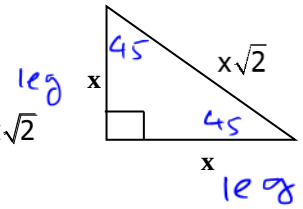
Special Right Triangles

THESE ARE ALWAYS RIGHT TRIANGLES!!!!

45-45-90 Triangles

The ratio of the sides of a 45-45-90 triangle are: x:x: $x\sqrt{2}$



45-45-90

if this measure is given:	and you want this measure:	then do this:
the leg	hypotenuse	multiply the leg by $\sqrt{2}$
hypotenuse	the leg	divide hypotenuse by $\sqrt{2}$

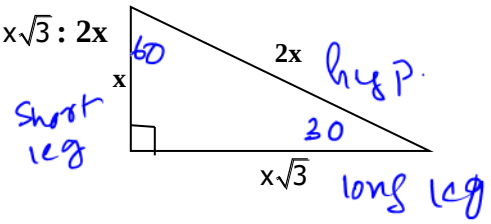
remember: the legs of a 45-45-90 are the SAME measure!

Leg = $\frac{\text{hypotenuse}}{\sqrt{2}}$ **Hypotenuse = Leg($\sqrt{2}$)**

30-60-90 Triangles

The ratio of the sides of a 30-60-90 triangle are: x: $x\sqrt{3}$: 2x

The short leg is always opposite the 30° angle!



30-60-90

if this measure is given:	and you want this measure:	then do this:
short leg	hypotenuse	multiply short leg by 2
short leg	long leg	multiply short leg by $\sqrt{3}$
long leg	short leg	divide long leg by $\sqrt{3}$
hypotenuse	short leg	divide hypotenuse by 2

remember: it is best to find the measure of the short leg first (that is if it is not given)

Short Leg = $\frac{\text{hypotenuse}}{2}$

Short Leg = $\frac{\text{long leg}}{\sqrt{3}}$

Hypotenuse = 2 (short leg)

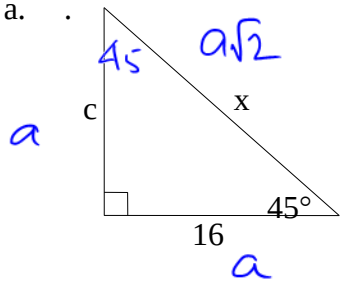
Long Leg = (short leg) $\sqrt{3}$

Theorem 5.5.1 and Theorem 5.5.2 is summarized on the previous page.

Example 1:

Find the missing sides for each of the following:

a. .



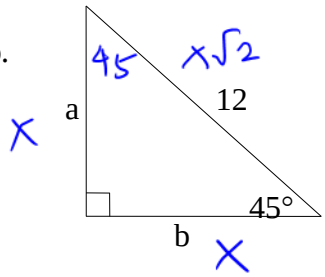
$a = 16$

$a\sqrt{2} = 16\sqrt{2}$

$\therefore x = 16\sqrt{2}$

$c = 16$

b.



$x\sqrt{2} = 12$

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

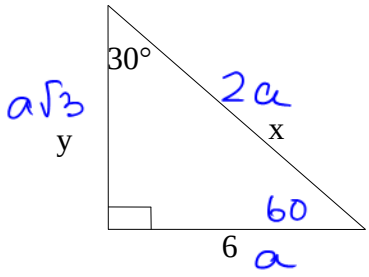
$= \frac{12\sqrt{2}}{\sqrt{2}\sqrt{2}} = \frac{12\sqrt{2}}{2} = 6\sqrt{2}$

$x = 6\sqrt{2}$

$\therefore a = 6\sqrt{2}$

$b = 6\sqrt{2}$

c.

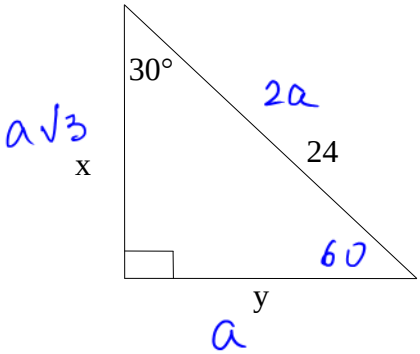


$a = 6$

$y = a\sqrt{3} = 6\sqrt{3}$

$x = 2a = 2 \cdot 6 = 12$

d..



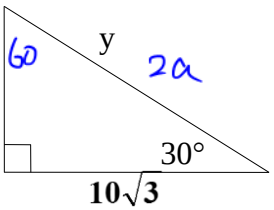
$2a = 24$

$a = 12$

$\therefore y = a = 12$

$x = a\sqrt{3} = 12\sqrt{3}$

e.



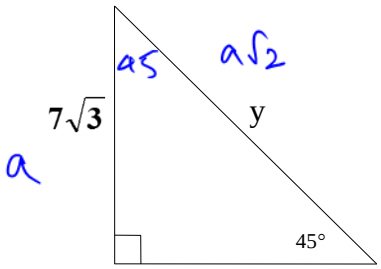
$a\sqrt{3} = 10\sqrt{3}$

$a = 10$

$x = a = 10$

$y = 2a = 2 \cdot 10 = 20$

f.



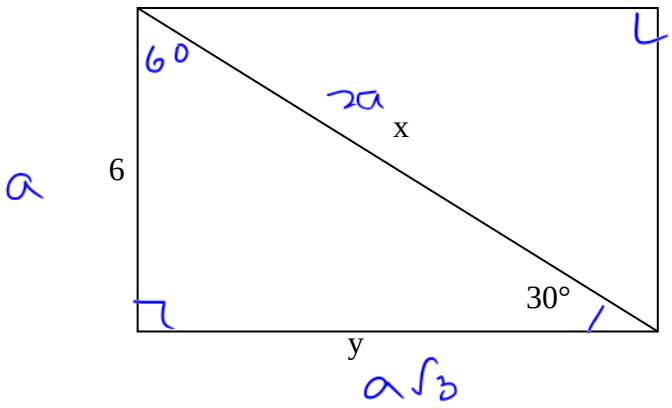
$x = a = 7\sqrt{3}$

$y = a\sqrt{2} = 7\sqrt{3} \cdot \sqrt{2} = 7\sqrt{3 \cdot 2} = 7\sqrt{6}$

$(\sqrt{3} + \sqrt{2} \neq \sqrt{5})$

Example 2:

Rectangle find the values for and y.



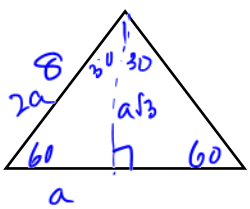
$a = 6$

$x = 2a = 2 \cdot 6 = 12$

$y = a\sqrt{3} = 6\sqrt{3}$

Example 3:

The length of the side of an equilateral triangle is 8. Find the length of altitude.



$2a = 8$

$a = 4$

$\text{Altitude} = a\sqrt{3}$

$= 4\sqrt{3}$

Find the length of each side if alt = 12

$a\sqrt{3} = 12$

$a = \frac{12}{\sqrt{3}}$

$= \frac{12\sqrt{3}}{\sqrt{3}\sqrt{3}} = \frac{12\sqrt{3}}{3} = 4\sqrt{3}$

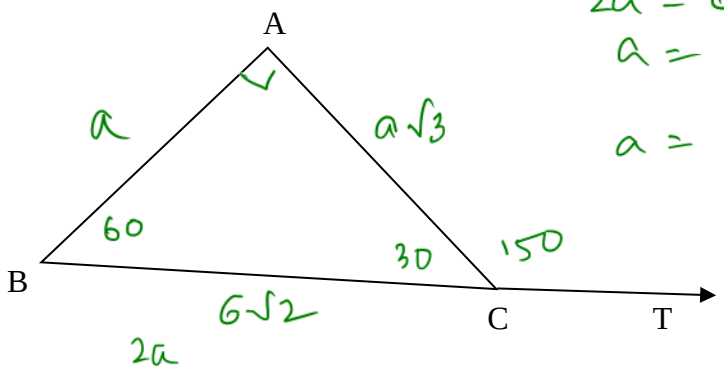
$\text{side} = 2a$

$= 2(4\sqrt{3})$

$= 8\sqrt{3}$

Example 4:

Given ΔABC is a right triangle with angle A is $90°$, $BC = 6\sqrt{2}$ and the $m\angle ACT = 150°$. Find AB and AC.



$2a = 6\sqrt{2}$

$a = \frac{6\sqrt{2}}{2}$

$a = 3\sqrt{2}$

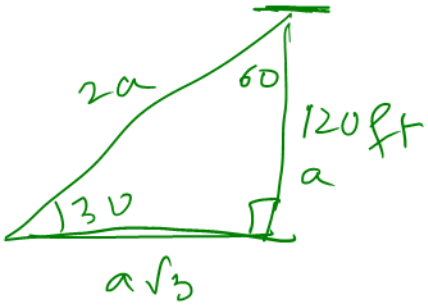
$AB = a = 3\sqrt{2}$

$AC = a\sqrt{3} = (3\sqrt{2})(\sqrt{3})$

$= 3\sqrt{6}$

Example 5:

A tightrope performer in a circus begins his act by walking up a wire to a platform that is 120 feet high. If the wire makes an angle of $30°$ with the ground, how far does he walk along the wire to reach the platform? Assume the pole with the platform is vertical.



$a = 120$

$2a = 2(120)$

$= 240$ ft