SIMILAR TRIANGLES AND INDIRECT MEASUREMENT

LESSON 5
OBJECTIVE:
Students will solve problems involving similar triangles.
1. Determine whether the pair of polygons is similar. Explain.

2. The pair of polygons is similar. Find the missing side measure.

3. **TEST PRACTICE** A greeting card is 8 inches by 6 inches, but it will have to be cut to fit in an envelope. The scale factor from the original card to the smaller card is 5:4. Find the dimensions of the smaller card.

   A. $3 \times 3\frac{3}{4}$
   
   B. $10 \times 7\frac{1}{2}$
   
   C. $6\frac{2}{3} \times 5\frac{1}{3}$
   
   D. $6\frac{2}{5} \times 4\frac{4}{5}$
1. Determine whether the pair of polygons is similar. Explain.

2. The pair of polygons is similar. Find the missing side measure.

ANSWERS
1. No; corresponding sides are not proportional.
2. \( \frac{3}{4} = \frac{x}{6}; x = 4.5 \)

3. TEST PRACTICE A greeting card is 6 inches by 6 inches, but it will have to be cut to fit in an envelope. The scale factor from the original card to the smaller card is 5:4. Find the dimensions of the smaller card.

A. \( 3 \times 3\frac{3}{4} \)

B. \( 10 \times 7\frac{1}{2} \)

C. \( 6\frac{2}{3} \times 5\frac{1}{3} \)

D. \( 6\frac{2}{5} \times 4\frac{4}{5} \)
Think – Pair – Share

Take 2 minutes to think about this question. Write down a few thoughts about what you have learned so far in this chapter.

Now, turn to a partner and discuss what you have learned.

I will call on a few pairs to share their thoughts.
VOCABULARY

Indirect measurement allows you to use properties of similar polygons to find distances or lengths that are difficult to measure directly.
**Key Concept**

**Angle-Angle (AA) Similarity**

**Words**
If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.

**Symbols**
If \( \angle A \cong \angle F \) and \( \angle B \cong \angle G \), then \( \triangle ABC \sim \triangle FGH \).

**Model**

![Diagram of two triangles with marked angles](image)
1. Determine whether the triangles are similar. If so, write a similarity statement.

Angle $A$ and $\angle E$ have the same measure, so they are congruent. Since $180 - 62 - 48 = 70$, $\angle G$ measures $70^\circ$. Two angles of $\triangle EFG$ are congruent to two angles of $\triangle ABC$, so $\triangle ABC \sim \triangle EFG$. 
Now you try.

Determine whether the triangles are similar. If so, write a similarity statement.
Determine whether the triangles are similar. If so, write a similarity statement.

The triangles are not similar.
2. A fire hydrant 2.5 feet high casts a 5-foot shadow. How tall is a street light that casts a 26-foot shadow at the same time? Let $h$ represent the height of the street light.

1. **Shadow**
   
   - hydrant $\rightarrow \frac{5}{26} = \frac{2.5}{h}$
   - street light $\leftarrow \frac{2.5}{h}$

2. **Height**
   
   - $5h = 26 \cdot 2.5$
   - $5h = 65$
   - $h = \frac{65}{5}$
   - $h = 13$

4. The street light is 13 feet tall.
How tall is the flagpole?
How tall is the flagpole?

Answer: 38.5 ft

Measuring a tree Video
3. In the figure at the right, triangle $DBA$ is similar to triangle $ECA$. Ramon wants to know the distance across the lake.

\[
\frac{AB}{AC} = \frac{BD}{CE}
\]

$AB$ corresponds to $AC$ and $BD$ corresponds to $CE$.

\[
\frac{320}{482} = \frac{40}{d}
\]

Replace $AB$ with $320$, $AC$ with $482$, and $BD$ with $40$.

\[
320d = 482 \times 40
\]

Find the cross products.

\[
\frac{320d}{320} = \frac{19,280}{320}
\]

Multiply. Then divide each side by $320$.

\[
d = 60.25
\]

6. The distance across the lake is 60.25 meters.
The two triangles in the figure are similar. Find the distance across the lake.
The two triangles in the figure are similar. Find the distance across the lake.

Answer: 15 m
HOMEWORK

Pg. 557-560
Problems: 1-12 all and 13-23 odds