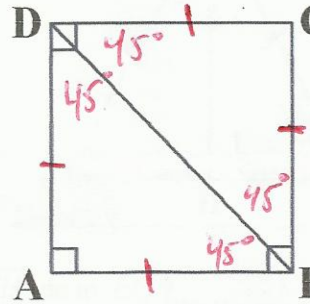
What's so special about these "Special" Right Triangles?

Name KEY
Date __________ Pd ____

1. Label the missing angle measures for *all* angles in this **square**, and mark any congruent sides with congruency marks.

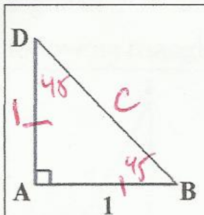


2. Fill in the blanks for each of the following angle measures:

m∠ADB 45° m∠ABD 45° m∠DAB 90°

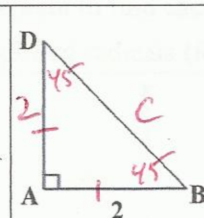
3. What type of triangle is ΔABD? (Classify by both angles and sides)
How do you know? Right (given)
Isosceles (sides of square ≅)

4. Now, focusing on just ΔABD taken from square ABCD, use the Pythagorean Theorem to find each of the missing side lengths in the following right isosceles triangles. Make sure to express sides as simplified radicals (for instance, $a\sqrt{b}$), not as decimals.



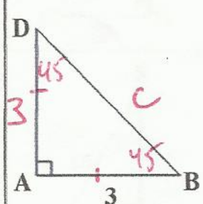
$1^2 + 1^2 = c^2$
$2 = c^2$
$c = \sqrt{2}$

AB = 1, AD = 1, DB = $\sqrt{2}$



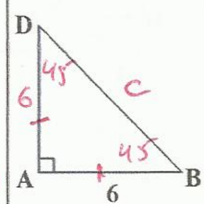
$2^2 + 2^2 = c^2$
$8 = c^2$
$c = 2\sqrt{2}$

AB = 2, AD = 2, DB = $2\sqrt{2}$



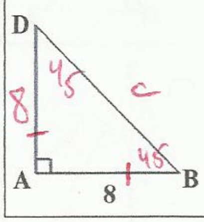
$3^2 + 3^2 = c^2$
$18 = c^2$
$c = 3\sqrt{2}$

AB = 3, AD = 3, DB = $3\sqrt{2}$



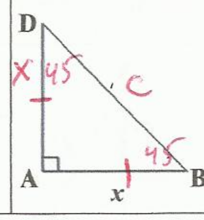
$6^2 + 6^2 = c^2$
$c^2 = 72$
$c = 6\sqrt{2}$

AB = 6, AD = 6, DB = $6\sqrt{2}$



$8^2 + 8^2 = c^2$
$c^2 = 128$
$c = 8\sqrt{2}$

AB = 8, AD = 8, DB = $8\sqrt{2}$

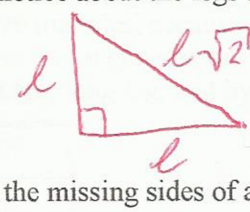


$x^2 + x^2 = c^2$
$c^2 = 2x^2$
$c = x\sqrt{2}$

AB = x, AD = X, DB = $X\sqrt{2}$

5. These triangles are all known as right isosceles triangles, but are also referred to as **45-45-90** triangles because of the measures of their angles. What pattern do you notice about the legs and hypotenuse of any **45-45-90** triangle?

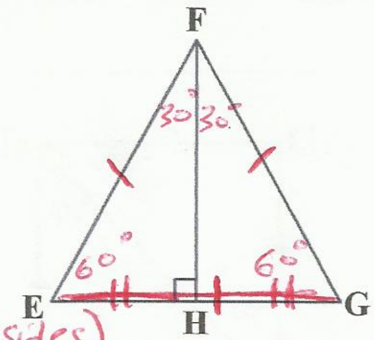
45	45	90
leg	leg	leg$\sqrt{2}$



6. How could you use this pattern to help you find the missing sides of any 45-45-90 triangle without having to use the Pythagorean Theorem?

If you know one side, you can set up an equation to calculate the other 2 missing sides.

1. Label the missing angle measures for *all* angles in this **equilateral triangle**, and mark any congruent sides with congruency marks.



2. Fill in the blanks for each of the following angle measures:

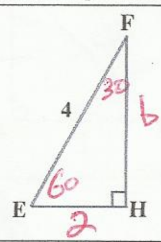
m∠EFH 30° m∠HEF 60° m∠FHE 90°

3. What type of triangle is ΔFEH? (Classify by both angles and sides) How do you know? Right (given)
Scalene (3 different ∠s, 3 different sides)

4.
What kind of special segment is $\overline{FH}$ in ΔFEG? Altitude What does $\overline{FH}$ do to $\overline{EG}$? bisects it.

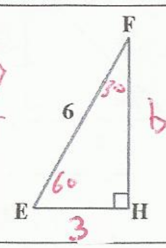
What is the relationship between m$\overline{EF}$ and m$\overline{EH}$? $EH = \frac{1}{2}EF$ or $EF = 2EH$

5. Now, focusing on just ΔFEH taken from equilateral ΔFEG, use the information you know about how special segment $\overline{FH}$ interacts with $\overline{EG}$ and the Pythagorean Theorem to find each of the missing side lengths in the following triangles. Make sure to express the sides as simplified radicals (for instance, $a\sqrt{b}$), not as decimals.



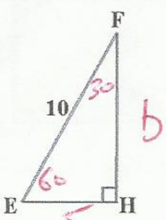
$2^2 + b^2 = 4^2$
$4 + b^2 = 16$ $\boxed{b = 2\sqrt{3}}$
$b^2 = 12$

EH = 2, FH = $2\sqrt{3}$, EF = 4



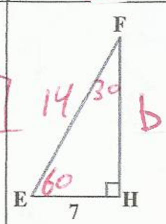
$3^2 + b^2 = 6^2$
$9 + b^2 = 36$ $\boxed{b = 3\sqrt{3}}$
$b^2 = 27$

EH = 3, FH = $3\sqrt{3}$, EF = 6



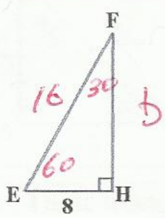
$5^2 + b^2 = 10^2$
$25 + b^2 = 100$ $\boxed{b = 5\sqrt{3}}$
$b^2 = 75$

EH = 5, FH = $5\sqrt{3}$, EF = 10



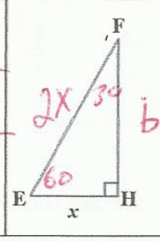
$7^2 + b^2 = 14^2$
$49 + b^2 = 196$ $\boxed{b = 7\sqrt{3}}$
$b^2 = 147$

EH = 7, FH = $7\sqrt{3}$, EF = 14



$8^2 + b^2 = 16^2$
$64 + b^2 = 256$ $b = \boxed{8\sqrt{3}}$
$b^2 = 192$

EH = 8, FH = $8\sqrt{3}$, EF = 16



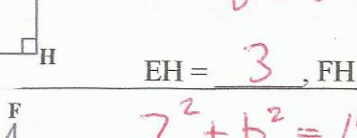
$x^2 + b^2 = (2x)^2$
$x^2 + b^2 = 4x^2$ $b = x\sqrt{3}$
$b^2 = 3x^2$

EH = *x*, FH = $x\sqrt{3}$, EF = $2x$

6. These triangles are usually referred to as **30-60-90** triangles, because of the measures of their angles. The short leg is across from the 30°, the long leg is across from the 60° angle, and the hypotenuse is across from the 90° angle. What pattern do you notice exists between the short leg, long leg, and hypotenuse of any **30-60-90** triangle?

s = short leg

30	60	90
s	$s\sqrt{3}$	$2s$



7. How could you use this pattern to help you find the missing sides of any 30-60-90 triangle without having to use the Pythagorean Theorem? If you know one side, you can set up an equation to find the other two.