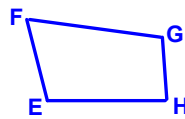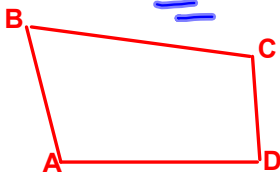# 6.1 Use Similar Polygons

G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and prove relationships in geometric figures.

Similar Polygons   Polygons with

"∠s ≅"   ✶ 1. **CONGRUENT** CORRESPONDING ANGL ← *MUST BE THE SAME!*

2. **PROPORTIONAL** CORRESPONDING SIDES.

ABCD is *SIMILAR* to EFGH written _____ ABCD ~ EFGH

Similarity symbol

B   C

F   G

E   H

A   D

Write the Corresponding Angles:

1. ∠A ≅ ∠E

2. ∠B ≅ ∠F

3. ∠C ≅ ∠G

4. ∠D ≅ ∠H

Write the Corresponding Sides as Ratios: *Fraction!*

$$\frac{AB}{EF}$$

$$\frac{BC}{FG}$$

$$\frac{CD}{GH}$$

$$\frac{DA}{HE}$$

EXAMPLE 1: △RST ~ △XYZ

T   Z

25   30   15   18

R   20   S   X   12   Y
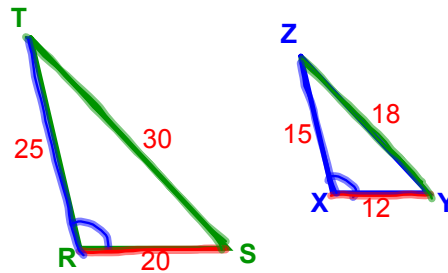
LIST:

Corresponding Angles:

1. ∠R ≅ ∠X

2. ∠S ≅ ∠Y

3. ∠T ≅ ∠Z

Corresponding Sides as Ratios:

1. $\frac{RS}{XY} = \frac{20}{12} = \frac{5}{3}$

2. $\frac{ST}{YZ} = \frac{30}{18} = \frac{5}{3}$

3. $\frac{TR}{ZX} = \frac{25}{15} = \frac{5}{3}$

Same!

Statement of PROPORTIONALITY:

$$\frac{RS}{XY} = \frac{ST}{YZ} = \frac{TR}{ZX}$$

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

SCALE FACTOR - The **RATIO of the LENGTHS** of two corresponding SIDES of SIMILAR polygons.

What is the SCALE FACTOR of Example 1? _____ $5/3$ _____

EXAMPLE 2: FIND THE SCALE FACTOR.

Determine whether the polygons are similar. If they are, write a similarity statement and find the scale factor of ZYXW to FGHJ.   ZYXW ~ FGHJ
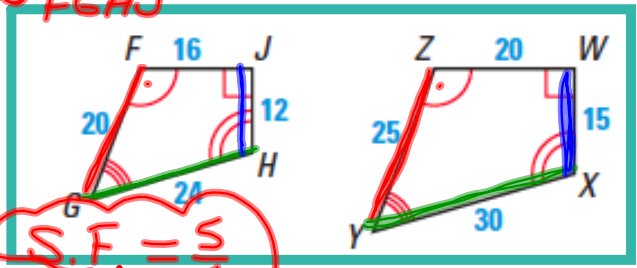
∀ corresp ∠s ≅

$\frac{ZY}{FG} = \frac{25}{20} = \frac{5}{4}$ $\frac{XW}{HJ} = \frac{15}{12} = \frac{5}{4}$

$\frac{YX}{GH} = \frac{30}{24} = \frac{5}{4}$ $\frac{WZ}{JF} = \frac{20}{16} = \frac{5}{4}$

S.F. = $\frac{5}{4}$

EXAMPLE 3: USE SIMILAR POLYGONS.

△DEF ~ △MNP. Find the value of x.

Proportions   S.F.

$\frac{9}{12} \times \frac{x}{20}$ $\frac{9}{12} \left(\frac{3}{4}\right)$

$12x = 180$ $\frac{\cancel{20}^{5} \cdot 3}{\cancel{4}_{1}} = 15$

$\frac{12x}{12} = \frac{180}{12}$

$x = 15$
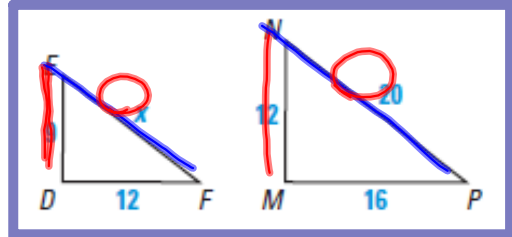
Guided Practice.

What is the scale factor of QRST to ABCD?

Find the value of x.
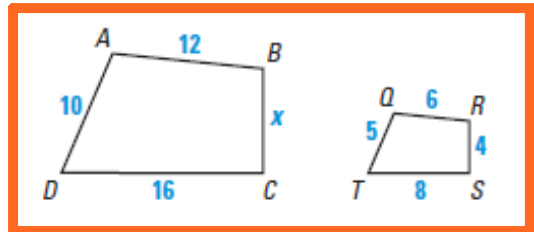
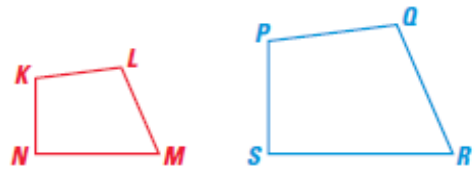Perimeters (Similar Polygons) - **RATIO OF LENGTHS = SCALE FACTOR**

THEOREM   *For Your Notebook*

**THEOREM 6.1 Perimeters of Similar Polygons**

If two polygons are similar, then the
ratio of their perimeters is equal to
the ratios of their corresponding
side lengths.

If $KLMN \sim PQRS$, then $\dfrac{KL + LM + MN + NK}{PQ + QR + RS + SP} = \dfrac{KL}{PQ} = \dfrac{LM}{QR} = \dfrac{MN}{RS} = \dfrac{NK}{SP}$.

EXAMPLE 4: Find perimeters of similar figures.

A town is building a new swimming pool. An Olympic pool
is rectangular with length 50 meters and width 25 meters.
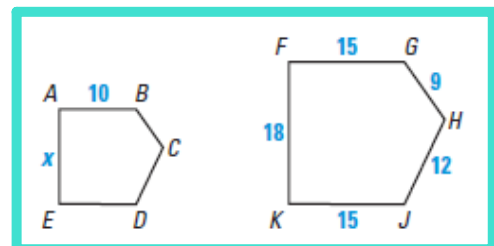The new pool will be similar in shape, but only 40 meters
long.

25 m

50 m
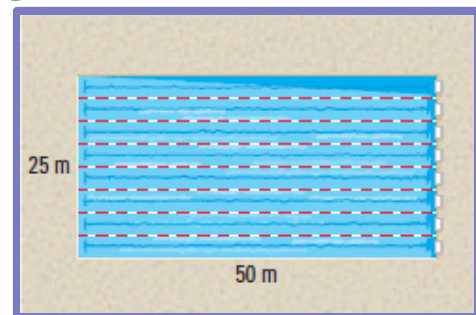
a. Find the scale factor of the new pool to an Olympic pool.

b. Find the perimeter of an Olympic pool and the new pool.

Guided Practice. ABCDE ~ FGHJK.

Find the scale factor of FGHJK to ABCDE.

Find the value of x.

Find the perimeter of ABCDE.

F   15   G
A   10   B
9
18   H
x   C
12
E   D   K   15   J

EXAMPLE 5: USE A SCALE FACTOR.

In the diagram, $\triangle TPR \sim \triangle XPZ$.

Find the length of the altitude $\overline{PS}$.

T   X
6   8
S   P   20   Y
6   8
R   Z