

# Proving Triangles Similar

## Warm-up:

- 1) Are the polygons similar? If they are, write a similarity statement and give the scale factor.

$\frac{18}{12} = \frac{3}{2}$        $\frac{24}{16} = \frac{3}{2}$        $\frac{12}{8} = \frac{3}{2}$   
 Yes, they are similar  
 $DEGH \sim PLQR$   
 SF  $\frac{3}{2}$  on  $\frac{3}{2}$

- 2)  $\triangle FGH \sim \triangle MNP$ . What is the value of  $x$ ?

$\frac{x}{12} = \frac{10}{20}$        $20x = 120$   
 $x = 6$

## Reteaching

### Similar Polygons

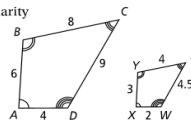
Similar polygons have corresponding angles that are congruent and corresponding sides that are proportional. An **extended proportion** can be written for the ratios of corresponding sides of similar polygons.

#### Problem

Are the quadrilaterals at the right similar? If so, write a similarity statement and an extended proportion.

Compare angles:  $\angle A \cong \angle X$ ,  $\angle B \cong \angle Y$ ,  
 $\angle C \cong \angle Z$ ,  $\angle D \cong \angle W$

Compare ratios of sides:  $\frac{AB}{XY} = \frac{6}{3} = 2$        $\frac{CD}{ZW} = \frac{9}{4.5} = 2$   
 $\frac{BC}{YZ} = \frac{8}{4} = 2$        $\frac{DA}{WX} = \frac{4}{2} = 2$



Because corresponding sides are proportional and corresponding angles are congruent,  $ABCD \sim XYZW$ .

The extended proportion for the ratios of corresponding sides is:

$$\frac{AB}{XY} = \frac{BC}{YZ} = \frac{CD}{ZW} = \frac{DA}{WX}$$

#### Exercises

If the polygons are similar, write a similarity statement and the extended proportion for the ratios of corresponding sides. If the polygons are not similar, write *not similar*.

1.  $\frac{18}{30} = \frac{24}{40} = \frac{36}{60}$

$KML \sim QSR$ ,  $\frac{KM}{QS} = \frac{ML}{SR} = \frac{LK}{RQ}$

2.  $\frac{20}{40} = \frac{30}{28} = \frac{21}{14}$

$BCA \sim YZX$ ,  $\frac{BC}{YZ} = \frac{CA}{ZX} = \frac{AB}{XY}$

3.  $\frac{6}{6} = \frac{6}{6} = \frac{4}{8}$

not similar

4.  $\frac{7}{7} = \frac{7}{7} = \frac{60}{7}$

not similar

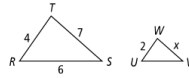
# Proving Triangles Similar

## Reteaching (continued)

### Similar Polygons

#### Problem

$\triangle RST \sim \triangle UVW$ . What is the scale factor?  
What is the value of  $x$ ?



Identify corresponding sides:  $\overline{RT}$  corresponds to  $\overline{UW}$ ,  $\overline{TS}$  corresponds to  $\overline{WV}$ , and  $\overline{SR}$  corresponds to  $\overline{VU}$ .

$$\frac{RT}{UW} = \frac{TS}{WV} \quad \text{Compare corresponding sides.}$$

$$\frac{4}{2} = \frac{7}{x} \quad \text{Substitute.}$$

$$4x = 14 \quad \text{Cross Products Property}$$

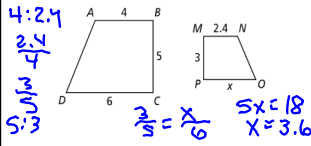
$$x = 3.5 \quad \text{Divide each side by 4.}$$

The scale factor is  $\frac{4}{2} = \frac{7}{3.5} = 2$ . The value of  $x$  is 3.5.

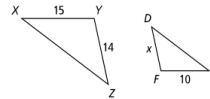
#### Exercises

Give the scale factor of the polygons. Find the value of  $x$ . Round answers to the nearest tenth when necessary.

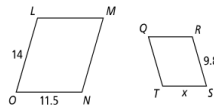
5.  $ABCD \sim NMPO$  5 : 3 ; 3.6



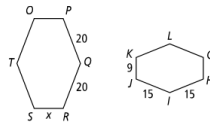
6.  $\triangle XYZ \sim \triangle EFD$  3 : 2 ; 9.3



7.  $LMNO \sim RQTS$  10 : 7 ; 8.1



8.  $OPQRST \sim GHIJKL$  4 : 3 ; 12



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# Proving Triangles Similar

fake note

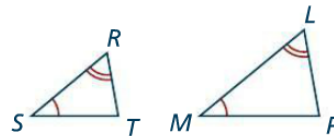
## Postulate 17 Angle-Angle Similarity (AA ~) Postulate

### Postulate

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

If ...

$$\angle S \cong \angle M \text{ and } \angle R \cong \angle L$$




Then ...

$$\triangle SRT \sim \triangle MLP$$

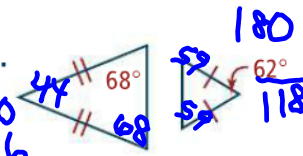
# Proving Triangles Similar

## Problem 1 Using the AA ~ Postulate

Are the two triangles similar? How do you know?

a.  Yes.

Handwritten calculations:  
 $90 + 39 = 129$   
 $180 - 129 = 51$

b.  NO.  
different angles.

Handwritten calculations:  
 $180 - 68 - 44 = 48$   
 $180 - 62 - 56 = 62$

take note

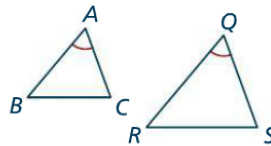
### Theorem 60 Side-Angle-Side Similarity (SAS ~) Theorem

#### Theorem

If an angle of one triangle is congruent to an angle of a second triangle, and the sides that include the two angles are proportional, then the triangles are similar.

#### If ...

$$\frac{AB}{QR} = \frac{AC}{QS} \text{ and } \angle A \cong \angle Q$$



#### Then ...

$$\triangle ABC \sim \triangle QRS$$

You will prove Theorem 60 in Exercise 32.

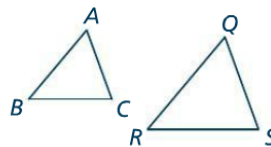
### Theorem 61 Side-Side-Side Similarity (SSS ~) Theorem

#### Theorem

If the corresponding sides of two triangles are proportional, then the triangles are similar.

#### If ...

$$\frac{AB}{QR} = \frac{AC}{QS} = \frac{BC}{RS}$$



#### Then ...

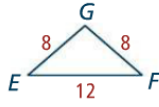
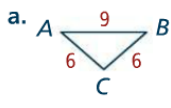
$$\triangle ABC \sim \triangle QRS$$

You will prove Theorem 61 in Exercise 33.

# Proving Triangles Similar

## Problem 2 Verifying Triangle Similarity

Are the triangles similar? If so, write a similarity statement for the triangles and explain how you know the triangles are similar.



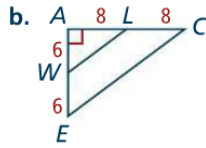
$$\frac{9}{6} = \frac{8}{4}$$

$$\frac{6}{6} = \frac{8}{4}$$

$$\frac{6}{12} = \frac{9}{12}$$

yes. SSS

$$\triangle ABC \sim \triangle EFG$$



$$\frac{6}{12} = \frac{8}{16}$$

$$\frac{8}{16} = \frac{1}{2}$$

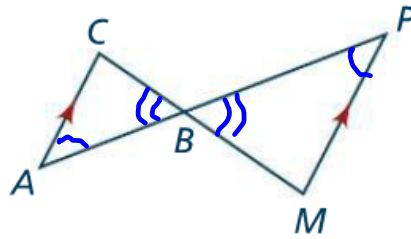
yes. SAS

## Problem 3 Proving Triangles Similar

**Proof**

**Given:**  $\overline{MP} \parallel \overline{AC}$

**Prove:**  $\triangle ABC \sim \triangle PBM$



Statements

Reasons

1.  $\overline{MP} \parallel \overline{AC}$
2.  $\angle A \cong \angle P$
3.  $\angle ABC \cong \angle PBM$
4.  $\triangle ABC \sim \triangle PBM$

1. Given
2. Alternate Interior Angles
3. vertical angles
4. AA ~

# Practice - form K

Form K

**Practice**  
Proving Triangles Similar

Determine whether the triangles are similar. If so, write a similarity statement and name the postulate or theorem you used. If not, explain.

1.   
 $\frac{3}{10}$   $\frac{2}{4}$   
*not similar*

3.   
 $\frac{40}{50} = \frac{4}{5}$   
*yes, SAS*

5. Given:  $PQ = \frac{3}{4} PR$ ,  $PT = \frac{3}{4} PS$   
 Prove:  $\triangle PQT \sim \triangle PRS$

2.   
 $\frac{36}{24} = \frac{3}{2}$   
 $\frac{12}{20} = \frac{3}{5}$   
 $\frac{30}{30} = 1$   
*yes, SSS*

4.   
 $180 - 50 - 100 = 30$   
 $180 - 63 - 46 = 71$   
*not similar*

Statements	Reasons
1) $PQ = \frac{3}{4} PR$ and $PT = \frac{3}{4} PS$	1) ? <i>Given</i>
2) $\frac{PQ}{PR} = \frac{3}{4}$ and $\frac{PT}{PS} = \frac{3}{4}$	2) ? <i>Division Property</i>
3) $\frac{PQ}{PR} = \frac{PT}{PS}$	3) ? <i>Substitution</i>
4) $\angle P = \angle P$	4) ? <i>Reflexive Property</i>
5) ? $\triangle PQT \sim \triangle PRS$	5) ? <i>SAS</i>

Explain why the triangles are similar. Then find the distance represented by x.

6.

$AA \sim$   $\frac{50}{80} = \frac{30}{x}$   
 $50x = 2400$   
 $x = 48$

7.

$AA \sim$   $\frac{6}{4.5} = \frac{12}{x}$   
 $4.5x = 72$   
 $x = 16$

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