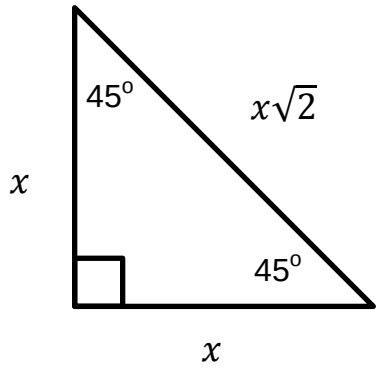
T3: Special Right Triangles

There are two special right triangles of interest.

1. The 45-45-90 triangle




This is an isosceles triangle, so the lengths of the legs are equal.

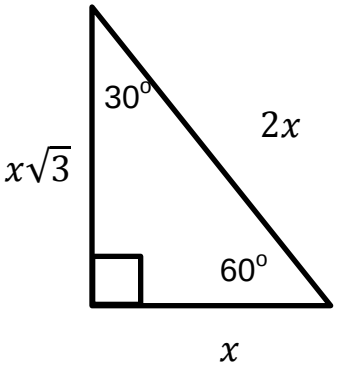
The hypotenuse (via Pythagorean Thm) is $\sqrt{2}$ times the length of each leg.

$$\sin 45° = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\cos 45° = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\tan 45° = \frac{1}{1} = 1$$

2. The 30-60-90 triangle




$$\sin 30° = \frac{1}{2}$$

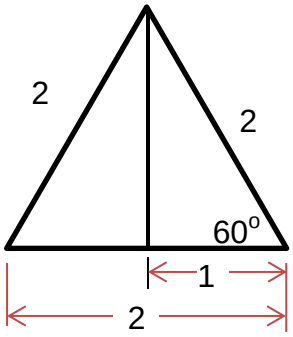
$$\cos 30° = \frac{\sqrt{3}}{2}$$

$$\tan 30° = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$\sin 60° = \frac{\sqrt{3}}{2}$$

$$\cos 60° = \frac{1}{2}$$

$$\tan 60° = \frac{\sqrt{3}}{1} = \sqrt{3}$$




This is half of an equilateral triangle.

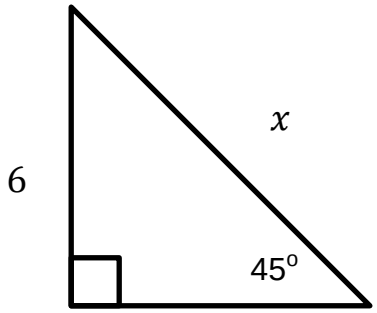
The top angle is $30^o$ (half of $60^o$).

The base (opposite to the $30^o$ angle) is half the length of the hypotenuse.

The third side (opposite to the $60^o$ angle) is $\sqrt{3}$ times greater than the base (Pythagorean Thm).

Find the missing value.

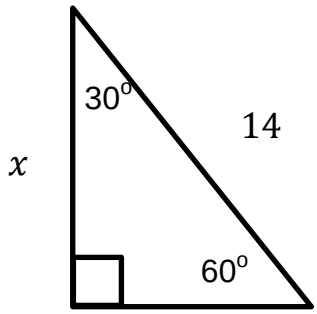
Ex 1




The hypotenuse is $\sqrt{2}$ times longer than the leg.

So x = $6\sqrt{2}$

Ex 2



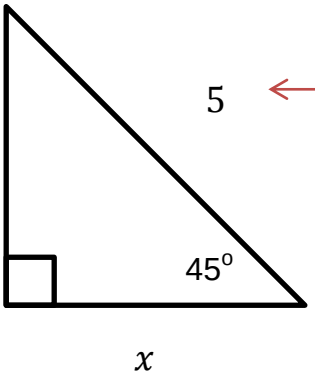

The short side (opposite the 30 degree angle) is half the length of the hypotenuse.

So the base is 7

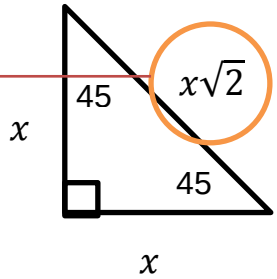
The side opposite the 60 degree angle is $\sqrt{3}$ times longer than the base.

So $x = 7\sqrt{3}$

Ex 3




The hypotenuse is $\sqrt{2}$ times longer than the leg.




Equating the triangles,

$x\sqrt{2} = 5$

Dividing both sides by $\sqrt{2}$,

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