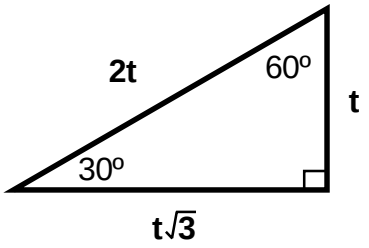
Math Study Strategies

Triangle Relationships

Relationships in a 30-60-90 degree triangle

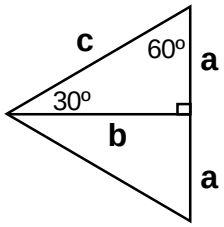
Let the **shortest leg** of the triangle (the side opposite the 30º angle) equal **t**
Then the length of the **hypotenuse** is twice the length of the shortest leg: **2t**
The length of the **longest leg** (the side opposite the 60º angle) is square root 3 times the shortest leg: **t√3**



Proof that longest leg = $t\sqrt{3}$ and hypotenuse = 2t given that shortest leg = t

Let a = t
$a^2 + b^2 = c^2 = (2a^2)^2$
$a^2 + b^2 = 4a^2$
$b^2 = 3a^2$
$b = a\sqrt{3}$
$b = t\sqrt{3}$

$a^2 + b^2 = c^2$
$t^2 + (t\sqrt{3})^2 = c^2$
$t^2 + 3t^2 = c^2$
$c^2 = 4t^2$
$c = \sqrt{4t^2} = 2t$

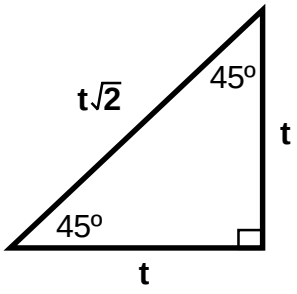


Relationships in a 45-45-90 degree triangle

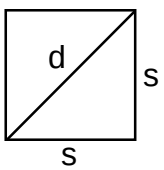
The legs of a 45-45-90 degree triangle are equal
Therefore, if one **leg** is named "**t**", then the other **leg** will be "**t**" as well
The **hypotenuse** is square root 2 times the length of a **leg**: $t\sqrt{2}$

Proof that hypotenuse = $t\sqrt{2}$:
According to the Pythagorean theorem,

$$2t^2 = t^2 + t^2$$
$$t\sqrt{2} = \sqrt{t^2} + \sqrt{t^2}$$
$$t = \frac{t\sqrt{2}}{\sqrt{2}}$$
$$t = t$$



Corollary: each diagonal (d) of a square is square root 2 times the length of a side (s)



$d = s\sqrt{2}$