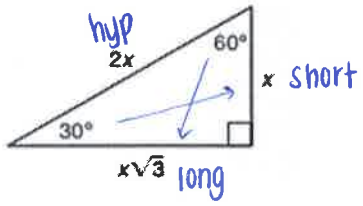
Geometry A
Section 7.4 Special Right Triangles 30-60-90

Name : Key
Date : _____ Period : _____

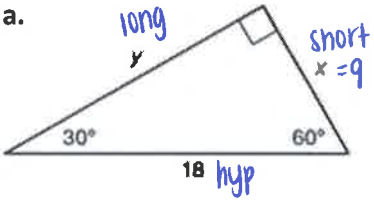
| Theorem | Diagram |
|---|---|
| **30° – 60°– 90° Triangle Theorem**<br><br>In a 30° – 60°– 90°, the length of the hypotenuse is twice the length of shorter leg, and the longer leg is $\sqrt{3}$ times the length of the shorter leg.<br>hyp = 2·short ; long = short·$\sqrt{3}$ |  |

**Note – The short leg is always opposite the 30° angle!
- It is best to find the length of the short leg first if you can! (if it is not already given)

**Example 1: Find lengths in a 30° – 60°– 90° triangle**

*Find the values of x and y. Leave answer in simplest radical form.*

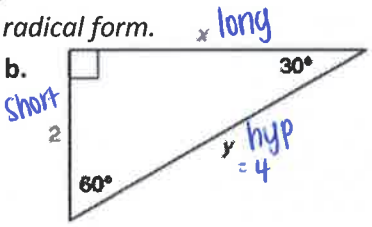
**a.**




hyp = 2·short
$\frac{18}{2} = \frac{2 \cdot x}{2}$
x = 9

long = short·$\sqrt{3}$
y = 9√3

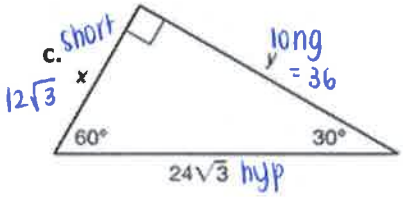
**b.**




hyp = 2·short
y = 2·2
y = 4

long = short·$\sqrt{3}$
x = 2√3

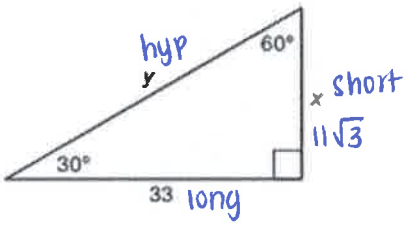
**c.**




hyp = 2·short
$\frac{24\sqrt{3}}{2} = \frac{2 \cdot x}{2}$
x = 12√3

long = short·$\sqrt{3}$
y = 12√3√3
y = 12√9
y = 12(3)
y = 36

**d.**

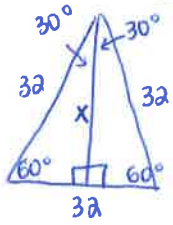



hyp = short·2
y = 2·11√3
y = 22√3

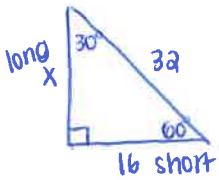
long = short·$\sqrt{3}$
$\frac{33}{\sqrt{3}} = \frac{x\sqrt{3}}{\sqrt{3}}$
$x = \frac{33}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{33\sqrt{3}}{3}$
x = 11√3

## Example 2: Apply 30° – 60°– 90° Triangle Theorem

**a.** You make a guitar pick that resembles and equilateral triangle with side lengths of 32 mm. What is the approximate height of the pick?




To find height, split the Δ in half:

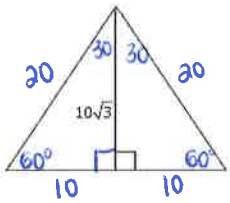



long = short · $\sqrt{3}$

$x = 16\sqrt{3}$

$x \approx 27.7$ mm tall

**b.** An equilateral triangle has a height of $10\sqrt{3}$. What is the length of a side of the triangle?

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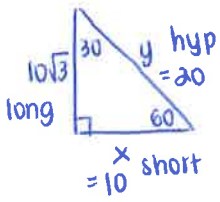
to find missing sides, cut the Δ in half




Each side of the Δ is 20 units

long = short · $\sqrt{3}$

$\frac{10\sqrt{3}}{\sqrt{3}} = \frac{x\sqrt{3}}{\sqrt{3}}$

$x = 10$

hyp = 2 · short

$y = 2 \cdot 10$

$y = 20$