AMDG

Name | Ms. Kresovic

Adv Geo – **_Special Right Triangles (9.7)_** 18 March 2014

Objectives

After studying this section, you will be able to

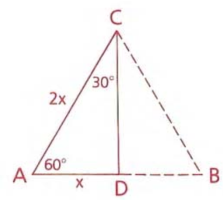
- Identify the ratio of side lengths in a 30°-60°-90° triangle
- Identify the ratio of side lengths in a 45°-45°-90° triangle

The smallest side is ALWAYS opposite the smallest angle.

The largest side is ALWAYS opposite the largest angle.

Theorem 72 ***In a triangle whose angles have the measures 30, 60, and 90, the lengths of the sides opposite these angles can be represented by x, $x\sqrt{3}$, and 2x respectively.*** **(30°-60°-90°-*Triangle Theorem*)**

Given: △ABC is equilateral.
$\overrightarrow{CD}$ bisects ∠ACB.
Prove: AD:DC:AC = $x:x\sqrt{3}:2x$

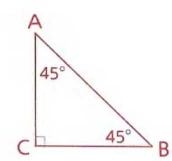


Proof: Since △ABC is equilateral, ∠ACD = 30°, ∠A = 60°, ∠ADC = 90°, and AD = $\frac{1}{2}$(AC).
By the Pythagorean Theorem, in △ADC,
$$x^2 + (DC)^2 = (2x)^2$$

work through the rest now.

Theorem 73 ***In a triangle whose angles have the measures 45, 45, and 90, the lengths of the sides opposite these angles can be represented by x, x, and $x\sqrt{2}$, respectively.*** **(45°-45°-90°-*Triangle Theorem*)**

Given: △ACB, with ∠A = 45° and ∠B = 45°.
Prove: AC:CB:AB = $x:x:x\sqrt{2}$
The proof of this theorem is left to you.

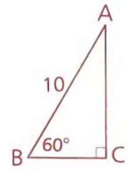


You will see 30°-60°-90° and 45°-45°-90° triangles frequently in this book and in other mathematics courses. Their ratios are worth memorizing now.

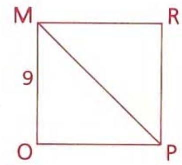
Six Common Families of Right Triangles	
30°-60°-90° ⟺ $(x, x\sqrt{3}, 2x)$	(5, 12, 13)
45°-45°-90° ⟺ $(x, x, x\sqrt{2})$	(7, 24, 25)
(3, 4, 5)	(8, 15, 17)

Class Examples

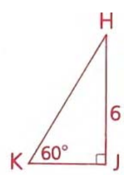
Problem 1 *Type: Hypotenuse (2x) known*
Find BC and AC.



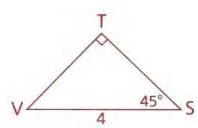
Problem 3 *Type: Leg (x) known*
MOPR is a square.
Find MP.



Problem 2 *Type: Longer leg $\left(x\sqrt{3}\right)$ known*
Find JK and HK.



Problem 4 *Type: Hypotenuse $\left(x\sqrt{2}\right)$ known*
Find ST and TV.



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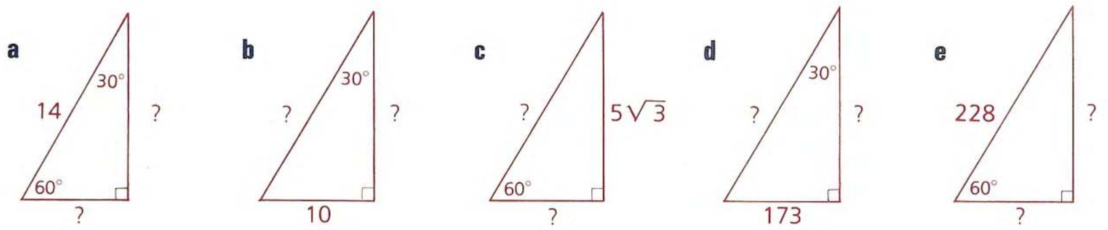
Homework

1 Find the two missing sides in each 30°-60°-90° triangle. Try to do the calculations in your head.

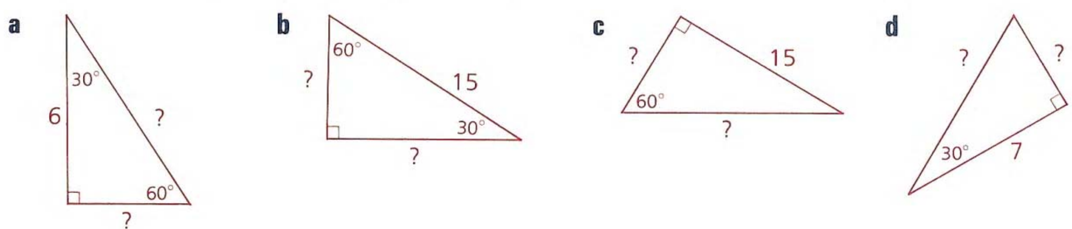


1a ______________________________ 1d ______________________________

1b ______________________________ 1e ______________________________

1c ______________________________

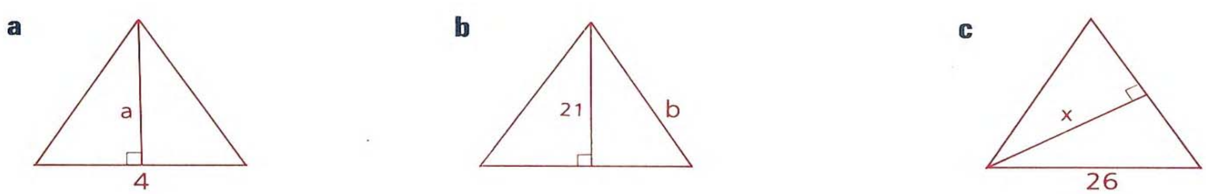
2 Find the two missing sides of each triangle. (Hint: These are a bit harder, and you may want to put x, $x\sqrt{3}$, and 2x on the proper sides as shown in the sample problems.)



2a ______________________________ 2c ______________________________

2b ______________________________ 2d ______________________________

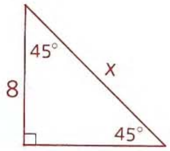
3 Solve for the variable in each of these equilateral triangles.



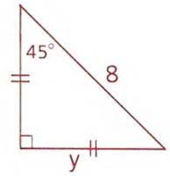
3a	3b	3c

4 Solve for the variable in each of these 45°-45°-90° triangles.

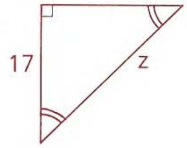
a



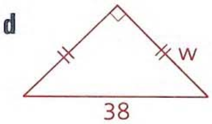
b



c



d

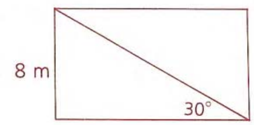


4a ____ 4c____

4b ____ 4d ____

5 The perimeter of a square is 44. Find the length of a diagonal.

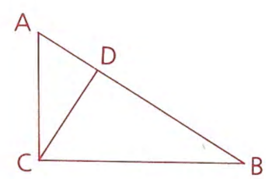
6 Find the length of the diagonal of the rectangle.



7 Find the altitude of an equilateral triangle if a side is 6 mm long.

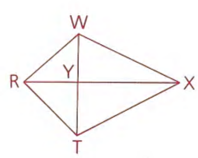
8 Given: $\overline{AC} \perp \overline{BC}$, $\overline{CD} \perp \overline{AB}$, $\angle B = 30°$, $BC = 8\sqrt{3}$

Find: CD



9 Given: TRWX is a kite ($\overline{TR} \cong \overline{WR}$ and $\overline{TX} \cong \overline{XW}$).
RY = 5, TW = 10, YX = 12

Find: **a** TR
b WX



10 **a** Find the ratio of the longer leg to the hypotenuse in a 30°-60°-90° triangle.

10

b Find the ratio of one of the legs to the hypotenuse in a 45°-45°-90° triangle.

12 **a** Find the coordinates of B.
b Find the slope of $\overleftrightarrow{OB}$.
c Find $\frac{AB}{OA}$. (In a trigonometry class, this ratio is called the *tangent* of angle BOA.)