

Math-2A

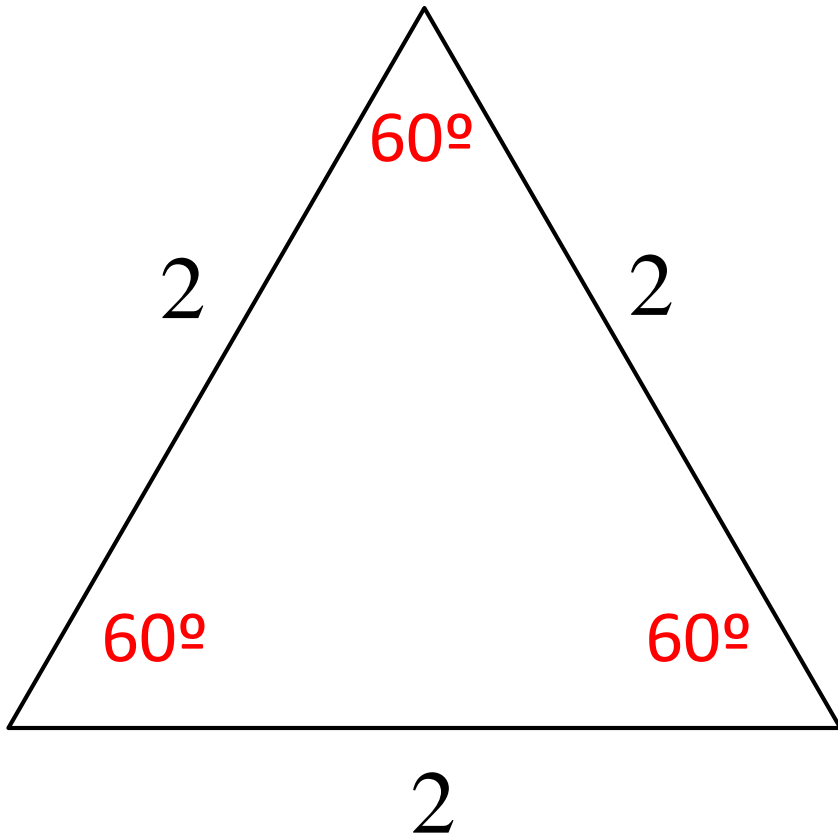
Lesson 9-6

Using Proportions To Solve
30-60-90 Right Triangles.

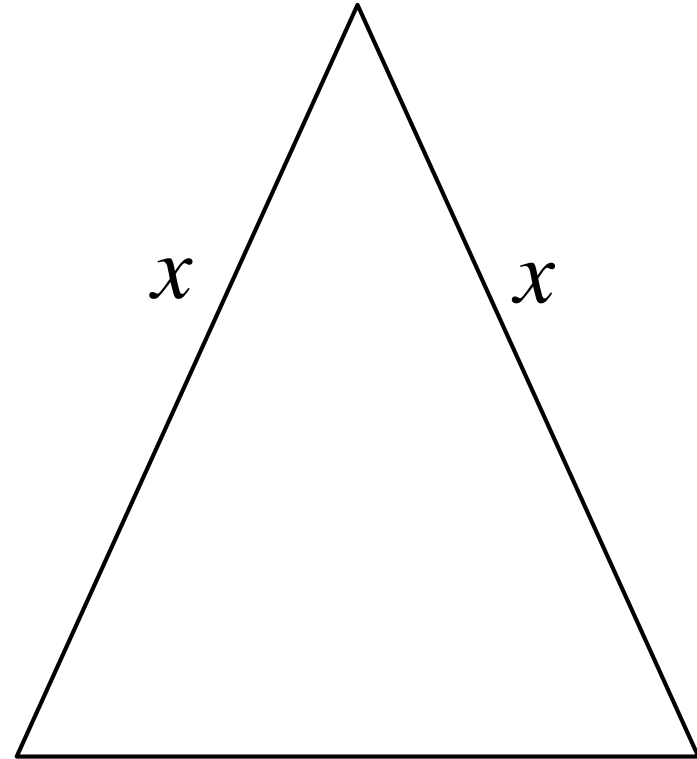
Building a 30-60-90 triangle.

Equilateral triangle: a triangle with 3 congruent sides

What are the measures of the angles?



Isosceles Triangle: a triangle with two sides that are congruent.



Construct an angle bisector of the top angle.

Are the two triangles congruent?

Why?

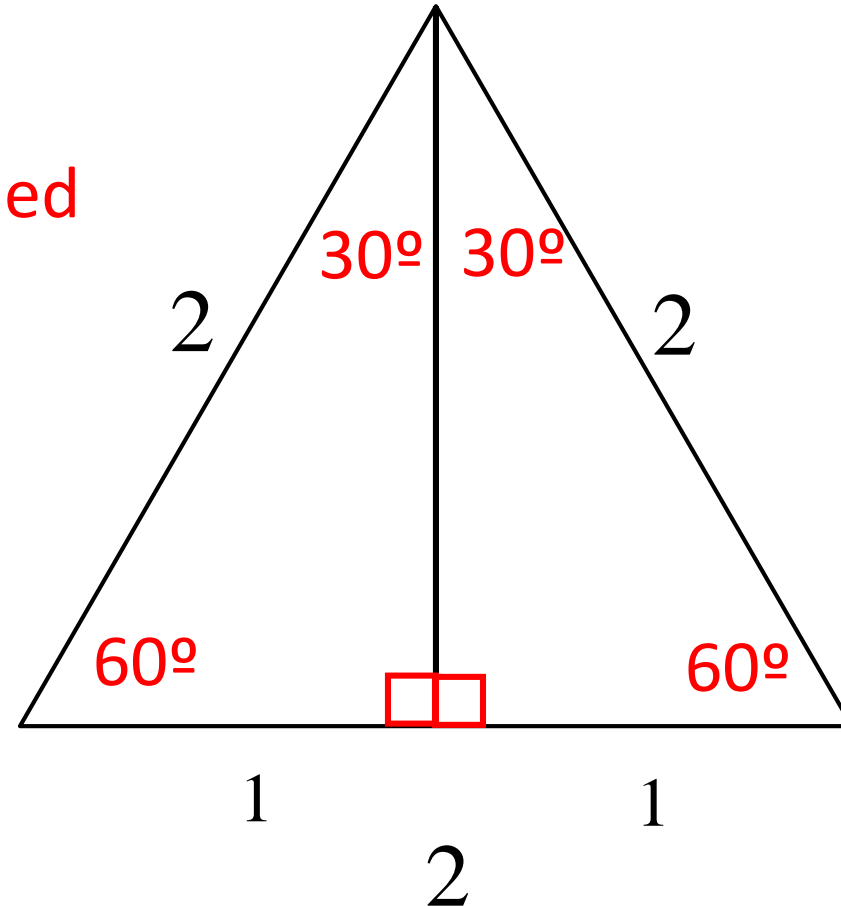
ASA

CPCTC (all remaining corresponding pairs of angles and sides are congruent).

What lengths are the two segments formed at the bottom of the original triangle?

Length = 1 and length = 1

Bottom legs (of the right triangles) are congruent so each is $\frac{1}{2}$ the total of the original triangle's bottom length).



We now have a 30-60-90 triangle.

Solve for 'x'.

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

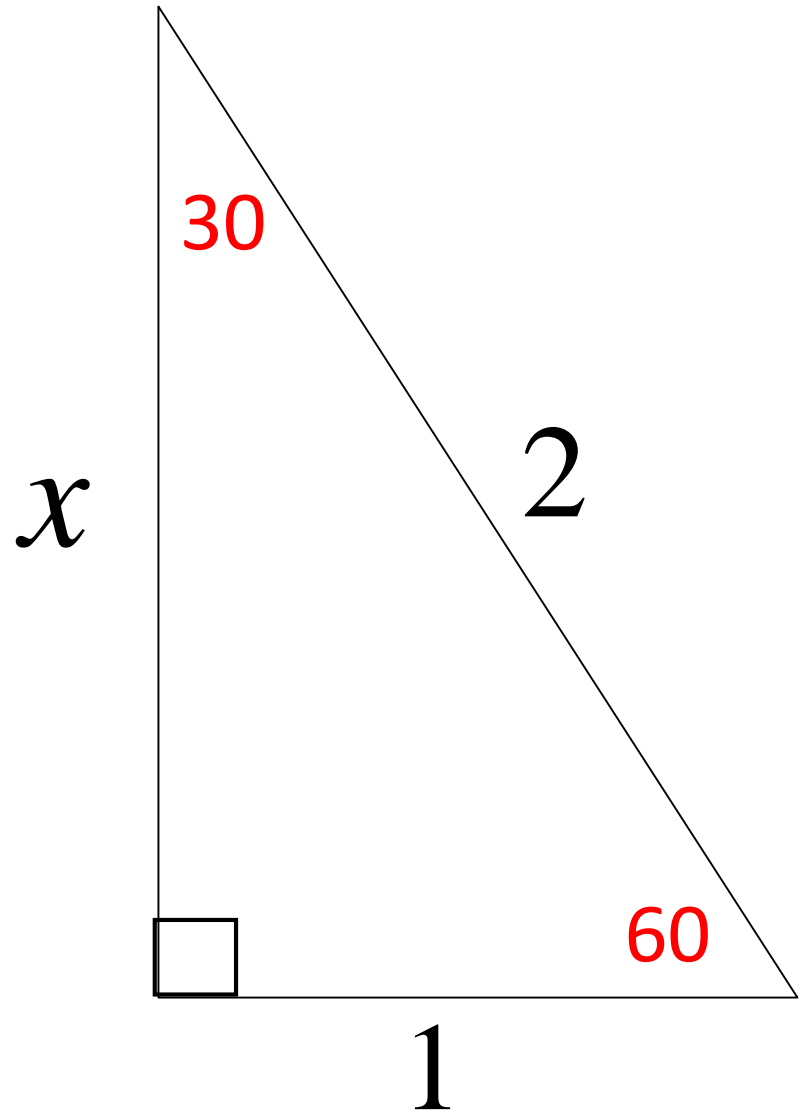
$$x^2 + 1^2 = 2^2$$

$$x^2 = 4 - 1$$

$$x^2 = 3$$

$$x = \sqrt{3}$$

“one-two-three-root”

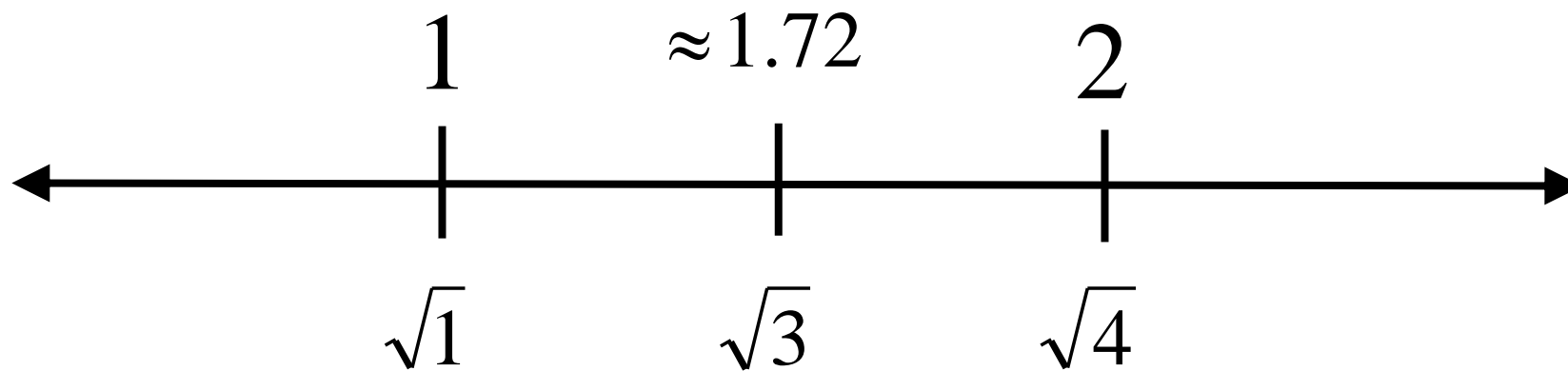


You have to remember this triangle. “one-two-three-root”

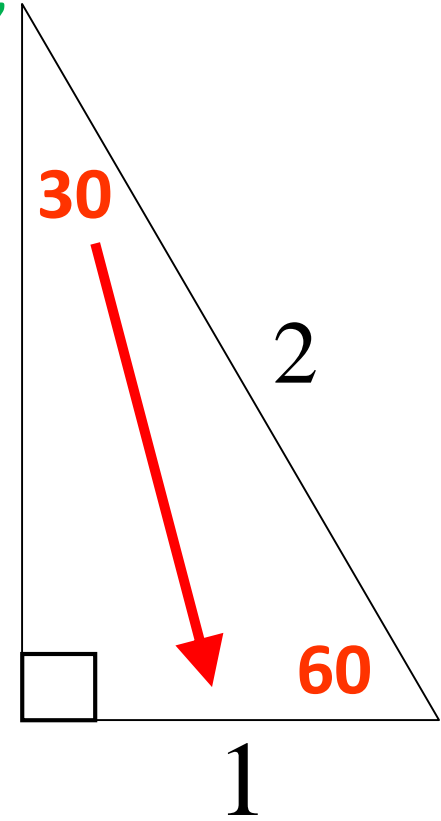
The numbers are easy. Where the numbers go is harder.

1. The shortest side is opposite the smallest angle.
2. The longest side is opposite the largest angle.

Which is a larger number; 2 or $\sqrt{3}$?



$\sqrt{3}$

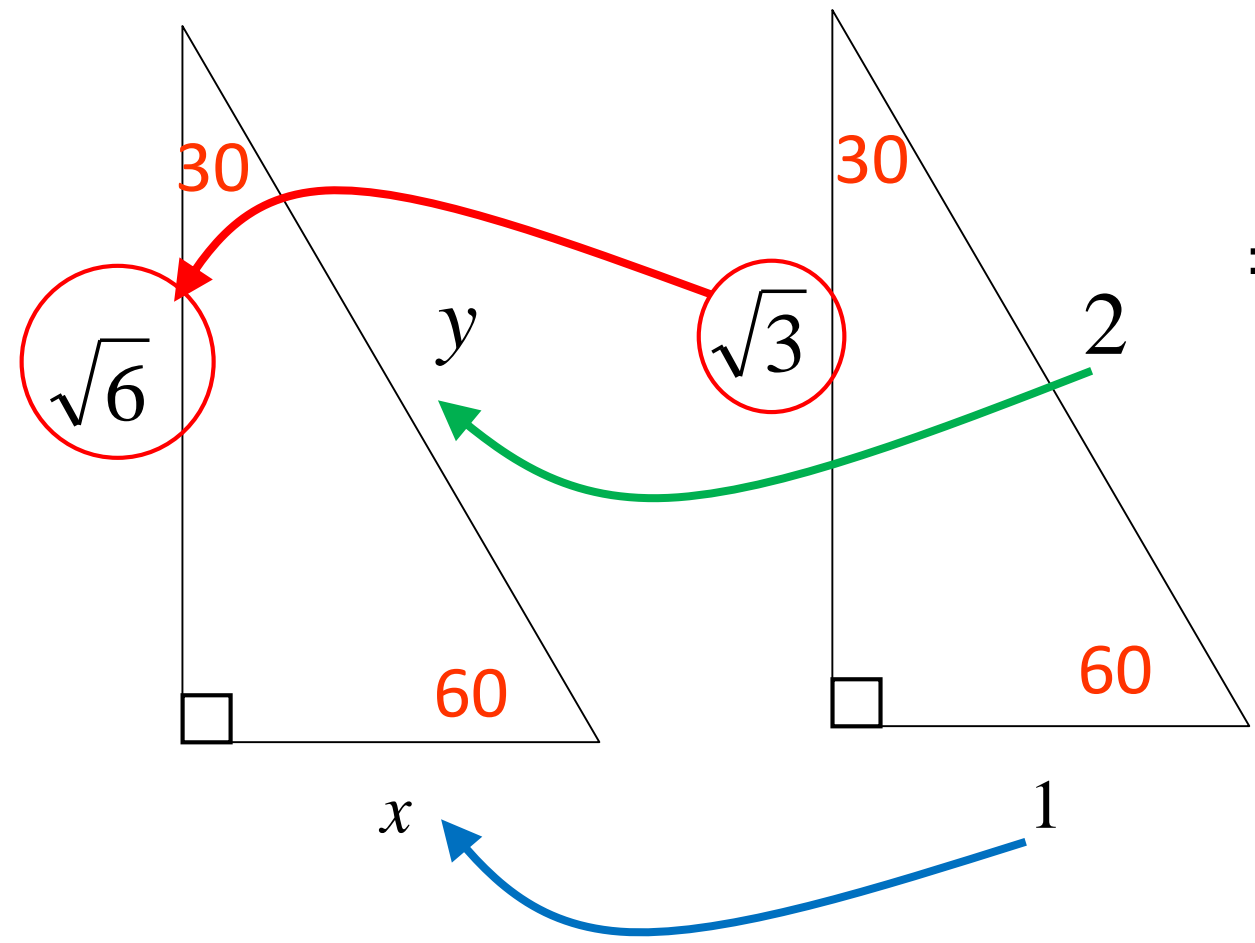


“one-two-three-root”

‘2’ is the longest side → The length of the hypotenuse is 2.

30-60-90 Right Triangle Solve Using Scale Factors

$$\sqrt{3} * (SF) = \sqrt{6} \Rightarrow SF = \frac{\sqrt{6}}{\sqrt{3}} \Rightarrow SF = \frac{\sqrt{2}\sqrt{3}}{\sqrt{3}} \Rightarrow \boxed{SF = \sqrt{2}}$$



$$y = 2(SF)$$

$$\Rightarrow y = 2\sqrt{2}$$

$$x = (SF) * 1$$

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

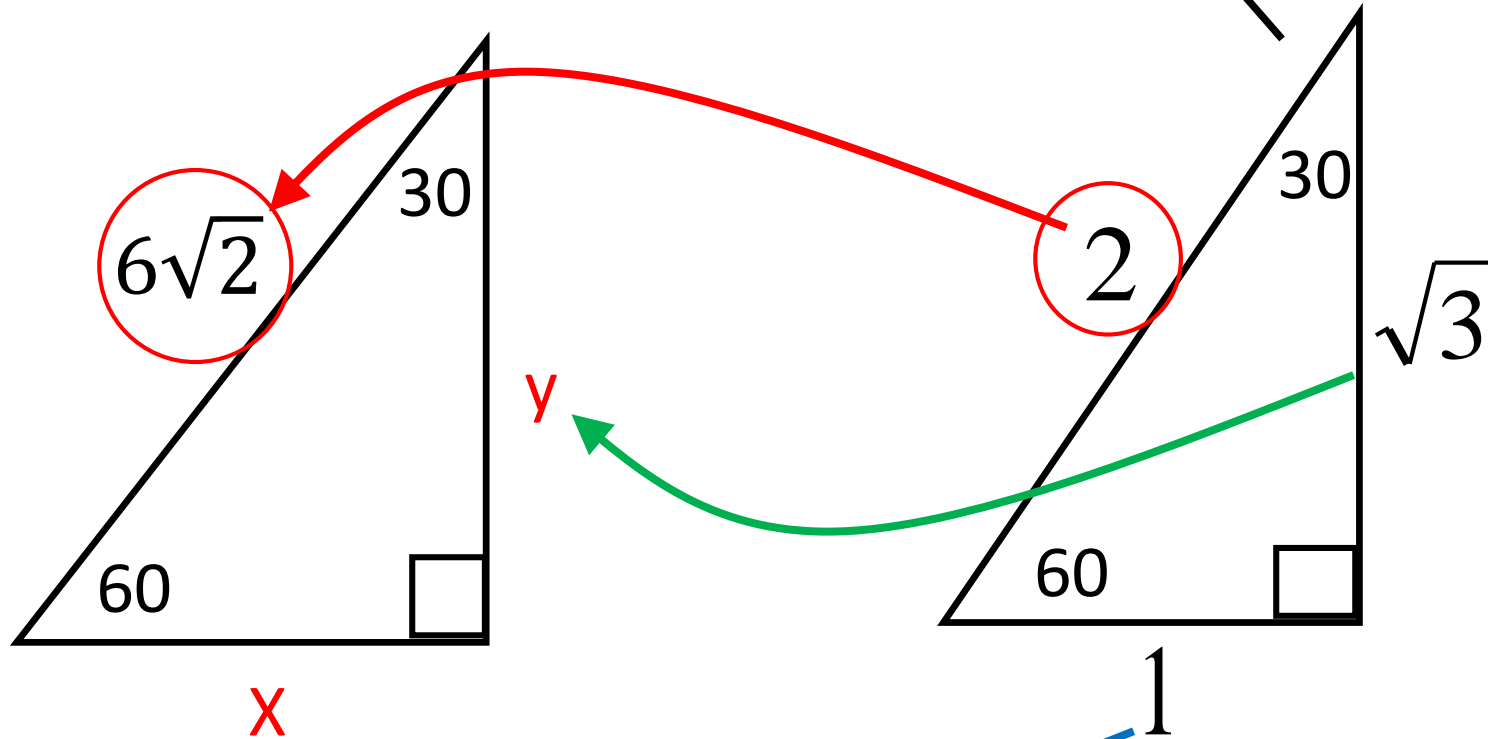
30-60-90 Right Triangle

Solve Using Scale Factors

$$2 * (SF) = 6\sqrt{2} \Rightarrow$$

$$SF = \frac{2 * 3 * \sqrt{2}}{2} \Rightarrow$$

$$SF = 3\sqrt{2}$$



$$y = (SF) * \sqrt{3}$$

$$\Rightarrow y = 3\sqrt{2}\sqrt{3}$$

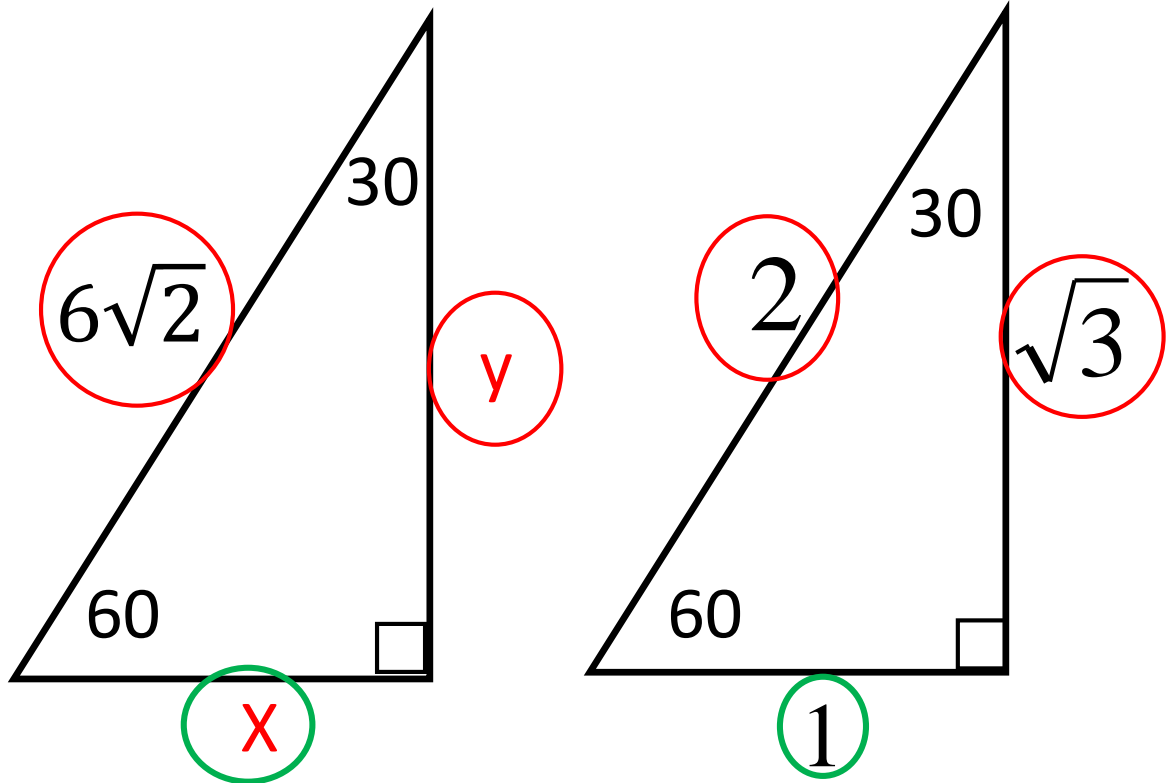
$$\Rightarrow y = 3\sqrt{6}$$

$$x = (SF) * 1$$

$$\Rightarrow x = 3\sqrt{2}$$

30-60-90 Right Triangle Solve with a proportion

Write a proportion (equation where a fraction equals a fraction)



$$\frac{6\sqrt{2}}{2} = \frac{x}{1} \Rightarrow \frac{\cancel{2} * 3 * \sqrt{2}}{\cancel{2}} = \frac{x}{1}$$

$$\frac{6\sqrt{2}}{2} = \frac{y}{\sqrt{3}} \Rightarrow \frac{\cancel{2} * 3 * \sqrt{2}}{\cancel{2}} = \frac{y}{\sqrt{3}}$$

$$\Rightarrow 3\sqrt{2} = \frac{y}{\sqrt{3}}$$

$$\Rightarrow 3\sqrt{2} * \sqrt{3} = \frac{y}{\sqrt{3}} * \frac{\sqrt{3}}{1}$$

$$\boxed{3\sqrt{2} = x}$$

$$\Rightarrow \boxed{3\sqrt{6} = y}$$

Solve using the scale factor.

$$\sqrt{3} * SF = \frac{\sqrt{6}}{2} \Rightarrow SF = \frac{\sqrt{6}}{2} * \frac{1}{\sqrt{3}} \Rightarrow SF = \frac{\sqrt{3} * \sqrt{2}}{2 * \sqrt{3}} \Rightarrow SF = \frac{\sqrt{2} * \sqrt{3}}{2\sqrt{3}}$$

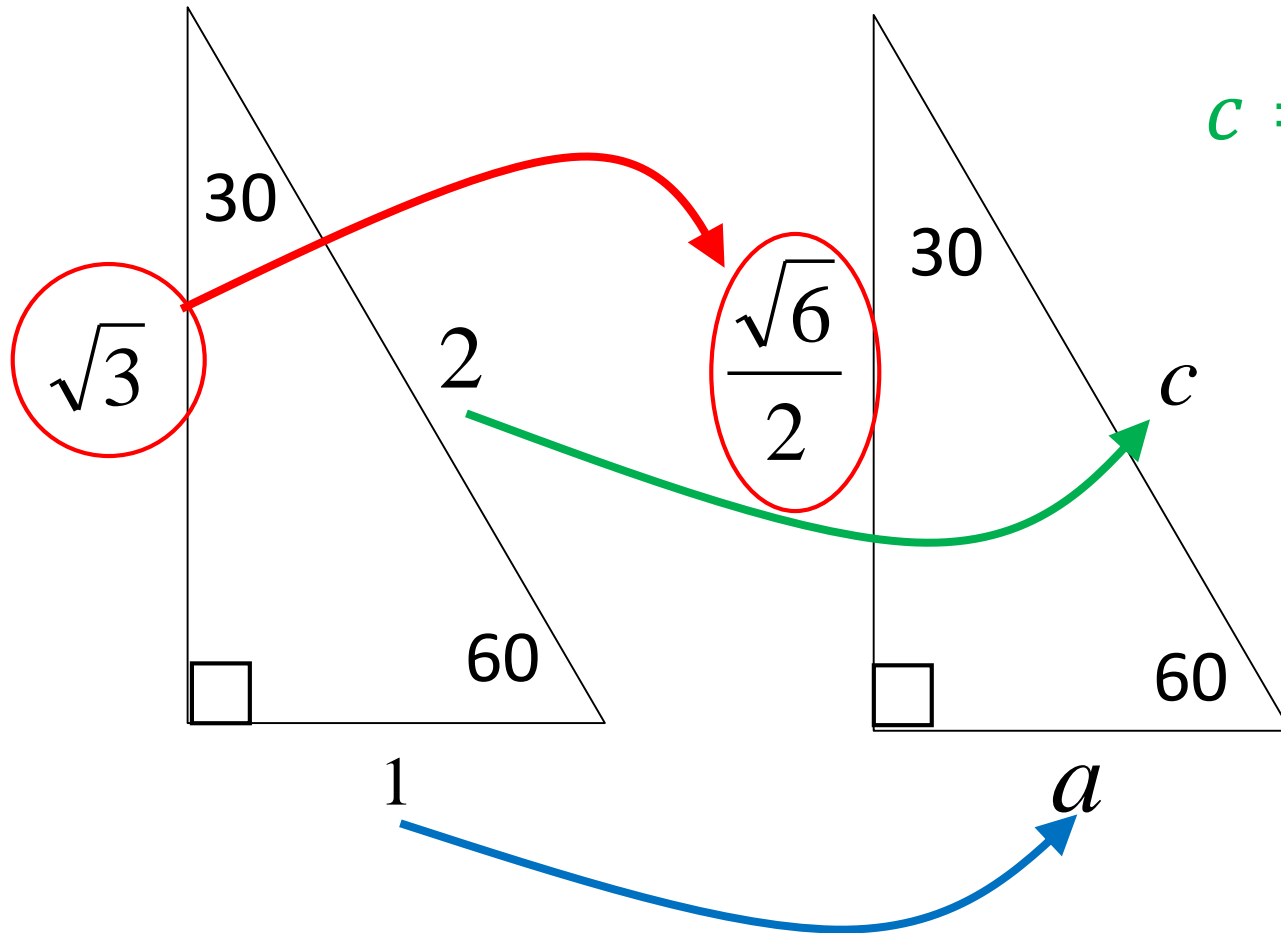
$$\Rightarrow \boxed{SF = \frac{\sqrt{2}}{2}}$$

$$c = 2 * (SF)$$

$$\Rightarrow \boxed{c = \sqrt{2}}$$

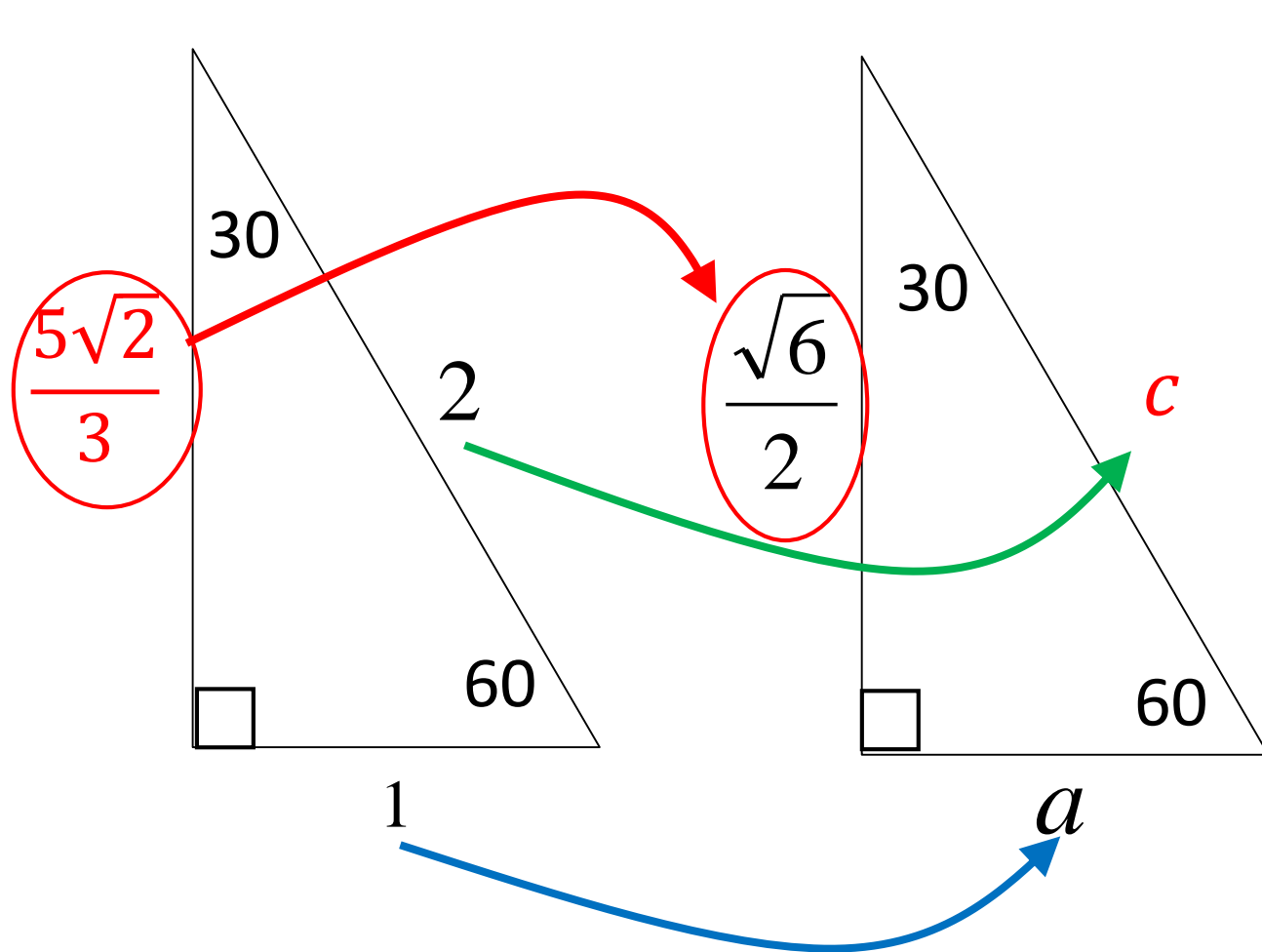
$$a = (SF) * 1$$

$$\Rightarrow \boxed{a = \frac{\sqrt{2}}{2}}$$



Solve using the scale factor.

$$\frac{5\sqrt{2}}{3} * SF = \frac{\sqrt{6}}{2} \Rightarrow SF = \frac{\sqrt{6}}{2} * \frac{3}{5\sqrt{2}} \Rightarrow SF = \frac{3\sqrt{3}\sqrt{2}}{10\sqrt{2}} \Rightarrow \boxed{SF = \frac{3\sqrt{3}}{10}}$$



$$\Rightarrow c = 2 * \frac{3\sqrt{3}}{10}$$

$$\Rightarrow \boxed{c = \frac{3\sqrt{3}}{5}}$$

$$a = (SF) * 1$$

$$\Rightarrow \boxed{a = \frac{3\sqrt{3}}{10}}$$