Name Key

8.3 Special Right Triangles

Part 1: Exploring the 45°-45°-90° Triangle

Use the Pythagorean Theorem to find the hypotenuse of the isosceles right Δ.

Length of Legs	Length of Hypotenuse
1	$\sqrt{2}$
2	$2\sqrt{2}$
3	$3\sqrt{2}$
4	$4\sqrt{2}$
5	$5\sqrt{2}$
$3\sqrt{2}$	6
n	$n\sqrt{2}$

$(3\sqrt{2})(\sqrt{2})$

$3(\sqrt{2})^2$

$3 \cdot 2$

Write your observations here:

the hypotenuse is always the leg multiplied by $\sqrt{2}$

Isosceles Right Triangle Conjecture:

In an isosceles right triangle, if the legs have the length l, then the hypotenuse has length $l\sqrt{2}$.

Part 2: Exploring the 30°-60°-90° Triangle

Draw an equilateral triangle to the best of your ability. Label it ABC and draw altitude CD.

Answer the following questions. They will set up the investigation for you.

1. What are m<A and m<B? What are m<ACD and m<BCD? What are m<ADC and m<BDC? Label all of these angles with their measures on your picture. $\measuredangle A = \measuredangle B = 60$ $\measuredangle ACD = \measuredangle BCD = 30$

2. Is ADC = BDC? Why?

yes both are 90° by def of alt.

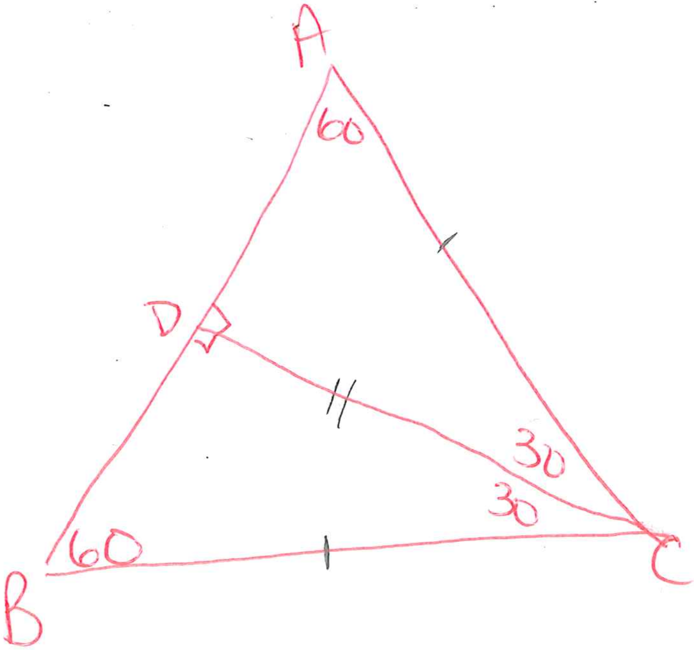
3. Is AD = BD? Why?

yes $\triangle ADC \cong \triangle BDC$ so $AD = BC$ by CPCTC

4. How do AC and AD compare? In a 30°-60°-90° triangle, will this relationship between the hypotenuse and the shorter leg always hold true? Explain.

$AC = 2 \cdot AD$ or $AD = \frac{1}{2}AC$

hyp = 2 · short



5. Sketch a 30°-60°-90° triangle below. Choose any integer for the length of the shorter leg. Use the relationship from questions #4 and the Pythagorean Theorem to find the length of the hypotenuse. Simplify the square root.

fill out the chart below.

Shorter Leg	Hypotenuse	Longer Leg
1	2	$\sqrt{3}$
2	4	$2\sqrt{3}$
3	6	$3\sqrt{3}$
$3\sqrt{2}$	$6\sqrt{2}$	$3\sqrt{6}$
n	2n	$n\sqrt{3}$

$2(3\sqrt{2})$

short $\cdot\sqrt{3}$

$(3\sqrt{2})(\sqrt{3})$

$3\sqrt{6}$

Write your observations here:

the long leg is short leg times $\sqrt{3}$

hypotenuse is twice the short leg

30°-60°-90° **Triangle Conjecture:**

In an 30°-60°-90° triangle, if the shorter leg has length a, then the longer leg has length $a\sqrt{3}$ and the hypotenuse has length $2a$.

Review:

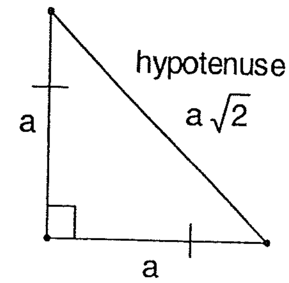
How do you know which leg is the shorter leg?

the shorter leg is always across from smaller ∡ so it should be across from 30° and not 60°

LENGTH RELATIONSHIPS IN SPECIAL TRIANGLES

THE ISOSCELES RIGHT TRIANGLE

In an isosceles right triangle, **the length of the hypotenuse is always the length of one of the legs times $\sqrt{2}$.**



The Pythagorean Theorem proves this fact. Using this triangle with leg length marked a, we'll solve for the hypotenuse using the Pythagorean Theorem.

$$a^2 + a^2 = \text{hypotenuse}^2$$

$$2a^2 = \text{hypotenuse}^2$$

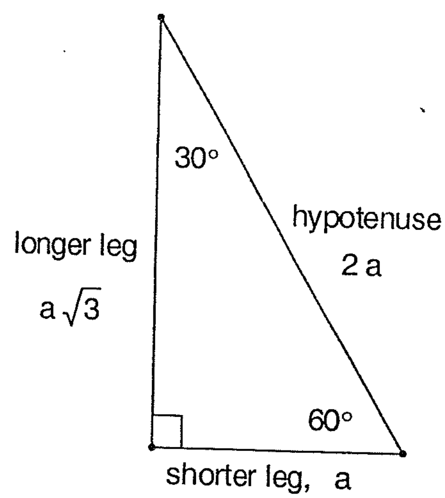
$$\sqrt{2a^2} = \text{hypotenuse}$$

$$a\sqrt{2} = \text{hypotenuse}$$

LENGTH RELATIONSHIPS IN SPECIAL TRIANGLES

$30° - 60° - 90°$ *TRIANGLES*

In a $30° - 60° - 90°$ triangle, **the length of the hypotenuse is twice the length of the shorter leg and the length of the longer leg is the shorter leg length times $\sqrt{3}$.**



The Pythagorean Theorem proves this fact. Using this triangle with the shorter leg length marked a, and hypotenuse marked 2a, we'll solve for the longer leg using the Pythagorean Theorem.

$$a^2 + \text{longer leg}^2 = (2a)^2$$

$$\text{longer leg}^2 = (2a)^2 - a^2$$

$$\text{longer leg}^2 = 4a^2 - a^2$$

$$\text{longer leg} = \sqrt{3a^2}$$

$$\text{longer leg} = a\sqrt{3}$$