Name: _____

Setting up Special Triangle Relationships to Solve

Special Triangles are (30° – 60° – 90° and 45° – 45° – 90°) are two types of triangles that can be solved *either* by using trigonometry or by remembering the relationships between the sides, which creates, in essence, a shortcut.

There are 3 steps in solving special triangles:

Step 1: Label the sides as "opp30, opp60 and hyp" or "opp45, opp45 and hyp".

If you have trouble finding opp sides, look for adj ones instead: opp30 is adj60 & opp60 is adj30.

Step 2: Create a complete equation using the special triangle relationships and the side you know.

The two relationship sets that you need to remember are:

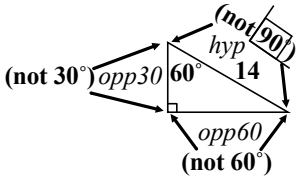
30° – 60° – 90°
*opp*30°: x
*opp*60°: $x\sqrt{3}$
hyp: $2x$

45° – 45° – 90°
*opp*45°: x
*opp*45°: x
hyp: $x\sqrt{2}$

Step 3: Solve any complete equation you have to find x, then plug x into the equation for the side you want.

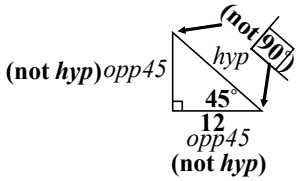
Section 1: Label the sides as "opp30, opp60 and hyp" or "opp45, opp45 and hyp".

EXAMPLE 1A:



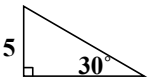
Just label the triangle's sides.
→*hyp* never touches the right angle
→*opp*60° never touches the 60°
→*opp*30° never touches the 30°

EXAMPLE 2A:

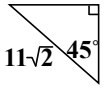


Just label the triangle's sides.
→*hyp* never touches the right angle
→*opp*45° are the other two sides
(same angle, same label)

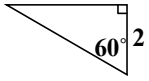
1*a*.



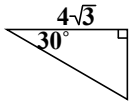
2*a*.



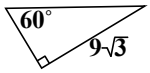
3*a*.



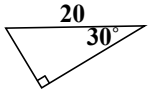
4*a*.



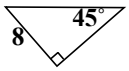
5*a*.



6*a*.

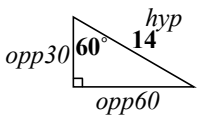


7*a*.



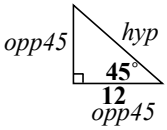
Section 2: Fill in the blanks to create a complete equation using the side you know. Put "?" next to your unknowns.

EXAMPLE 1B:



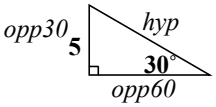
Just write in the sides that you know.
*opp*30: $x =$ __?__ ← *blank*
*opp*60: $x\sqrt{3} =$ __?__ ← *blank*
hyp: $2x =$ __14__ ← *hyp was* 14

EXAMPLE 2B:

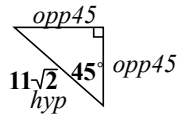
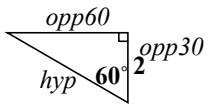
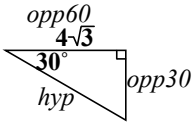
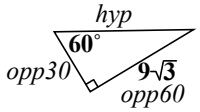
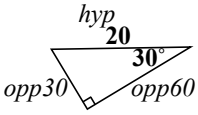
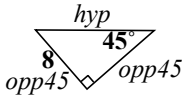


*opp*45: $x =$ __12__ ← *opp*45 *was* 12
*opp*45: $x =$ __?__ ← *blank*
hyp: $x\sqrt{2} =$ __?__ ← *blank*

1*b*.



*opp*30: $x =$ ____
*opp*60: $x\sqrt{3} =$ ____
hyp: $2x =$ ____

2*b.*  $opp45$: $x =$ ____ $opp45$: $x =$ ____ hyp: $x\sqrt{2} =$ ____	3*b.*  $opp30$: $x =$ ____ $opp60$: $x\sqrt{3} =$ ____ hyp: $2x =$ ____	4*b.*  $opp30$: $x =$ ____ $opp60$: $x\sqrt{3} =$ ____ hyp: $2x =$ ____
5*b.*  $opp30$: $x =$ ____ $opp60$: $x\sqrt{3} =$ ____ hyp: $2x =$ ____	6*b.*  $opp30$: $x =$ ____ $opp60$: $x\sqrt{3} =$ ____ hyp: $2x =$ ____	7*b.*  $opp45$: $x =$ ____ $opp45$: $x =$ ____ hyp: $x\sqrt{2} =$ ____

Section 3: Now that you have one complete equation, solve it for *x*, then plug *x* into the equation for the side you want.

EXAMPLE 1C: $opp30$: $x = ?$ $opp60°$: $x\sqrt{3} = ?$ hyp: $2x = 14$ The complete equation is: $2x = 14$ Now, I'll solve it for *x*: $2x = 14$ $\div 2 \quad \div 2$ $x = 7$ Plug *x* into the other two equations $opp30$: $x = ?$ $(7) = ?$, so $opp30$ is $\boxed{7}$ $opp60°$: $x\sqrt{3} = ?$ $(7)\sqrt{3} = ?$, so $opp60$ is $\boxed{7\sqrt{3}}$	**EXAMPLE 2C:** $opp45$: $x = 12$ $opp45$: $x = ?$ hyp: $x\sqrt{2} = ?$ The complete equation is: $x = 12$ Now, I'll solve it for *x*: $x = 12$ *...umm, it's already solved. So...* Plug *x* into the other two equations $opp45$: $x = ?$ $(12) = ?$, so $opp45$ is $\boxed{12}$ hyp: $x\sqrt{2} = ?$ $(12)\sqrt{2} = ?$, so hyp is $\boxed{12\sqrt{2}}$	1*c.* $opp30$: $x = 5$ $opp60$: $x\sqrt{3} = ?$ hyp: $2x = ?$
2*c.* $opp45$: $x = ?$ $opp45$: $x = ?$ hyp: $x\sqrt{2} = 11\sqrt{2}$	3*c.* $opp30$: $x = 2$ $opp60$: $x\sqrt{3} = ?$ hyp: $2x = ?$	4*c.* $opp30$: $x = ?$ $opp60$: $x\sqrt{3} = 4\sqrt{3}$ hyp: $2x = ?$
5*c.* $opp30$: $x = ?$ $opp60$: $x\sqrt{3} = 9\sqrt{3}$ hyp: $2x = ?$	6*c.* $opp30$: $x = ?$ $opp60$: $x\sqrt{3} = ?$ hyp: $2x = 20$	7*c.* $opp45$: $x = 8$ $opp45$: $x = ?$ hyp: $x\sqrt{2} = ?$