3-4-5 Right Triangle

The 3-4-5 right triangle is a right triangle whose sides are in the ratio of 3-4-5 (3-4-5, 6-8-10, 30-40-50, for example). This is valuable because if you see a right triangle with, say, a side with length of 3 and a hypotenuse of 5, you can skip the Pythagorean theorem because you'll recognize this as a 3-4-5 triangle and know that the missing side is 4.

5-12-13 Right Triangle

The 5-12-13 right triangle is just like the 3-4-5 triangle, except the lengths of the sides are different. So, if you see a triangle with sides of 5 and 12 (or 10 and 24, or 50 and 120, etc.) you know the hypotenuse will be 13 (or 26, or 130, etc. respectively).

30-60-90 Right Triangle

The 30-60-90 right triangle is a right triangle with a 30-degree interior angle and a 60-degree interior angle in addition to the right angle all right triangles have. This is valuable because triangles with these angles have a predictable ratio between their sides: $x : x\sqrt{3} : 2x$. Naturally, the hypotenuse is 2x, the shortest side is x, and the final side is x*square root of 3 ($x\sqrt{3}$). Use this knowledge to avoid making calculations that take up time on the SAT.

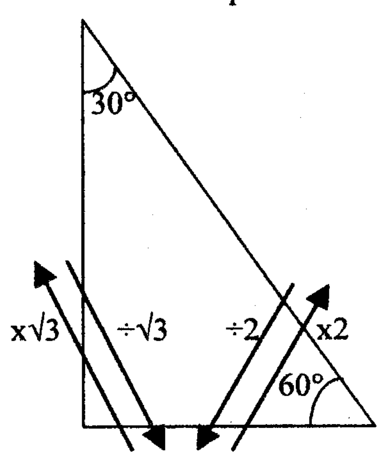
45-45-90 Right Triangle

The 45-45-90 right triangle is similar to the 30-60-90 right triangle, but with different angles. The sides are in a ration of $x : x : x\sqrt{2}$. The hypotenuse is x*square root of 2 ($x\sqrt{2}$), while the other two sides are each x. This triangle is also sometimes refered to as an **isosceles right triangle**.

Using the ratios of the 30-60-90 Right Triangle and the 45-45-90 Right Triangle

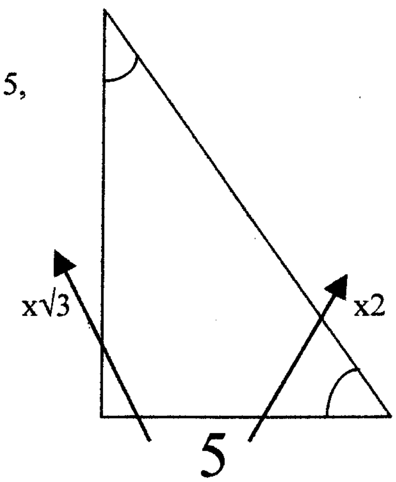
Keep your square roots straight by using the tip that the 30-60-90 right triangle has THREE different angle measures, so it will use the square root of 3 ($\sqrt{3}$), while the 45-45-90 right triangle has only TWO different angle measures, so it will use the square root of 2 ($\sqrt{2}$).

In a 30-60-90 triangle, the short leg is king. You are advised always to go through the short leg when given the long leg and asked to produce the hypotenuse or vice versa. Use the following figure to help:

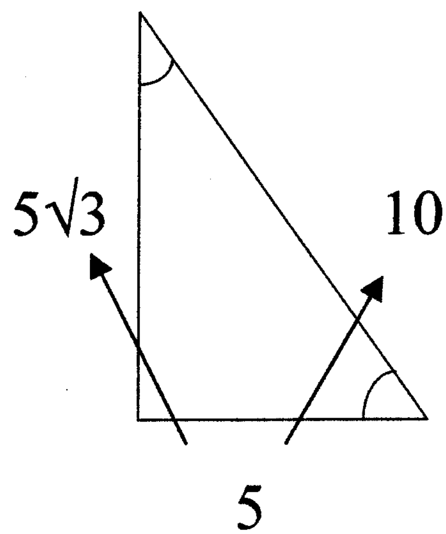


Notice that whenever you go from a bigger length to a shorter length, you divide. When you go from a shorter length to a longer length, you multiply. <u>NEVER</u> go directly from the long leg to the hypotenuse or vice versa!!!

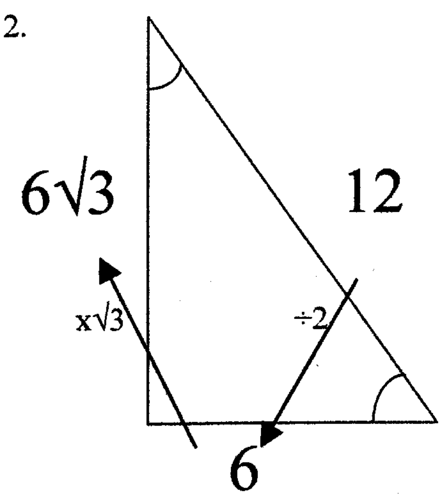
So in this triangle with a short leg of 5,



the long leg is found by multiplying by √3, and the hypotenuse is found by multiplying by 2:

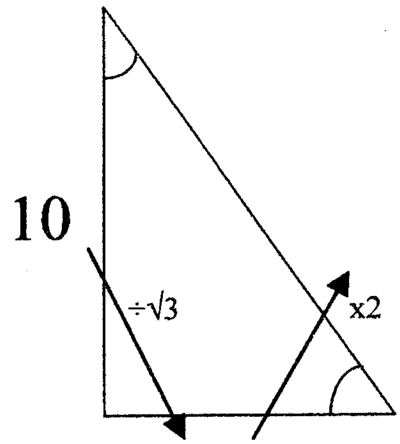


Now, start with a hypotenuse of 12.

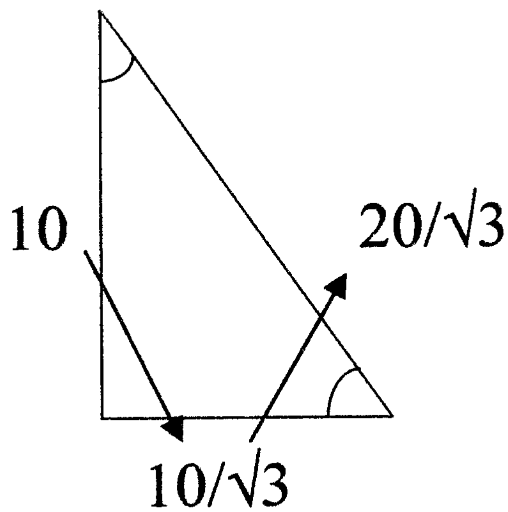


Easy, but wait!

The tricky part is when you start with the long leg, because you have to divide by √3:

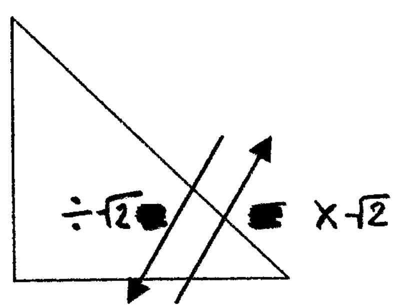


To get the short leg, divide by √3, then to get the hypotenuse, multiply the short leg by two:



Tada!

Now in a 45-45-90 triangle, there are only two different measurements. Both legs have the same measure. To go from either leg to the hypotenuse, multiply by √2, to go the other way, divide. Use following figure to help:



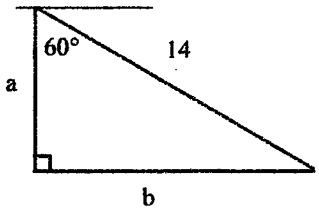
These are much easier, so you just need to try some. Go on to the worksheet!

Geometry
Chapter 8 Assignment #5
30-60-90 and 45-45-90 Worksheet

Name: ______________________________

Period: __________ Group #:

1.



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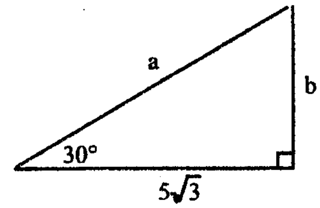
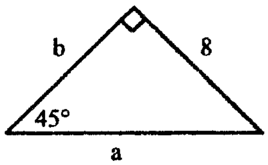


3.



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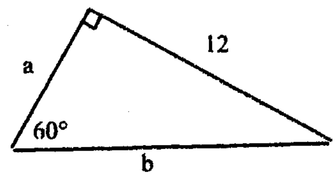

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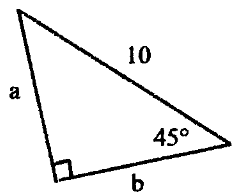

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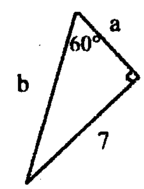
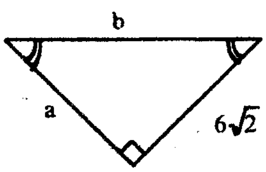
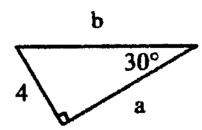


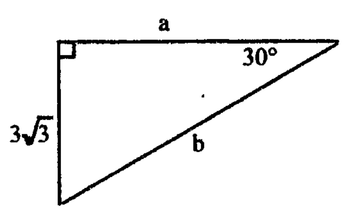
7.



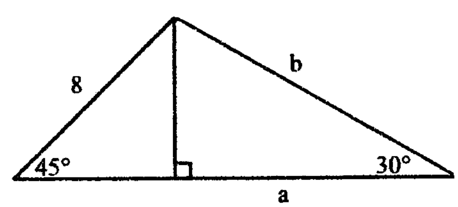
8.



9.



10.



Solve each of the following. Express answers in simplified form. Draw a figure for each.

11. One side of an equilateral triangle measures 6 cm. Find the measure of an altitude of the triangle.

12. The altitude of an equilateral triangle measures 21 in. Find the measure of a side of the triangle.

13. The hypotenuse of an isosceles right triangle measures 8 m. Find the measure of a leg of the triangle.

14. The diagonal of a square measures 36 ft. Find the measure of one side of the square.

Answers

1. $a = 7$ $b = 7\sqrt{3}$
2. $a = 10$ $b = 5$
3. $a = 8\sqrt{2}$ $b = 8$
4. $a = 4\sqrt{3}$ $b = 8\sqrt{3}$
5. $5\sqrt{2} = a = b$

*6. $a = \frac{7}{3}\sqrt{3}$ $b = \frac{14}{3}\sqrt{3}$

*7. $a = 6\sqrt{2}$ $b = 12$

8. $a = 4\sqrt{3}$ $b = 8$

*9. $a = 9$ $b = 6\sqrt{3}$

*10. $a = 4\sqrt{6}$ $b = 8\sqrt{2}$

11. $3\sqrt{3}$
12. $14\sqrt{3}$
13. $4\sqrt{2}$
14. $18\sqrt{2}$

*very challenging