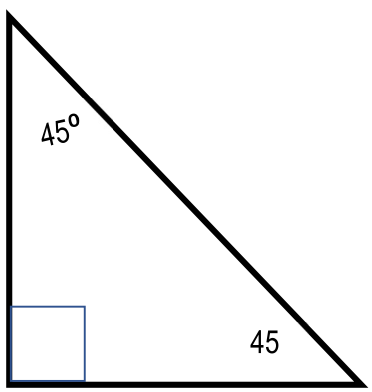
Read this before beginning Fun Binder section 5.1.1 – 5.2.2, Special Right Triangles

1) <u>Special Right Triangles</u>

There are two Special Right Triangles. **And they appear on the ACT all the time! So, it pays to remember them!**

You'll also find that, once you learn them, they'll save you a *whole* lot of work and time!

<table>
<tr>
<td>a) 45^o 45^o 90^o

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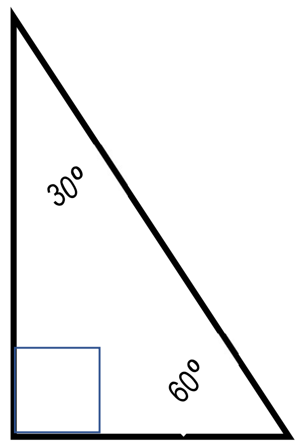
<td>b) 30^o 60^o 90^o

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<tr>
<td>In a 45, 45, 90 triangle, the measures of the 2 legs are equal to each other, and the hypotenuse will always be whatever the leg is, multiplied by the square root of "2".</td>
<td>In a 30, 60, 90 triangle, the measure of the hypotenuse will always be twice the measure of the short leg, and the long leg will always be the measure of the short leg multiplied by the square root of "3".</td>
</tr>
<tr>
<td colspan="2">Well, again, I know what you're asking: "Mr. Mahlmann, why is this?" Again, a great question. If we were in class, I'd be happy to show you, but the proof is a bit complicated, involving prime factorization and rationalization of denominators. (See what I mean?) And it's really not that important. It's just important for now, to know that it's true. When we get back in class, I'll show the proof to you.</td>
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<u>Examples:</u>

Here are a couple of examples. It’s really easy. It really doesn’t involve much calculating, just remembering:

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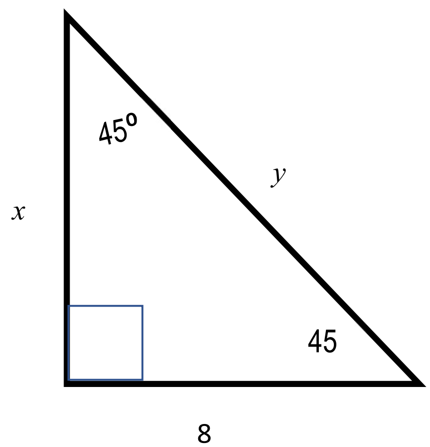
a) 45° 45° 90°



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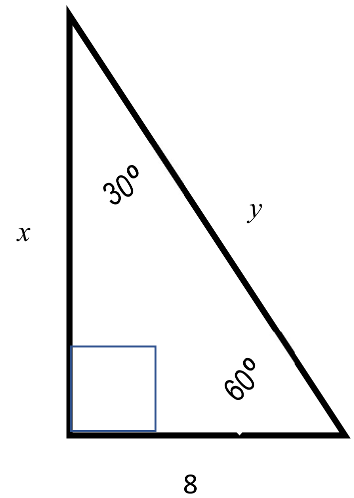
b) 30° 60° 90°



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<tr>
<td>So, since the legs are equal, $x = 8$</td>
<td>So, since the hypotenuse is twice the size of the short leg $y = 16$</td>
</tr>
<tr>
<td>Since the leg is 8, then $y = 8\sqrt{2}$

That’s it! Don’t’ do anything else! Just put “8” in front of $\sqrt{2}$, and you’re done!</td>
<td>Since the short leg is 8, then $x = 8\sqrt{3}$

That’s it! Don’t’ do anything else! Just put “8” in front of $\sqrt{3}$, and you’re done!</td>
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2) <u>Pythagorean Triples</u>

What's 2 + 2 ?

How long did it take you to get the answer? The fact is, you got the answer immediately, didn't you?

That's because you've done it so many times, you know the answer. You didn't have to use a calculator, your fingers, or even pencil & paper.

The point is, if you can remember something, it can save you work and time. (Which you want to do on the ACT exam…)

You may not have realized it, but there are some things we've done in class many times, involving the Pythagorean (Mahlmann) Theorem.

For instance, every time we had a right triangle whose legs measured:

1) 3 & 4, we always found the hypotenuse was 5.

2) 5 & 12, we always found the hypotenuse was 13.

These are examples of what are called "Pythagorean Triples." If you can just remember these, it will save you work and time.

<u>Examples:</u>

So, what about a right triangle whose legs measure 6 & 8? Well, I can tell you right away that the hypotenuse will measure: 10.

That's because this is also a 3-4-5 Pythagorean Triple. 6 & 8 are multiples of 3 & 4; so, the hypotenuse must be a multiple of 5!

(3 x 2 = 6,   4 x 2 = 8,   5 x 2 = 10)

What about a right triangle whose legs measure 15 & 36? Againl, I can tell you right away that that the hypotenuse will measure: 39.

That's because this is also a 5-12-13 Pythagorean Triple. 15 & 36 are multiples of 5 & 12; so, the hypotenuse must be a multiple of 13!

(5 x 3 = 15,   12 x 3 = 36   13 x 3 = 39)

There are many other Pythagorean Triples (including 7-24-25 & 8-15-17, which you should also probably remember), but the ones you really need to remember are the ones shown in the examples above; the ACT exam *loves* to use those all the time!

You should now be ready to work on Fun Binder section 5.2.1 – 5.2.2.