Honors Geometry
Notes - Section 5.8 Special Right Triangles

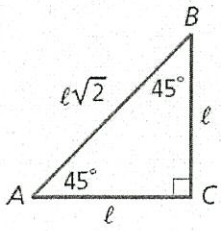
Name KEY
Date _____ Period _____

1. 45-45-90 Triangle Theorem

Theorem 5-8-1 45°-45°-90° Triangle Theorem

In a 45°-45°-90° triangle, both legs are congruent, and the length of the hypotenuse is the length of a leg times $\sqrt{2}$.

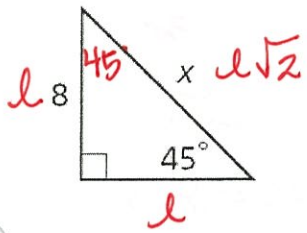
$AC = BC = \ell$ $\quad AB = \ell\sqrt{2}$



why? it is isosceles!

Example #1: Find the value of x. Give your answer in simplest radical form.

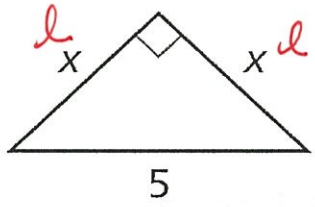
a.



$\ell = 8$

$x = 8\sqrt{2}$

b.



$\ell\sqrt{2}$

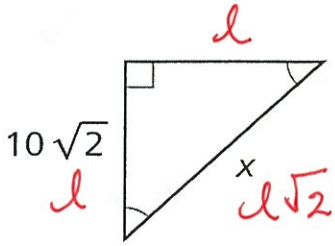
$\frac{5}{\sqrt{2}} = \frac{\ell\sqrt{2}}{\sqrt{2}}$

must rationalize!

$\ell = \frac{5}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{\sqrt{4}} = \frac{5\sqrt{2}}{2}$

$x = \frac{5\sqrt{2}}{2}$

c.



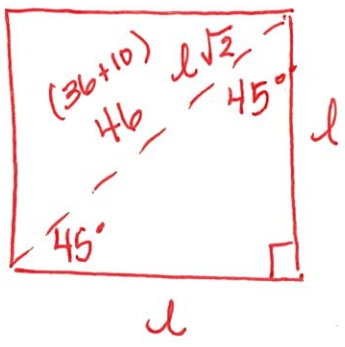
$\ell = 10\sqrt{2}$

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

$x = 10 \cdot \sqrt{4}$

$x = 20$

Example #2: Jana is cutting a square of material for a tablecloth. The table's diagonal is 36 inches. She wants the diagonal of the tablecloth to be an extra 10 inches so it will hang over the edges of the table. What size square should Jana cut to make the tablecloth? Round to the nearest inch.



$\frac{46}{\sqrt{2}} = \frac{\ell\sqrt{2}}{\sqrt{2}}$

$\ell = \frac{46}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{46\sqrt{2}}{\sqrt{4}} = \frac{46\sqrt{2}}{2} = 23\sqrt{2}$

≈ 33 in

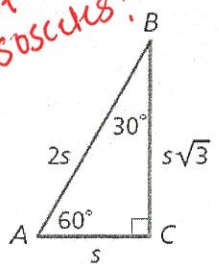
II. 30-60-90 Triangle Theorem

Theorem 5-8-2 **30°-60°-90° Triangle Theorem**

In a 30°-60°-90° triangle, the length of the hypotenuse is is 2 times the length of the shorter leg, and the length of the longer leg is the length of the shorter leg times $\sqrt{3}$.

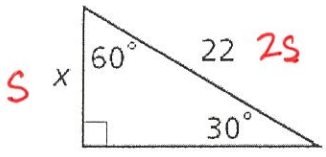
$AC = s$ $\quad AB = 2s$ $\quad BC = s\sqrt{3}$

not isosceles!



Example #3: Find the values of x and y. Give your answers in simplest radical form.

a.



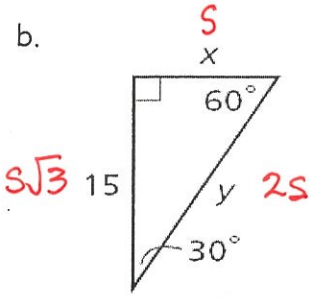
$2s = 22$

$s = 11$

$x = 11$

$y = 11\sqrt{3}$

b.



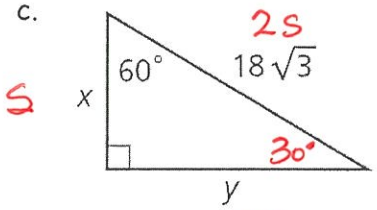
$\frac{15}{\sqrt{3}} = \frac{s\sqrt{3}}{\sqrt{3}}$

$s = \frac{15}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{15\sqrt{3}}{\sqrt{9}} = \frac{15\sqrt{3}}{3}$

$s = 5\sqrt{3}$

$x = 5\sqrt{3}$ $\quad y = 10\sqrt{3}$

c.



$2s = 18\sqrt{3}$

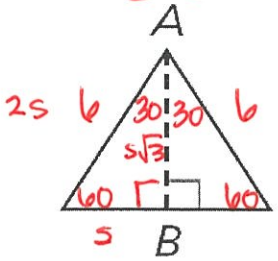
$s = 9\sqrt{3}$

$x = 9\sqrt{3}$

$y = 9\sqrt{3} \cdot \sqrt{3}$

$y = 27$

Example #4: An ornamental pin is in the shape of an equilateral triangle. The length of each side is 6 centimeters. Josh will attach the fastener to the back along $\overline{AB}$. Will the fastener fit if it is 4 centimeters long?



$2s = 6$

$s = 3$

$AB = s\sqrt{3}$

$AB = 3\sqrt{3} \approx 5.2 > 4$ ✓

$\therefore$ yes!