Lesson 10-3

Example 1

ARCHITECTURE A triangular support on a blueprint forms a 30°-60°-90° triangle. On the plans, the leg opposite the 30º angle measures 5 cm. What are the measures of the other two sides?

Solution

In a 30°-60°-90° triangle, if the leg opposite the 30º angle is s, then the other leg is $s\sqrt{3}$, and the hypotenuse is $2s$.

So, in this triangle, the leg opposite the 30º angle is 5 cm, the other leg is $5\sqrt{3}$cm, and the hypotenuse is 10 cm.

Example 2

In a 30°-60°-90° triangle, the hypotenuse measures 11 in. Find the measure of the other two sides to the nearest tenth.

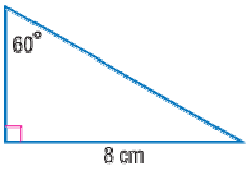
Solution

$2s$	hypotenuse	$2s = 11$
s	side opposite the 30º angle	$s = 5.5$
$s\sqrt{3}$	side opposite the 60º angle	$s\sqrt{3} = 5.5\sqrt{3} \approx 9.5$

So, the missing measures of this triangle are 5.5 in. and 9.5 in.

Example 3

In a 30°-60°-90° triangle, the measure of the leg opposite the 60° angle is 8 cm. Find the measure of the other two sides in simplest radical form.



Solution

You are given $s\sqrt{3} = 8$.

$s = \frac{8}{\sqrt{3}}$ Rationalize the denominator. $s = \frac{8\sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = \frac{8\sqrt{3}}{3}$

The measure of the hypotenuse is $2s$.

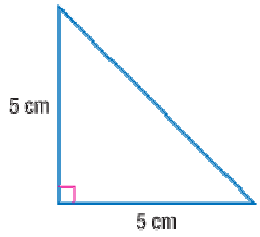
Substitute the value you found for s. $2s = 21\frac{8\sqrt{3}}{3}2 = \frac{16\sqrt{3}}{3}$

So, the missing measures are $\frac{8\sqrt{3}}{3}$ cm and $\frac{16\sqrt{3}}{3}$cm.

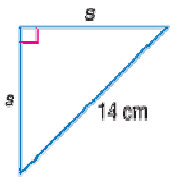
Example 4

Find the unknown measures.

a.



b.



Solution

If s is the length of a side of a 45°-45°-90° triangle, then the hypotenuse is $s\sqrt{2}$.

a. Because $s = 5$, the measure of the hypotenuse is $5\sqrt{2}$.

b. The measure of the hypotenuse is 14 cm. You can use the equation $s\sqrt{2} = 14$ and solve it for s.

$$s = \frac{14}{\sqrt{2}} = \frac{14\sqrt{2}}{\sqrt{2}\cdot\sqrt{2}} = \frac{14\sqrt{2}}{2}$$

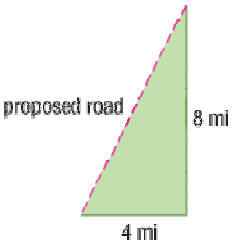
Rationalize the denominator.

$$s = 7\sqrt{2}$$

The measure of s is $7\sqrt{2}$.

Example 5

ROAD PLANNING Presently to get from a school to a neighborhood, you must drive 8 miles south and then 4 miles west. The city planner is considering having a new road paved to provide a more direct route. What will be the length of the new road to the nearest tenth?



Solution

The roads form a right triangle. Use the Pythagorean Theorem to find the hypotenuse, which will be the length of the new road.

Let x = the length of the new road.

$$\begin{aligned} 4^2 + 8^2 &= x^2 \\ 16 + 64 &= x^2 \\ 80 &= x^2 \\ 8.94427191... &= x \end{aligned}$$

So, the length of the new road will be 8.9 miles.