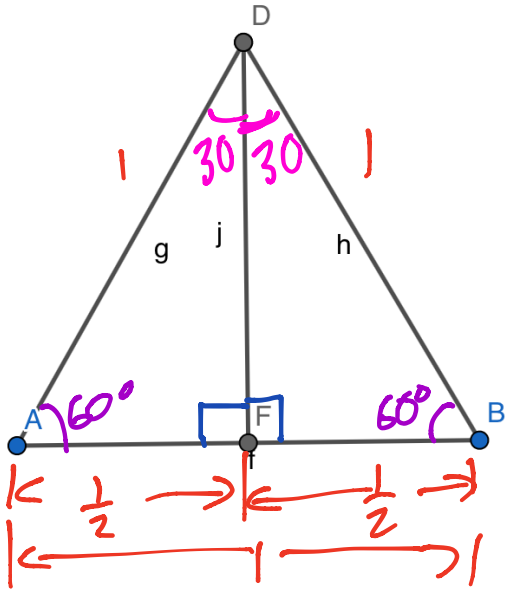
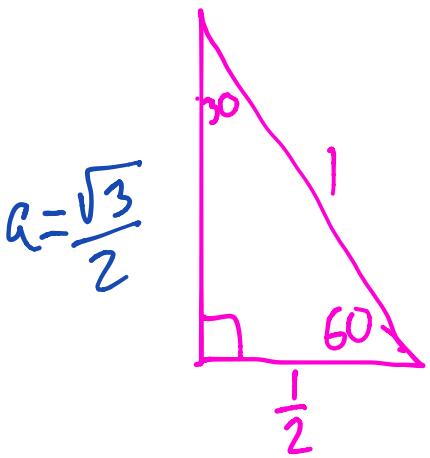




$$a^2 + b^2 = c^2$$

$$a^2 + \left(\frac{1}{2}\right)^2 = [1]^2$$

$$a^2 + \frac{1}{4} = 1$$

$$a^2 = 1 - \frac{1}{4}$$

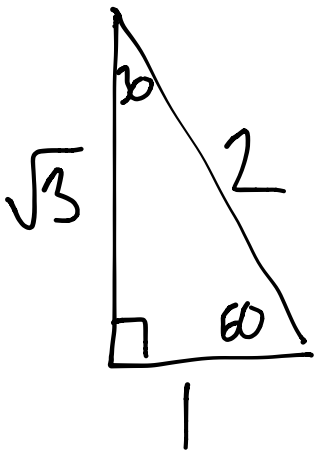
$$a^2 = \frac{3}{4}$$

$$a = \pm\frac{\sqrt{3}}{2}$$

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

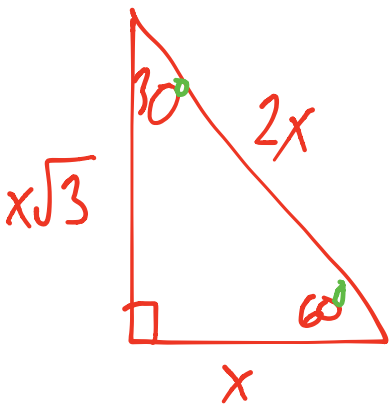
.

Note: For two triangles to be similar, two sets of corresponding angles must be congruent



Every 30-60-90 triangle has ratios proportional to this triangle

- The side opposite 60° will always be $\sqrt{3}x$ ← not touching 60° ∠
- The side adjacent to 60° will always be $1x$ ← touching the 60° ∠
- The hypotenuse will always measure $2x$



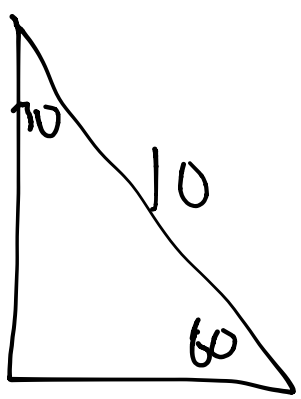
* In each case, $x \in \mathbb{R}$ "x is a real number"

Given 30-60-90 △ with a given length, find the remaining sides.

a.) hypotenuse: 10m $= 2x$

find longer leg: $\sqrt{3}x = 5\sqrt{3}$

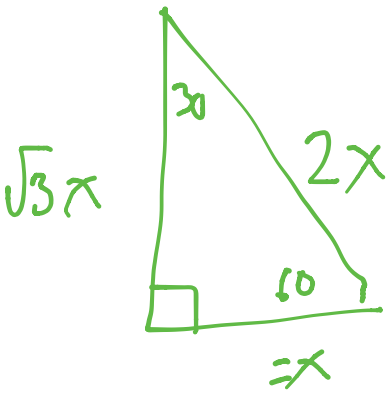
shorter leg: $x = 5$



b.) shorter leg: $8m = x$

find longer leg: $\sqrt{3}x = 8\sqrt{3}$

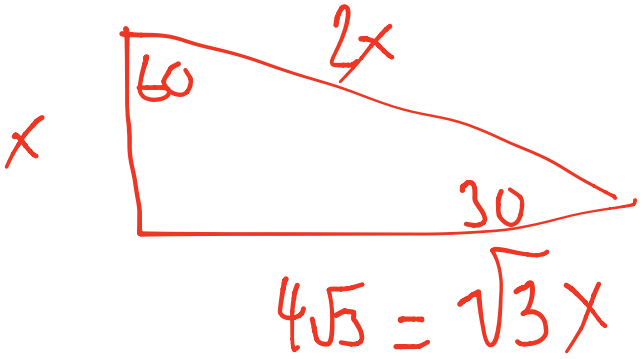
hypotenuse: $2x = 2(8) = 16$



c.) longer leg: $4\sqrt{3} = \sqrt{3}x$

short leg: $4 = x$

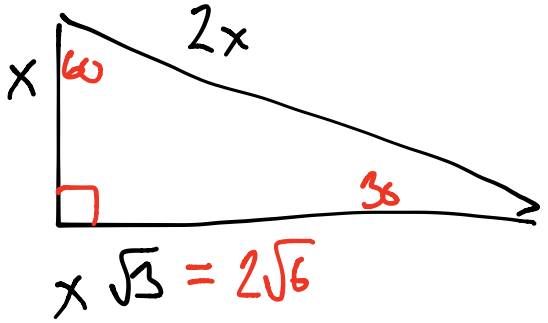
hypotenuse: $8 = 2x$



d. longer leg: $2\sqrt{6} = x\sqrt{3}$

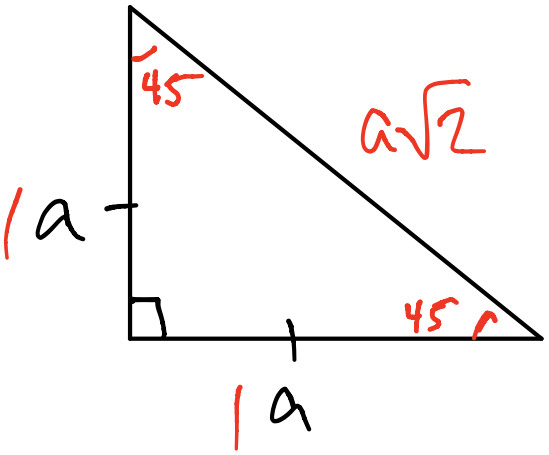
shorter leg: $x = 2\sqrt{2}$

hypotenuse: $2x = 4\sqrt{2}$



$$\frac{x\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{6}}{\sqrt{3}}$$

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



isosceles △

$a^2+b^2=c^2$ ← hypotenuse

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

$2a^2=c^2$

$\pm\sqrt{2a^2}=c$

reject − ↗

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

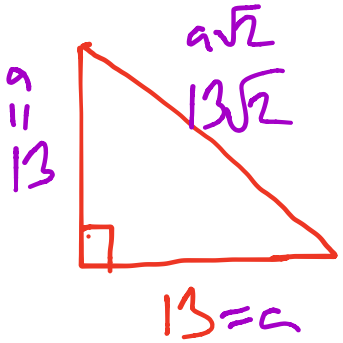
$a\sqrt{2}=c$

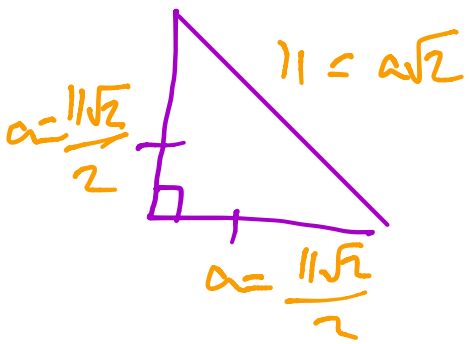
*All 45-45-90° △ have sides ratio $1:1:\sqrt{2}$

$a:a:a\sqrt{2}$

↖ hypotenuse

Given 45-45-90° △





$\frac{11}{\sqrt{2}}=\frac{a\sqrt{2}}{\sqrt{2}}$

$\frac{11}{\sqrt{2}}=a$

$\frac{11\sqrt{2}}{2}=a$

Define:

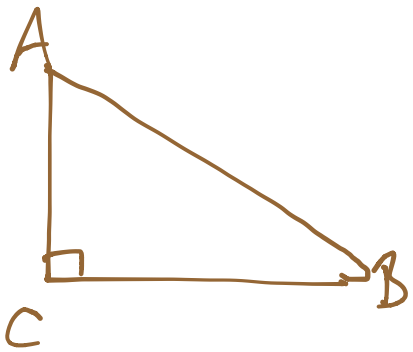
- hypotenuse: longest side of right $\triangle$
  side opposite right $\angle$ in a right $\triangle$

- opposite: leg that is not touching angle in question

- adjacent: leg that is touching angle in question

* in a right $\triangle$, hypotenuse is neither adjacent or opposite.

Given a right $\triangle ABC$,
where $m\angle C = 90°$



side opposite to $\angle A$: $\overline{CB}$

adjacent to $\angle A$: $\overline{AC}$

side opposite to $\angle B$: $\overline{AC}$

adjacent to $\angle B$: $\overline{CB}$

note: opposite: opp adjacent: adj hypotenuse: hyp

Given $\angle\theta$

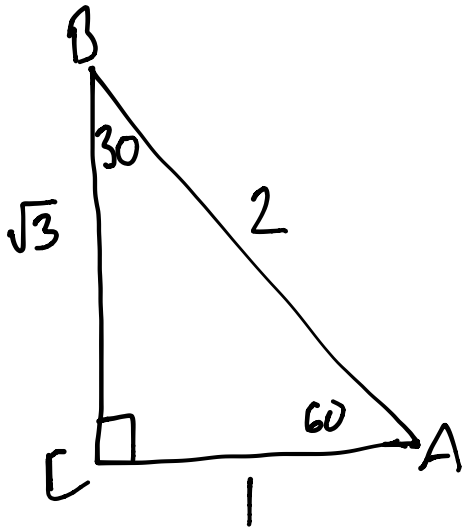
$$\sin\theta = \frac{opp}{hyp}$$

$$\cos\theta = \frac{adj}{hyp}$$

$$\tan\theta = \frac{opp}{adj}$$

"SOH CAH TOA"

S_H^O C_H^A T_A^O



$$\sin(\angle A) = \frac{opp}{hyp}$$

$$\sin(\angle A) = \frac{\sqrt{3}}{2}$$

$$\sin(60^\circ) = \frac{opp}{hyp}$$

$$\sin(60^\circ) = \frac{\sqrt{3}}{2}$$

$$\sin(\angle B) = \frac{opp}{hyp}$$

$$= \frac{1}{2}$$

$$\sin(30^\circ) = \frac{1}{2}$$

$$\cos(60^\circ) = \frac{adj}{hyp}$$

$$\cos(60^\circ) = \frac{1}{2}$$

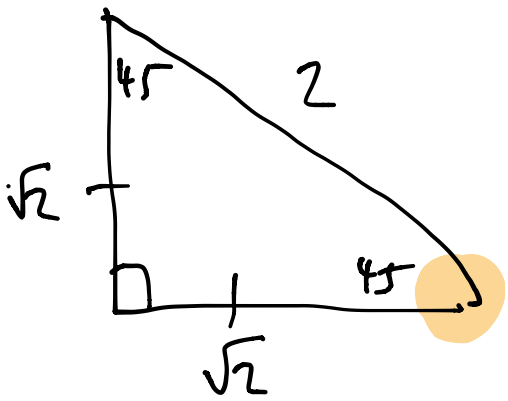
$$\cos(30^\circ) = \frac{adj}{hyp}$$

$$\cos(30^\circ) = \frac{\sqrt{3}}{2}$$

$\tan(60°) = \frac{opp}{adj}$ $\qquad$ $\tan(30°) = \frac{opp}{adj}$

$\tan(60°) = \frac{\sqrt{3}}{1}$ $\qquad$ $\tan(30°) = \frac{1}{\sqrt{3}}$

$\tan(60°) = \sqrt{3}$ $\qquad$ $\tan(30°) = \frac{\sqrt{3}}{3}$



$\sin(45°) = \frac{\sqrt{2}}{2}$

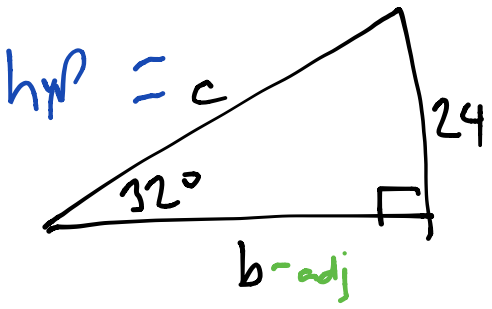
$\cos(45°) = \frac{\sqrt{2}}{2}$

$\tan(45°) = \frac{\sqrt{2}}{\sqrt{2}} = 1$

Solving right Δ

*Turn all calculators to Degree Mode.

Find sides b & c



* 24 is opposite to 32° ∠

Solve for b

$$\tan(32) = \frac{opp}{adj}$$

$$\frac{\tan(32^\circ)}{1} = \frac{24}{b}$$

$$\frac{24}{\tan(32^\circ)} = \frac{b\tan(32^\circ)}{\tan(32)}$$ ← DO NOT REPLACE TAN(32°)

$$38.4 \approx b$$

$$\sin(32) = \frac{opp}{hyp}$$

$$\sin(32) = \frac{24}{c}$$

$$\frac{c\sin(32)}{\sin(32)} = \frac{24}{\sin(32)}$$

$$c = \frac{24}{\sin(32^\circ)}$$

$$c \approx 45.3$$