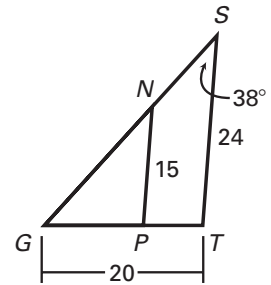## 8.4 Similar Triangles

Goals
- Identify similar triangles.
- Use similar triangles in real-life problems.

Example 1   *Writing Proportionality Statements*

In the diagram, $\triangle GST \sim \triangle GNP$.

a. Write the statement of proportionality.

b. Find $m\angle GNP$.

c. Find GP.

Solution

a. $\dfrac{GN}{\boxed{GS}} = \dfrac{GP}{\boxed{GT}} = \dfrac{NP}{\boxed{ST}}$

b. $\angle NST \cong \angle GNP$, so $m\angle GNP = \underline{38}°$.

c.

$\dfrac{NP}{\boxed{ST}} = \dfrac{GP}{\boxed{GT}}$ **Write proportion.**

$\dfrac{15}{\boxed{24}} = \dfrac{GP}{\boxed{20}}$ **Substitute.**

$\dfrac{\boxed{20}\,(15)}{\boxed{24}} = GP$ **Multiply each side by $\underline{20}$.**

$\underline{12.5} = GP$ **Simplify.**

Answer So, GP is $\underline{12.5}$ units.

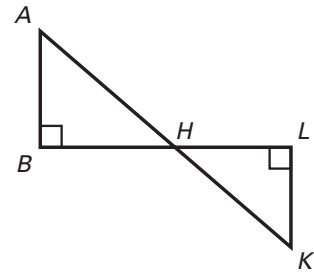### POSTULATE 25: ANGLE-ANGLE (AA) SIMILARITY POSTULATE

If two angles of one triangle are congruent to two angles of another triangle, then the two triangles are similar.
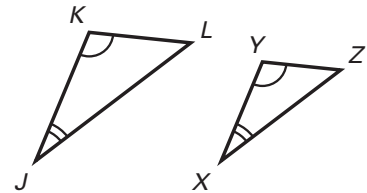
If $\angle JKL \cong \angle XYZ$ and $\angle KJL \cong \angle YXZ$, then $\triangle \underline{JKL} \sim \triangle \underline{XYZ}$.

Example 2 — Proving that Two Triangles are Similar

In the diagram, △**ABH** ∼ △**KLH**. Use properties of similar triangles to explain why these triangles are similar.

Solution

You can use the Vertical Angles Theorem to determine ∠**AHB** ≅ ∠ _KHL_ . Because they are right angles, ∠**ABH** ≅ ∠ _KLH_ . By the _AA Similarity Postulate_ , you can conclude that △**ABH** ∼ △**KLH**.

Example 3 — Using Similar Triangles

To comply with the Americans with Disabilities Act, wheelchair ramps made for new constructions must have a height to length ratio of **1 : 12**. At a new construction, the height h to the bottom of a door is **2.5** feet. Use the proportion $\dfrac{a}{b} = \dfrac{h}{r}$ to estimate the length r that the ramp should be to have the correct slope ratio. In the proportion, use $a = $ **1** ft and $b = $ **12** ft.
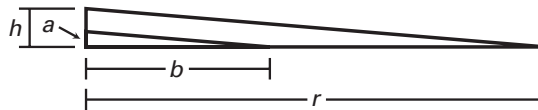
Solution

$$\frac{a}{b} = \frac{h}{r} \qquad \text{Write proportion.}$$

$$\frac{\boxed{1 \text{ ft}}}{\boxed{12 \text{ ft}}} = \frac{\boxed{2.5 \text{ ft}}}{r} \qquad \text{Substitute.}$$
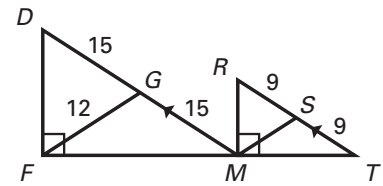
$$r = \underline{30} \text{ ft} \qquad \text{Cross product property}$$

Answer The ramp should have a length of _30_ feet.

Example 4 *Using Scale Factors*

Find the length of $\overline{MS}$.

First, find the scale factor of
$\triangle DFM$ to $\triangle RMT$.

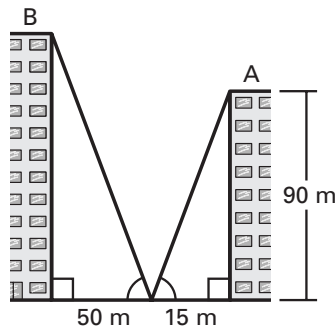$$\frac{DM}{RT} = \frac{\boxed{15} + \boxed{15}}{\boxed{9} + \boxed{9}} = \frac{\boxed{30}}{\boxed{18}} = \frac{5}{3}$$

Now, because the ratio of the lengths of the segments is equal to the scale factor, you can write the following equation.

$$\frac{FG}{MS} = \frac{5}{3}$$

Answer Substitute 12 for *FG* and solve for *MS* to show that
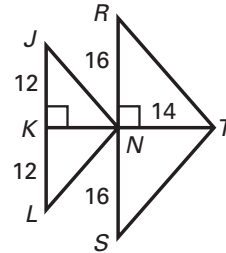*MS* = 7.2 .

✔ *Checkpoint* **Complete the following exercises.**

1. You are standing 15 m from building A and 50 m from building B. Building A is 90 m tall. Find the height of building B.

300 m

2. $\triangle JNL \sim \triangle RTS$. Find the length of $\overline{KN}$.

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