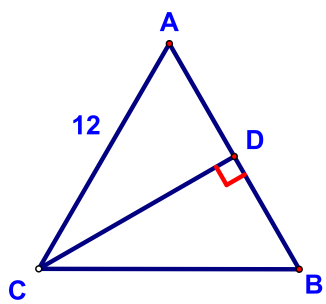
Lesson 9-7 - Special Right Triangles

OK, so I don't say this often, but I really mean it today...this could be one of the most important lessons we have all year. You'll use the results of this lesson more than almost anything else you learn this year. Granted, most of this use will be on other math problems throughout your high school and college careers, but let's face it...if you learn it now, you'll do better later!

Here's the warmup!



△ABC is equilateral

What is the relationship between △ADC and △BDC?

Find AD and BD.

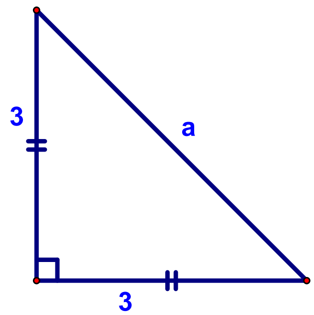
Find CD.

What relationship exists between AD and AC?

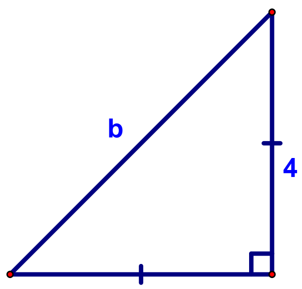
What relationship exists between CD and AD?

We'll start today's lesson by looking at the following examples of problems involving isosceles right triangles:

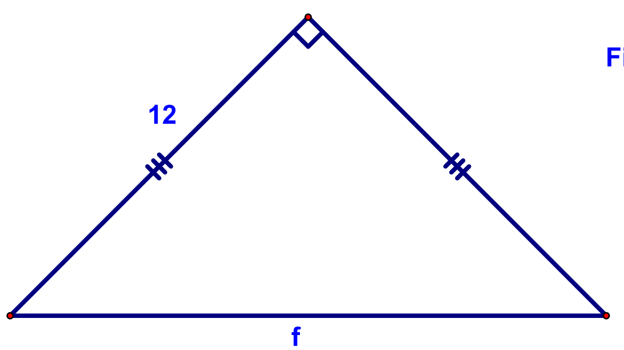
Find a.



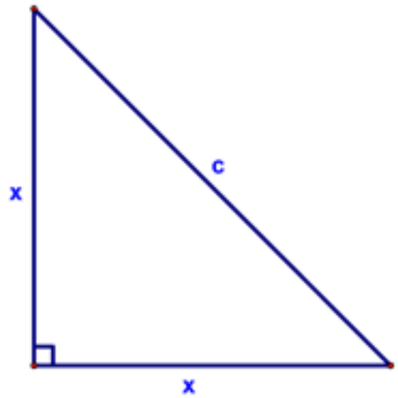
Find *b*



Find *f*.



At this point, you should notice a pattern. It is shown below:



Find *c*.

$a^2 + b^2 = c^2$
$x^2 + x^2 = c^2$
$2x^2 = c^2$
$c = \sqrt{2x^2} = x\sqrt{2}$

This, in turn, leads to the following theorem:

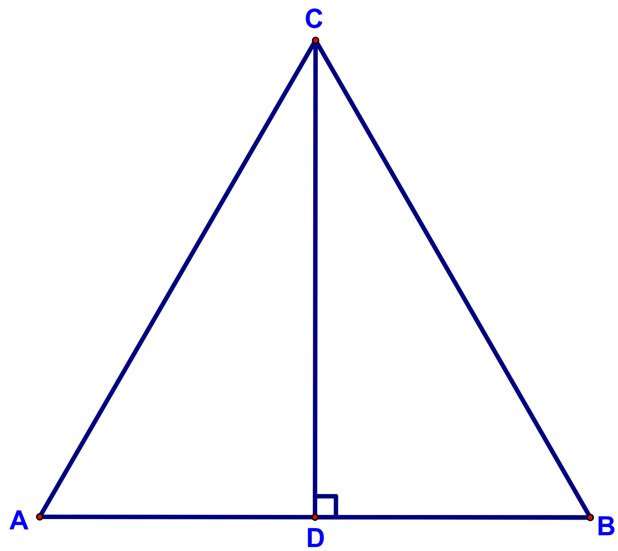
Theorem 71 (Isosceles Right Triangle Theorem)

In an isosceles right triangle (a Δ whose angles have measures 45, 45, and 90), if the legs have length *x*, then the hypotenuse has length $x\sqrt{2}$.

Here's some space for you to practice your 45-45-90s along with the video!

Next, let's look at 30-60-90 (a.k.a. 30-60-Right) triangles. To do this, we'll first consider an equilateral triangle, from which we were able to derive some interesting facts about a 30-60-90 triangle:

△ABC is equilateral. CD is an altitude.



What are m∠A & m∠B?

What are m∠ACD & m∠BCD?

What are m∠ADC & m∠BDC?

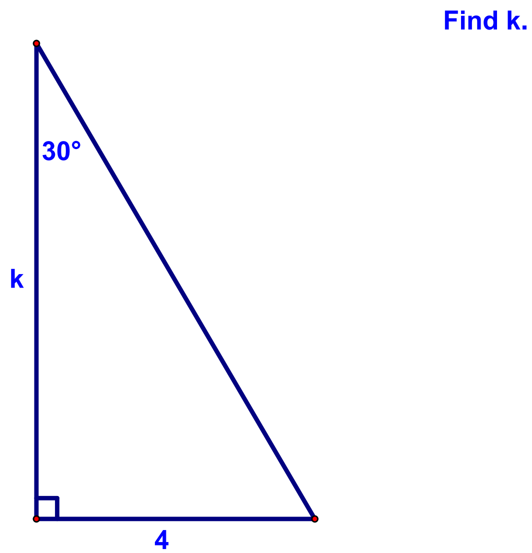
Is △ADC ≅ △BDC? Why?

Is $\overline{AD} \cong \overline{BD}$? Why?

How do AC and AD compare?

You should be able to see how we came up with the last conclusion - if you can't follow it through step by step until you can!

Now, let's look at the following example:



You should be able to figure this out quickly! If you don't know, then look at the previous diagram and really study it!!

So, we can generalize with the following theorem:

Theorem 72 **(30-60 Right Triangle Theorem)**

In a 30-60 right triangle, if the shorter leg has length x, then the longer leg has length $x\sqrt{3}$ and the hypotenuse has length 2*x*.

Here's some space for you to practice along with the video!

To conclude, here are the two special triangles. Please, please, please....memorize these!! If you do, you'll thank me many times over the next couple of years...