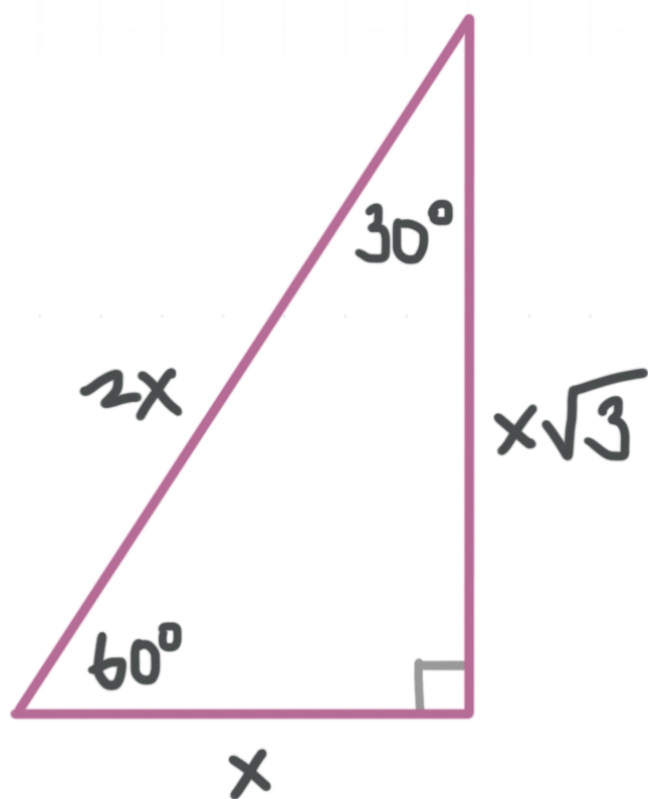


30-60-90 triangles

A 30-60-90 is a right triangle in which the measures of the interior angles are 30° , 60° , and 90° , which means it's a scalene right triangle, that is, each side has a different length. Since it's a right triangle, it has a long leg and a short leg, and just like any right triangle, the hypotenuse is the longest side of all.

In this 30-60-90 triangle (and in any 30-60-90 triangle), the length of the hypotenuse is twice the length of the short leg, and the ratio of the length of the long leg to the length of the short leg is $\sqrt{3}$. In this figure, the length of the short leg is x , so the length of the long leg is $x\sqrt{3}$ and the length of the hypotenuse is $2x$



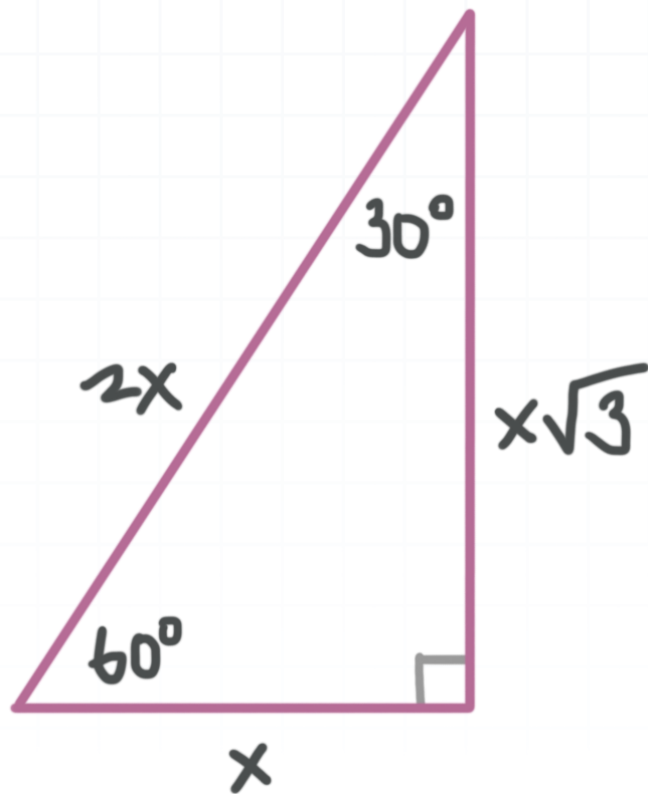
We can use these relationships to find the length of a side of any 30-60-90 triangle if we know the length of one of the other sides,



provided that we also know which angle is opposite the side of known length. Let's start by working through an example.

Example

If $x = 6$, what are the lengths of the hypotenuse and the long leg?



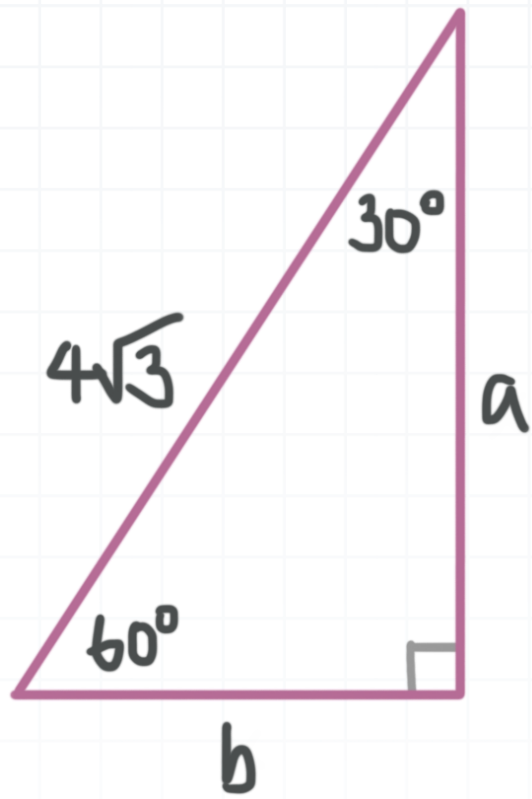
The length of the hypotenuse is $2x$. We know that $x = 6$, so the length of the hypotenuse is $2x = 12$. The length of the long leg is $x\sqrt{3} = 6\sqrt{3}$.

Let's look at another example.

Example

What are the values of a and b ?





The pattern for the lengths of the sides of a 30-60-90 triangle is x for the short leg, $x\sqrt{3}$ for the long leg, and $2x$ for the hypotenuse. In this case we know that the length of the hypotenuse is $4\sqrt{3}$, so

$$2x = 4\sqrt{3}$$

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

b is the length of the short leg, so $b = x = 2\sqrt{3}$, and a is the length of the long leg, so

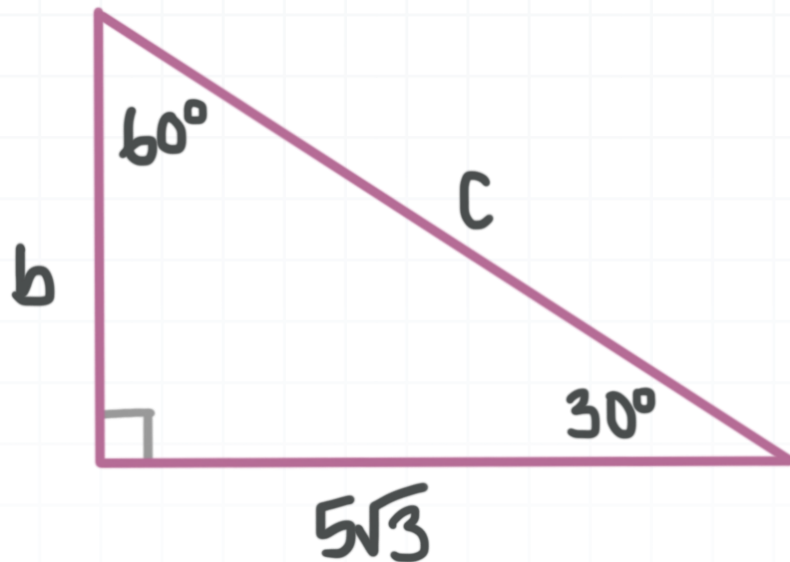
$$a = x\sqrt{3} = (2\sqrt{3})(\sqrt{3}) = 2(\sqrt{3} \cdot \sqrt{3}) = 2(3) = 6$$

Let's try another example.



Example

What are the values of b and c ?



We know that the length of the long leg is $5\sqrt{3}$, so

$$x\sqrt{3} = 5\sqrt{3}$$

$$x = 5$$

b is the length of the short leg, so $b = x = 5$, and c is the length of the hypotenuse, so

$$c = 2x = 2(5) = 10$$

