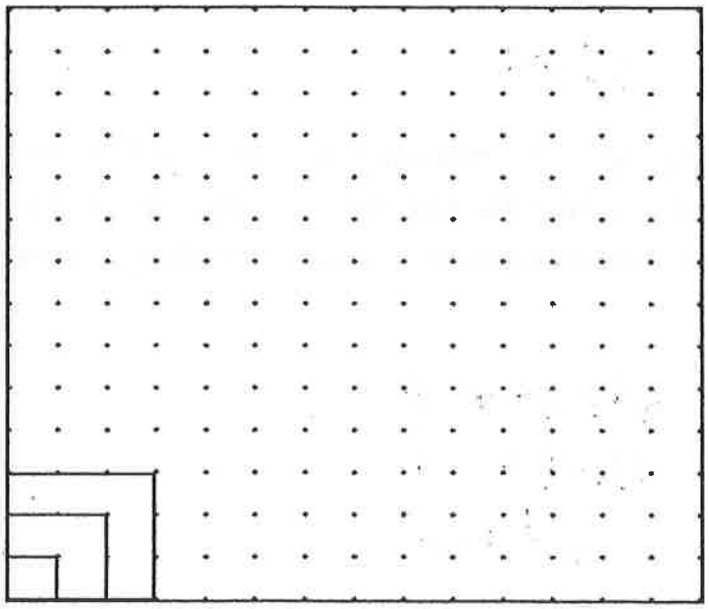
$\sqrt{18} = \sqrt{c^2}$

$3\sqrt{2} = c$

$2\overline{)18}$
$3\overline{)9}$
3

5. Use the information above to fill in part of the chart below and then complete the information for the remainder of the chart. You may use the dot paper below to help.

Length of each leg	1	2	3	4	5	6	7	8	x
Length of hypotenuse	$\sqrt{2}$	$2\sqrt{2}$	$3\sqrt{2}$	$4\sqrt{2}$	$5\sqrt{2}$	$6\sqrt{2}$	$7\sqrt{2}$	$8\sqrt{2}$	$x\sqrt{2}$



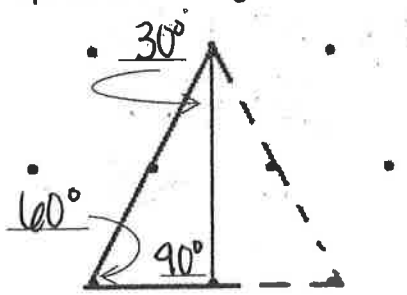
6. What is the general rule for finding the hypotenuse of a 45-45-90 triangle?

the hypotenuse is equal to the leg length multiplied by $\sqrt{2}$

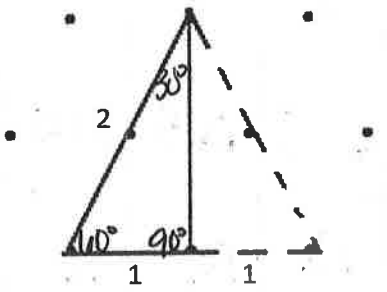
Discovering Special Right Triangles - 30-60-90 Triangle

In this discovery activity, we will be looking at another special type of right triangles. Through this process, you will be able to discover the rules for a 30-60-90 Triangle.

7. Start with an equilateral triangle as shown below. The altitude of the equilateral triangle will need to be drawn to create two right triangles. We will just use one of the right triangles. Fill in the blanks below to identify the measures of each angle. Keep in mind that we started with an equilateral triangle.



8. The sides have been labeled by its unit length for this example. Use Pythagorean Theorem to find the length of the altitude of the equilateral triangle. Express the measure of the altitude in simplest radical form. Label all angle measures below as shown in # 1.



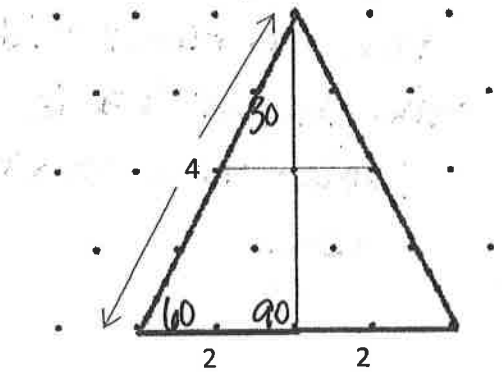
$1^2 + x^2 = 2^2$

$1 + x^2 = 4$

$x^2 = 3$

$x = \sqrt{3}$

9. Use an equilateral triangle that is 4 units on the sides. The sides have been labeled by its unit length for this example. Use Pythagorean Theorem to find the length of the altitude of the equilateral triangle. Express the measure of the altitude in simplest radical form. Label all angle measures below as shown in # 1.



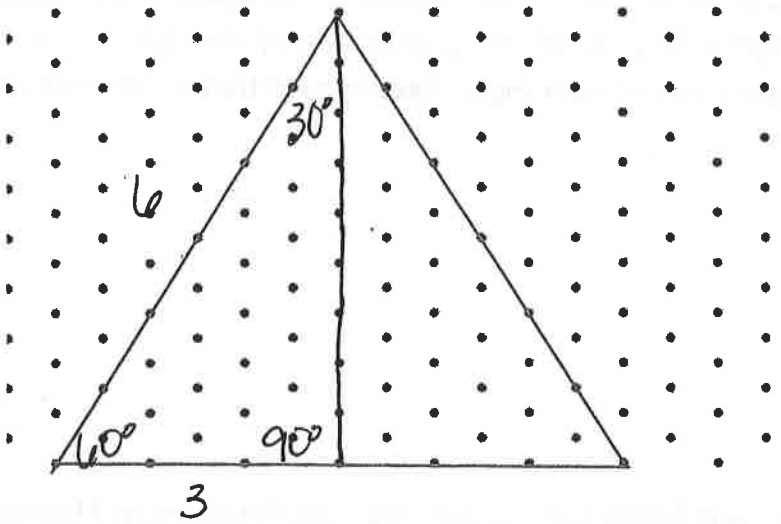
$2^2 + x^2 = 4^2$

$4 + x^2 = 16$

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

$x = 2\sqrt{3}$

10. Use an equilateral triangle that is 6 units on the sides. You will need to draw the altitude to the triangle. Use Pythagorean Theorem to find the length of the altitude of the equilateral triangle. Express the measure of the altitude in simplest radical form. Label all angle measures below as shown in # 1.



$3^2 + x^2 = 6^2$

$9 + x^2 = 36$

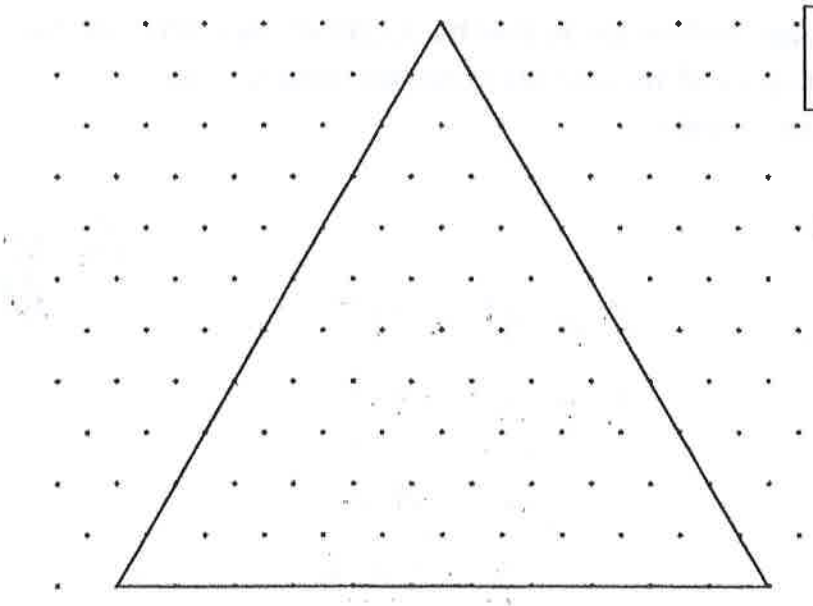
$\sqrt{x^2} = \sqrt{27}$

$x = 3\sqrt{3}$

3|27
3|9
3

11. Use the information above to fill in part of the chart below and then complete the information for the remainder of the chart. You may use the dot paper below to help.

Length of short leg ($\frac{1}{2}$ of Δ side)	1	2	3	4	5	6	7	8	x
Length of long leg (altitude)	$\sqrt{3}$	$2\sqrt{3}$	$3\sqrt{3}$	$4\sqrt{3}$	$5\sqrt{3}$	$6\sqrt{3}$	$7\sqrt{3}$	$8\sqrt{3}$	$x\sqrt{3}$
Length of hypotenuse (side of Δ)	2	4	6	8	10	12	14	16	2x ~~x~~



12. What is the general rule for finding the sides of a 30-60-90 triangle?

- the shorted side is x
- the hypotenuse is twice the shortest side
- the longest leg is $\sqrt{3}$ times the shortest leg