# 9.2A - Special Right Triangles

## Bellwork

**Solve the equation. Write your answer in simplest form.**

**1.** $\frac{8}{\sqrt{2}} = \frac{x\sqrt{2}}{\sqrt{2}}$

$X = \frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2}}{2} = 4\sqrt{2}$

**2.** $\frac{1.5}{\sqrt{3}} = \frac{x\sqrt{3}}{\sqrt{3}}$

$\frac{1.5}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{1.5\sqrt{3}}{3}$ or $\frac{3\sqrt{3}}{2 \cdot 3} = \frac{\sqrt{3}}{2}$

**3.** $\frac{2x}{2} = \frac{8\sqrt{7}}{2}$

$X = 4\sqrt{7}$

**4.** $5\sqrt{2} = \sqrt{3}x$

$\frac{5\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{6}}{3} = X$

**5.** $\frac{9}{2} = x\sqrt{3}$

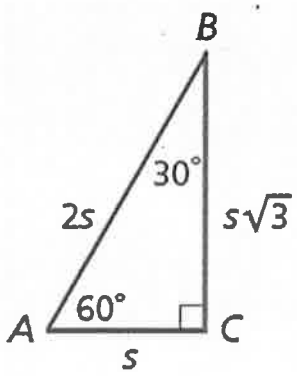
$\frac{9}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{9\sqrt{3}}{6} = \frac{3\sqrt{3}}{2}$

**6.** $8.4 = \sqrt{2}x$

$\frac{8.4}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{8.4\sqrt{2}}{2} = 4.1\sqrt{2}$

**Theorem 9.5 30°-60°-90° Triangle Theorem**

In a 30°-60°-90° triangle, the hypotenuse is twice as long as the shorter leg, and the longer leg is $\sqrt{3}$ times as long as the shorter leg.




Proof:

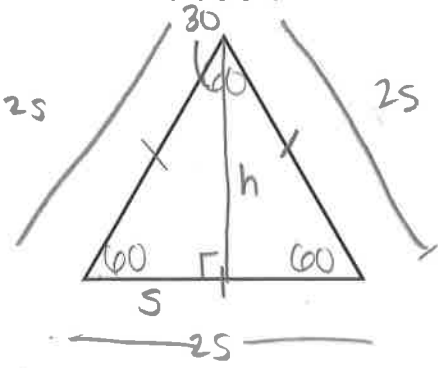
$s^2 + h^2 = (2s)^2$

$s^2 + h^2 = 4s^2$

$-s^2 \quad -s^2$

$\sqrt{h^2} = \sqrt{3s^2}$

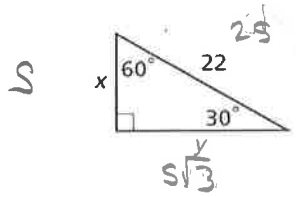
$h = s\sqrt{3}$

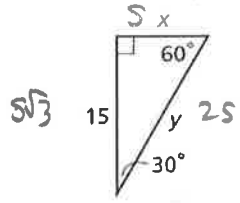


$2s = 22$

$s = 11$

$x = 11 \quad y = 11\sqrt{3}$




$s\sqrt{3} = 15$

$s = \frac{15}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{15\sqrt{3}}{3} = 5\sqrt{3}$

$x = 5\sqrt{3}$

$y = 2(5\sqrt{3}) = 10\sqrt{3}$

$2s = 18\sqrt{3}$

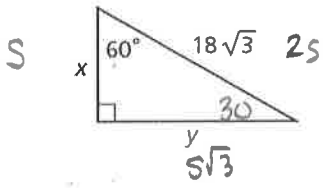
$s = 9\sqrt{3}$

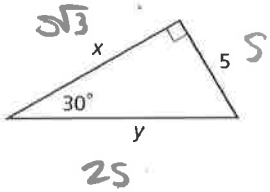
$x = 9\sqrt{3}$

$y = (9\sqrt{3})\sqrt{3}$

$y = 9 \cdot 3$

$y = 27$




$s = 5$

$x = 5\sqrt{3}$

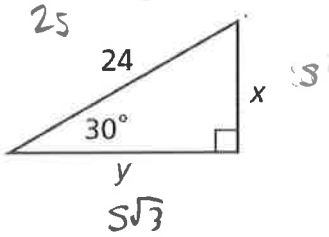
$y = 10$

$2s = 24$

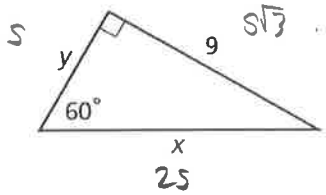
$s = 12$

$x = 12$

$y = 12\sqrt{3}$




$\frac{s\sqrt{3}}{\sqrt{3}} = \frac{9}{\sqrt{3}}$

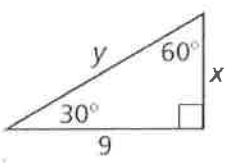



$s = \frac{9}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{9\sqrt{3}}{3} = 3\sqrt{3}$

$y = 3\sqrt{3}$

$x = 2(3\sqrt{3})$

$x = 6\sqrt{3}$



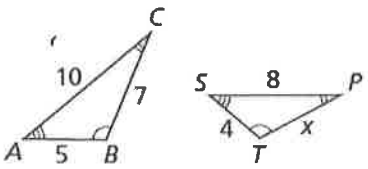
# Homework:
# WS 9.2A Special Right Triangles

## 9.2B - Special Right Triangles

### Bellwork

**Given that the polygons are similar, find the value of *x*.**

**1.**

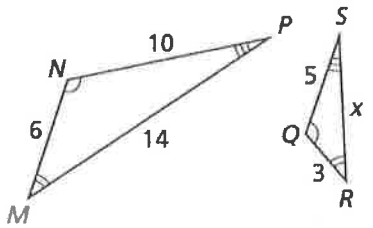



$\frac{8}{10} = \frac{x}{7}$

$\frac{4}{5} = \frac{x}{7}$

$\frac{28}{5} = \frac{5x}{5}$ $\quad x = \frac{28}{5}$ or 5.6

**2.**




$\frac{x}{14} = \frac{5}{10}$

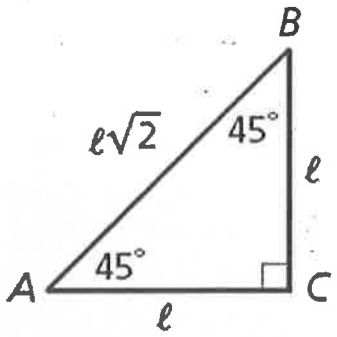
$\frac{x}{14} = \frac{1}{2}$

$2x = 14$

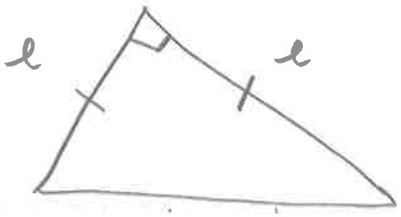
$x = 7$

**Theorem 9.4 45°-45°-90° Triangle Theorem**

In a 45°-45°-90° triangle, the hypotenuse is $\sqrt{2}$ times as long as each leg.



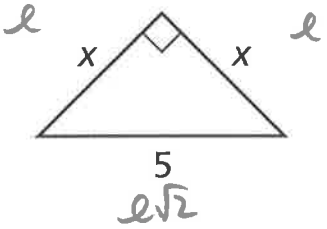

## Proof:




$\ell^2 + \ell^2 = c^2$

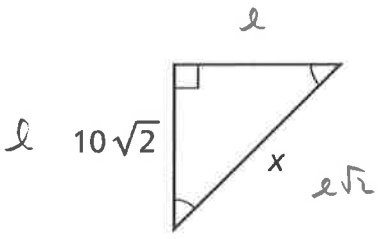
$\sqrt{2\ell^2} = \sqrt{c^2}$

$\ell\sqrt{2} = c$




$\frac{\ell\sqrt{2}}{\sqrt{2}} = \frac{5}{\sqrt{2}}$

$\ell = \frac{5}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{5\sqrt{2}}{2}}$

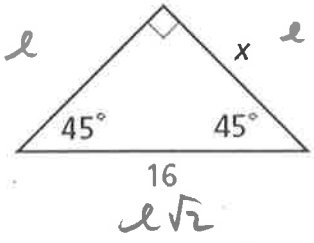


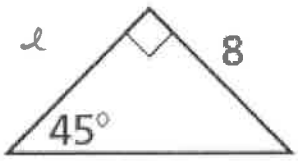

$\ell = 10\sqrt{2}$

$x = (10\sqrt{2})\sqrt{2} = 10 \cdot 2 = \boxed{20}$

$\frac{\ell\sqrt{2}}{\sqrt{2}} = \frac{16}{\sqrt{2}}$

$\ell = \frac{16}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{16\sqrt{2}}{2} = \boxed{8\sqrt{2}}$



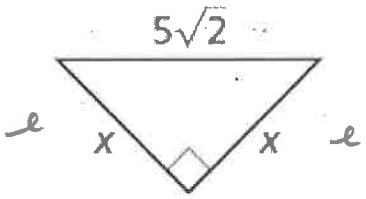



$\ell\sqrt{2}$

$\ell = 8$

$x = 8\sqrt{2}$

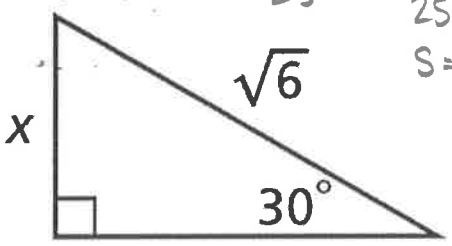
$\ell\sqrt{2}$




$\ell\sqrt{2} = 5\sqrt{2}$

$\ell = 5$

$x = 5$

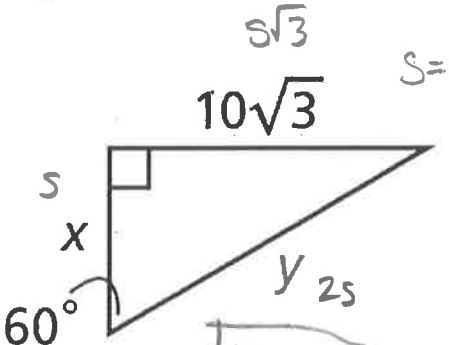



$2s = \sqrt{6}$

$s = \frac{\sqrt{6}}{2}$

$x = \frac{\sqrt{6}}{2}$

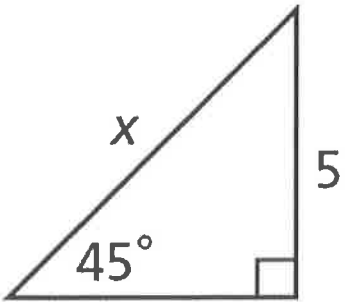
$y = \left(\frac{\sqrt{6}}{2}\right)\sqrt{3} = \frac{3\sqrt{2}}{2}$



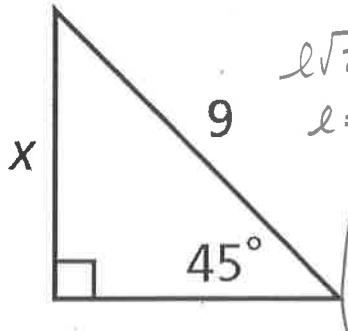

$s = 10$

$x = 10$

$y = 20$




$x = 5\sqrt{2}$



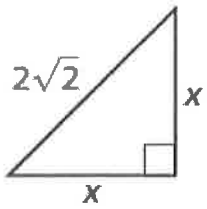

$\ell\sqrt{2} = 9$

$\ell = \frac{9}{\sqrt{2}} = \frac{9\sqrt{2}}{2}$

$x = \frac{9\sqrt{2}}{2}$

**Find the value of the variable. Write your answer in simplest form.**

**1.**

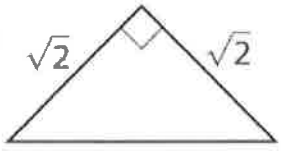



$\ell\sqrt{2} = 2\sqrt{2}$

$\ell = 2$

$X = 2$

**2.**



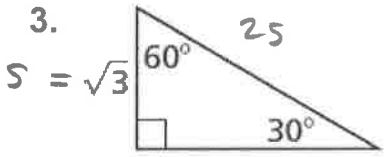

$\ell$ $\ell$ $\ell\sqrt{2}$

$\ell = \sqrt{2}$

$Y = \sqrt{2} \cdot \sqrt{2}$

$Y = 2$

**3.**

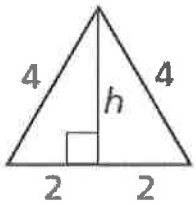



$5 = \sqrt{3}$ $5\sqrt{3}$

$X = \sqrt{3} \cdot \sqrt{3} = 3$

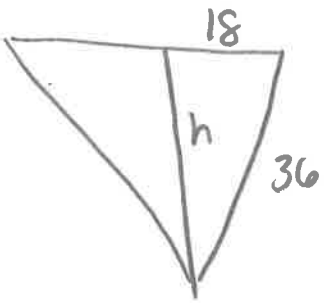
$Y = 2(\sqrt{3}) = 2\sqrt{3}$

**4.**




$h = 2\sqrt{3}$

The road sign is shaped like an equilateral triangle. Estimate the area of the sign by finding the area of the equilateral triangle.


$A = \frac{1}{2} b \cdot h$

$b = 36$

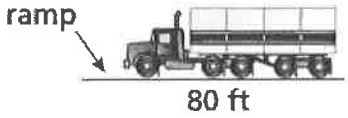
$h = 18\sqrt{3}$

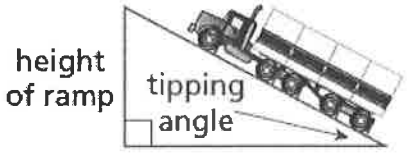
$A = \frac{1}{2} \cdot 36 \cdot 18\sqrt{3}$

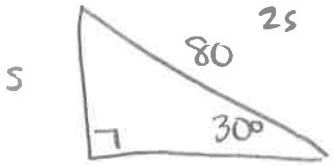
$A = 18 \cdot 18\sqrt{3}$

$A = 324\sqrt{3}\ in^2$

A tipping platform is a ramp used to unload trucks. How high is the end of an 80-foot ramp when the tipping angle is 30°? 45°?



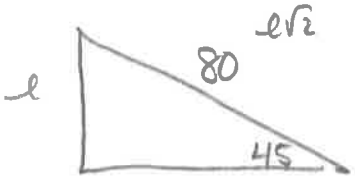




$2s = 80$

$s = 40$

height $= 40$




$\ell\sqrt{2} = 80$

$\ell = \frac{80}{\sqrt{2}} = \frac{80\sqrt{2}}{2} = 40\sqrt{2}$

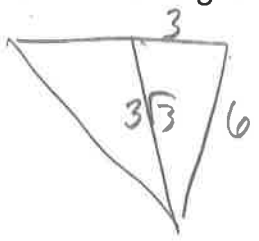
height $= 40\sqrt{2}$

**5.** The logo on a recycling bin resembles an equilateral triangle with side lengths of 6 centimeters. Approximate the area of the logo.

$A = \frac{1}{2}(6)(3\sqrt{3})$

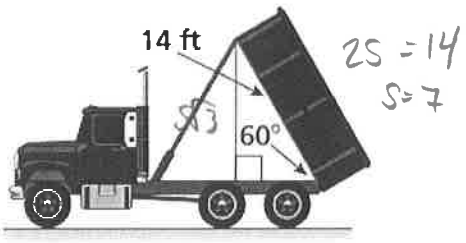
$= (3)(3\sqrt{3})$

$A = 9\sqrt{3}$ cm




**6.** The body of a dump truck is raised to empty a load of sand. How high is the 14-foot-long body from the frame when it is tipped upward by a 60° angle?

$7\sqrt{3}$ ft




$2s = 14$

$s = 7$

# Homework:

pg. 475 #3-18, 20, 22