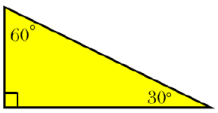
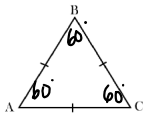
The 30°-60°-90° Special Right Triangle

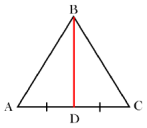
In a triangle with angle measures 30°, 60°, 90° you can find the lengths of all 3 sides, when you are only given 1 side.



Recall: Equilateral Triangles have equal sides and angles.

An altitude drawn to the midpoint creates two ≅ segments lengths and bisects angle ABC.





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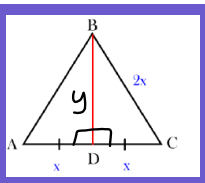
Use the Pythagorean Theorem to find the length of the altitude BD, in *simplest radical form.*



$x^2 + y^2 = (2x)^2$

$x^2 + y^2 = 4x^2$

$-x^2 \quad -x^2$

$\sqrt{y^2} = \sqrt{3x^2}$

$y = x\sqrt{3}$

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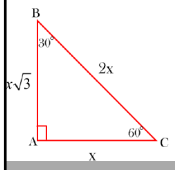
Special Right Triangle: 30° - 60° - 90°

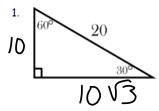
Use the table below to remember the relationship of the 30°-60°-90° special right triangle.



Angle Measure	Side Across from Angle
30°	x
60°	$x\sqrt{3}$
90°	2x

Step 1: Fill in the missing angle measures.
Step 2: Fill in the missing side lengths of each triangle, in *simplest radical form.*

1.



Angle Measure	Side Across from Angle	Answer
30°	x	10
60°	$x\sqrt{3}$	$10\sqrt{3}$
90°	2x	20

$\frac{2x}{2} = \frac{20}{2}$

$x = 10$

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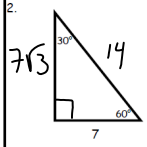
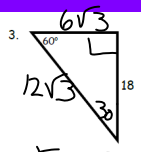
2.



Angle Measure	Side Across from Angle	Answer
30°	x	7
60°	$x\sqrt{3}$	$7\sqrt{3}$
90°	2x	14

3.



Angle Measure	Side Across from Angle	Answer
30°	x	$6\sqrt{3}$
60°	$x\sqrt{3}$	18
90°	2x	$12\sqrt{3}$

$\frac{x\sqrt{3}}{\sqrt{3}} = \frac{18}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$\frac{18\sqrt{3}}{3} \rightarrow 6\sqrt{3}$

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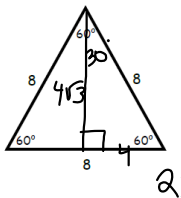
4. What is the height of the equilateral triangle below, in simplest radical form? (Hint: what does the height represent?)

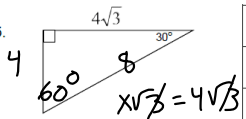


Angle Measure	Side Across from Angle	Answer
30°	x	4
60°	$x\sqrt{3}$	$4\sqrt{3}$
90°	2x	8

$2x = 8$

$x = 4$

5.



$x\sqrt{3} = 4\sqrt{3}$

$x = 4$

Angle Measure	Side Across from Angle	Answer
30°	x	4
60°	$x\sqrt{3}$	$4\sqrt{3}$
90°	2x	8

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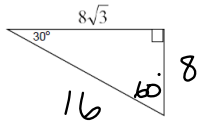
6.



Angle Measure	Side Across from Angle	Answer
30°	x	8
60°	$x\sqrt{3}$	$8\sqrt{3}$
90°	2x	16

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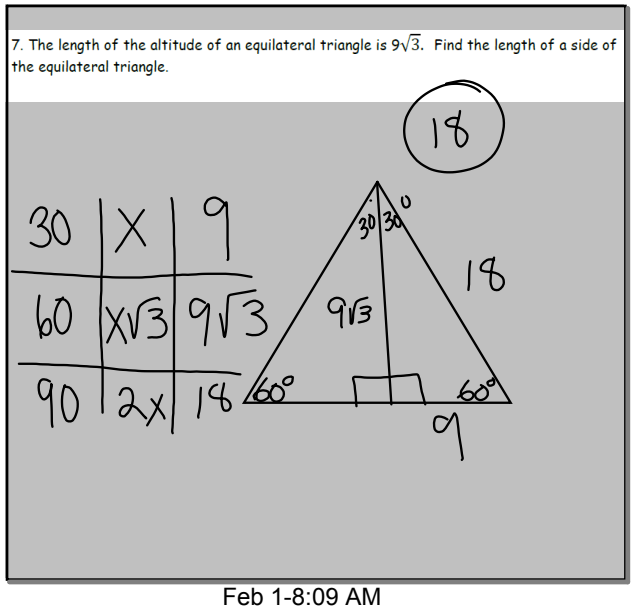
7. The length of the altitude of an equilateral triangle is $9\sqrt{3}$. Find the length of a side of the equilateral triangle.



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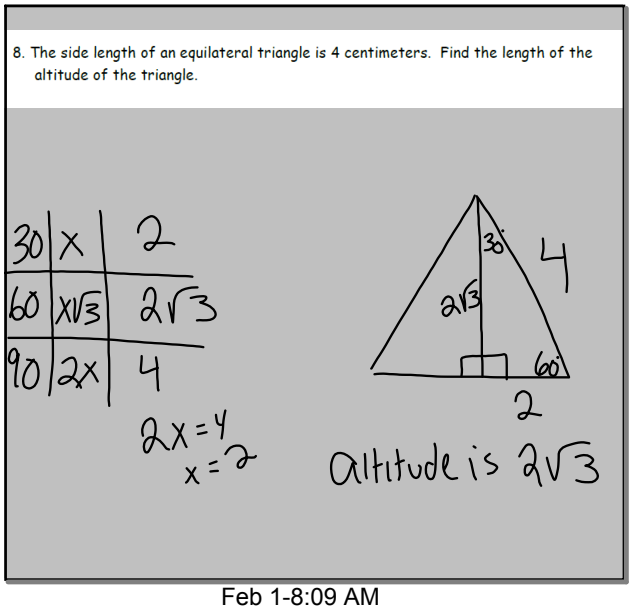
8. The side length of an equilateral triangle is 4 centimeters. Find the length of the altitude of the triangle.



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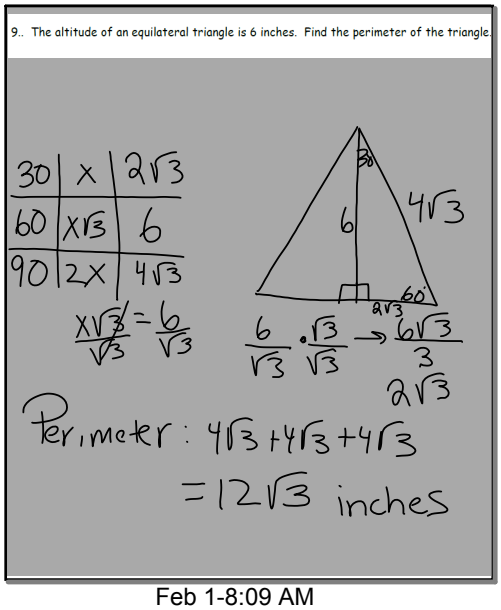
9. The altitude of an equilateral triangle is 6 inches. Find the perimeter of the triangle.



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