5.5 Special Rights

A Solidify Understanding Task

In previous courses you have studied the Pythagorean theorem and right triangle trigonometry. Both of these mathematical tools are useful when trying to find missing sides of a right triangle.

1. What do you need to know about a right triangle in order to use the Pythagorean theorem?

2 sides a & b → c

2. What do you need to know about a right triangle in order to use right triangle trigonometry?

$\sin\theta = \frac{O}{H}$

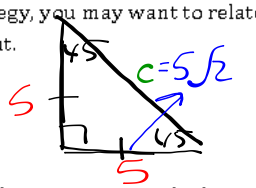
2 sides → angle (θ)

angle + side → other side

While using the Pythagorean theorem is fairly straight forward (you only have to keep track of the legs and hypotenuse of the triangle), right triangle trigonometry generally requires a calculator to look up values of different trig ratios. There are some right triangles, however, for which knowing a side length and an angle is enough to calculate the value of the other sides without using trigonometry. These are known as *special right triangles* because their side lengths can be found by relating them to another geometric figure for which we know a great deal about its sides.

One type of special right triangle is a 45°-45°-90° triangle.

3. Draw a 45°-45°-90° triangle and assign a specific value to one of its sides. (For example, let one of the legs measure 5 cm, or choose to let the hypotenuse measure 8 inches. You will want to try both approaches to perfect your strategy.) Now that you have assigned a measurement to one of the sides of your triangle, find a way to calculate the measures of the other two sides. As part of your strategy, you may want to relate this triangle to another geometric figure that may be easier to think about.



$5^2 + 5^2 = c^2$

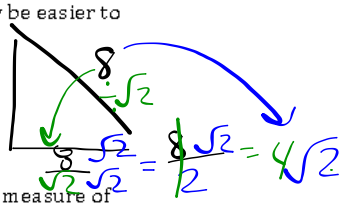
$25 + 25 = c^2$

$\sqrt{50} = \sqrt{c^2}$

$5\sqrt{2} = c$

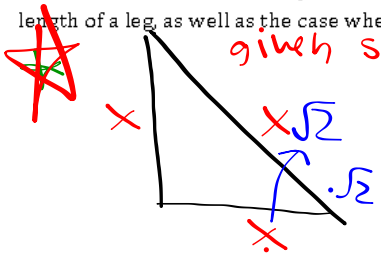
$2 \cdot 25$

$5\sqrt{2}$

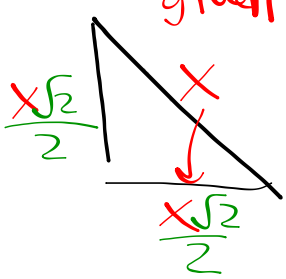


4. Generalize your strategy by letting one side of the triangle measure x. Show how the measure of the other two sides can be represented in terms of x. (Make sure to consider cases where x is the length of a leg, as well as the case where x is the length of the hypotenuse.)

given side:

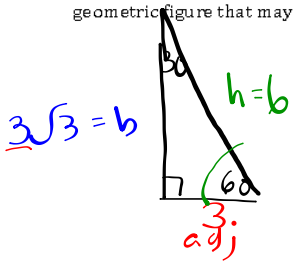


given H:



Another type of special right triangle is a 30°-60°-90° triangle.

5. Draw a 30°-60°-90° triangle and assign a specific value to one of its sides. Now that you have assigned a measurement to one of the sides of your triangle, find a way to calculate the measures of the other two sides. As part of your strategy, you may want to relate this triangle to another geometric figure that may be easier to think about.



$3\sqrt{3} = b$

$h\cos 60 = 3$

$\frac{h\cos 60}{\cos 60} = \frac{3}{\cos 60}$

$h = \frac{3}{\cos 60}$

$h = 6$

$a^2 + b^2 = c^2$

$9 + b^2 = 36$

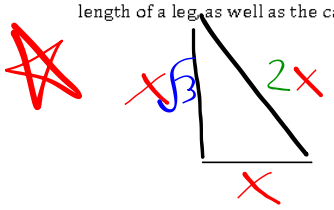
$-9 \quad -9$

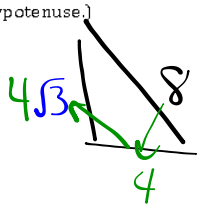
$\sqrt{b^2} = \sqrt{27}$

$= 3\sqrt{3}$

$3 \cdot 3$

6. Generalize your strategy by letting one side of the triangle measure x. Show how the measure of the other two sides can be represented in terms of x. (Make sure to consider cases where x is the length of a leg, as well as the case where x is the length of the hypotenuse.)





Ready, Set, Go!

Ready

Topic: Finding missing measurements in triangles

Use the given figure to answer the questions. Round your answers to hundredths place.

1 www.flickr.com/photos/gottgraphicsdesign

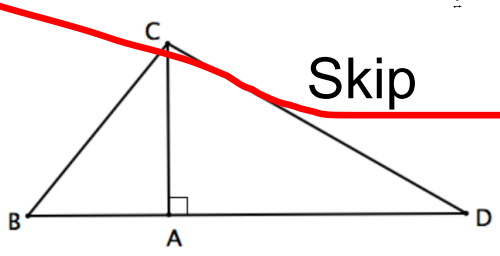
Given: $m\angle CBD = 51°$
$m\angle CDA = 30°$

1. Find $m\angle BCD$

Given : $m\angle CAD = 90°$

2. Find $m\angle BCA$ and $m\angle ACD$

Given: $CA = 6\ ft$



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3. Find BC

4. Find BA

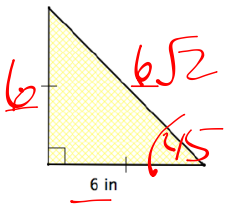
5. Find CD

6. Find AD

7. Find BD

8. Find the area of ΔBCD

9.



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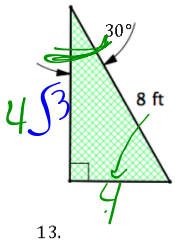

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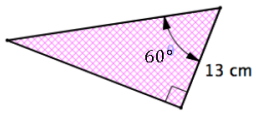

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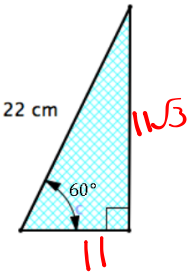

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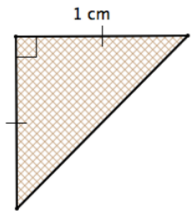

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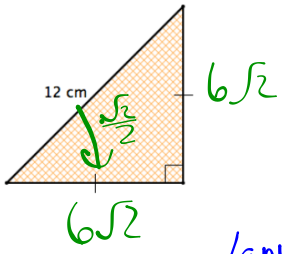


Use an appropriate triangle from above to fill in the function values below.

15. use #9 16. use #10 17. use #12 (any 30-60-90 triangle would work)

sin 45° = $\frac{O}{H}$ $\frac{6}{6\sqrt{2}}$ $\frac{1}{\sqrt{2}}$ $\frac{\sqrt{2}}{2}$		sin 30° = $\frac{O}{H}$ $\frac{4}{8}$ = $\frac{1}{2}$		sin 60° =	
cos 45° =		cos 30° =		cos 60° =	
tan 45° =		tan 30° =		tan 60° =	

Go Topic: Function arithmetic

18. Add $f(x)$ and $g(x)$ using the graph at the right.

Draw the new figure on the graph and label it as $s(x)$.
(the sum of x)

19. Subtract $f(x)$ from $g(x)$ using the graph at the right.

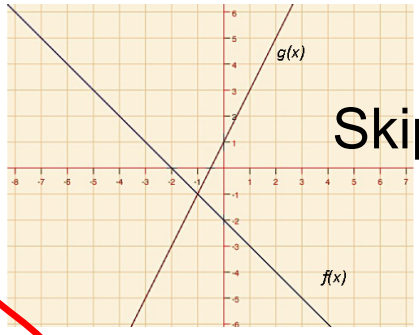
Draw the new figure on the graph and label it as $d(x)$.
(the difference of x)

20. Multiply $f(x)$ and $g(x)$ on the second graph at the right.

Draw the new figure on the graph and label it as $p(x)$.
(the product of x)

21. Divide $f(x)$ by $g(x)$ on the second graph at the right.

Draw the new figure on the graph and label it as $q(x)$.
(the quotient of x)



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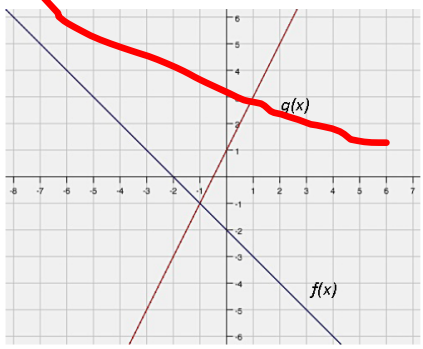

22. Write the equations of $f(x)$ and $g(x)$.

23. Write the equation of the sum of $f(x)$ and $g(x)$.
$s(x)$ =

24. Write the equation of the difference of $f(x)$ and $g(x)$.
$d(x)$ =

25. Write the equation of the product of $f(x)$ and $g(x)$.
$p(x)$ =

26. Write the equation of the quotient of $f(x)$ divided by $g(x)$.
$q(x)$ =