

**Similar Polygons:** have the same shape but not necessarily the same size.

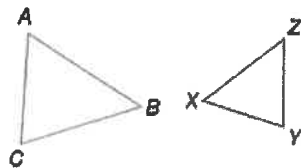
Two polygons similar: 1) corresponding angles are  $\cong$   
2) corresponding side lengths are proportional

\*similar\*  
~

| similarity statement               | congruent angles   | corresponding sides   |
|------------------------------------|--|---|
| <p><math>ABCD \sim EFGH</math></p> | $\angle A \cong \angle E$<br>$\angle B \cong \angle F$<br>$\angle C \cong \angle G$<br>$\angle D \cong \angle H$ | $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$ |

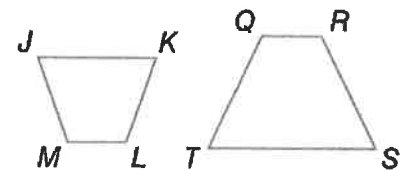
1. List all pairs of congruent angles, and write a proportion that relates the corresponding sides for each pair of similar polygons.

a.  $\triangle ABC \sim \triangle ZYX$  ← similarity statement



$$\begin{aligned} \angle A &\cong \angle Z \\ \angle B &\cong \angle Y \\ \angle C &\cong \angle X \\ \frac{AB}{ZY} &= \frac{BC}{YX} = \frac{CA}{XZ} \end{aligned}$$

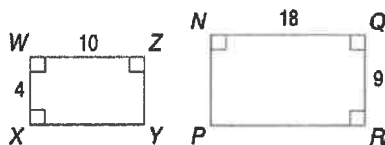
b.  $JKLM \sim TSRQ$



$$\begin{aligned} \angle J &\cong \angle T \\ \angle K &\cong \angle S \\ \angle L &\cong \angle R \\ \angle M &\cong \angle Q \\ \frac{JK}{TS} &= \frac{KL}{SR} = \frac{LM}{RQ} = \frac{MJ}{QT} \end{aligned}$$

2. Determine whether each pair of figures is similar. If so, write the similarity statement and scale factor. If not, explain your reasoning.

a.

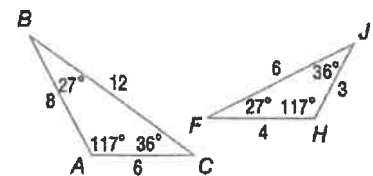


$$\begin{aligned} \frac{WZ}{PQ} &= \frac{WX}{QR} \\ \frac{10}{18} &= \frac{4}{9} \\ \frac{5}{9} &= \frac{4}{9} \end{aligned}$$

Not similar

corresponding lengths are not proportional

a.

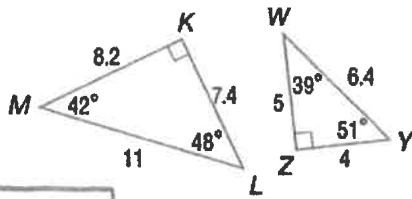


$$\begin{aligned} \frac{8}{4} &= \frac{6}{3} = \frac{12}{6} \\ \frac{1}{2} &= \frac{1}{2} = \frac{1}{2} \end{aligned}$$

similar  $ABC \sim FJH$   
scale factor =  $\frac{1}{2}$

Geometry CP  
7.2 Similar Polygons

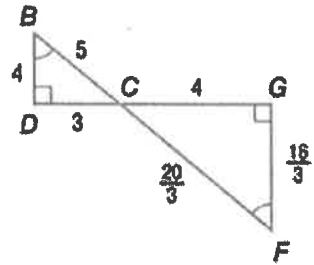
b.



Not similar

corresponding angles are not congruent

c.



$$\frac{4}{\frac{16}{3}} = \frac{5}{\frac{20}{3}} = \frac{3}{4}$$

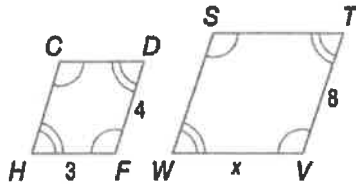
$$\frac{12}{16} = \frac{15}{20} = \frac{3}{4}$$

$$\frac{3}{4} = \frac{3}{4} = \frac{3}{4} \checkmark$$

$BCD \sim FCG$   
scale factor =  $\frac{3}{4}$

3. Each pair of polygons is similar. Find the value of x.

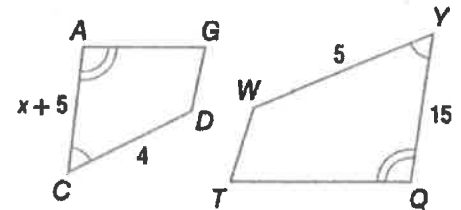
a.  $CDFH \sim STVW$



$$\frac{4}{8} = \frac{3}{x}$$

$$4x = 24$$

$$x = 6$$



$$\frac{x+5}{15} = \frac{4}{5}$$

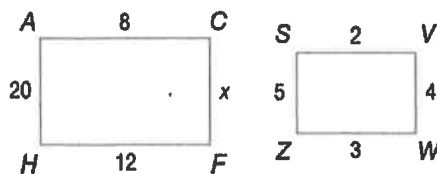
$$5(x+5) = 4(15)$$

$$5x + 25 = 60$$

$$5x = 35$$

$$x = 7$$

b.  $ACFH \sim SVWZ$



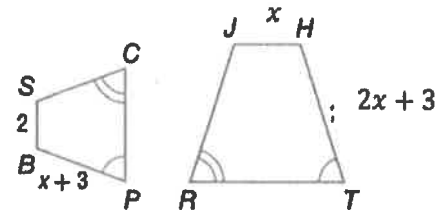
$$\frac{AC}{SV} = \frac{CF}{VW}$$

$$\frac{8}{2} = \frac{x}{4}$$

$$32 = 2x$$

$$16 = x$$

d.



$$\frac{2}{x} = \frac{x+3}{2x+3}$$

$$2(2x+3) = x(x+3)$$

$$4x+6 = x^2+3x$$

$$0 = x^2 - x - 6$$

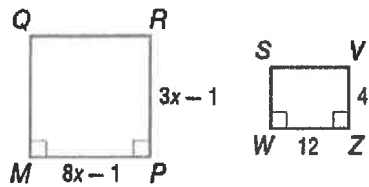
$$0 = (x-3)(x+2)$$

$x = 3, -2$   
↑  
make side neg

$$x = 3$$

Geometry CP  
7.2 Similar Polygons

e.



$$\frac{3x-1}{4} = \frac{8x-1}{12}$$

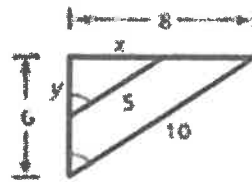
$$12(3x-1) = 4(8x-1)$$

$$36x - 12 = 32x - 4$$

$$4x = 8$$

$$\boxed{x = 2}$$

f.



$$\frac{x}{8} = \frac{5}{10}$$

$$\frac{y}{6} = \frac{5}{10}$$

$$10x = 40$$

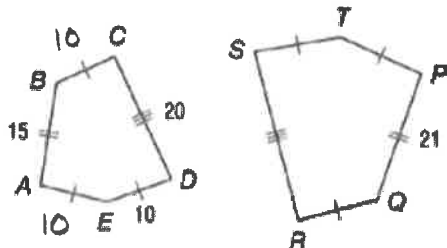
$$10y = 30$$

$$\boxed{x = 4}$$

$$\boxed{y = 3}$$

|                                |   |   |
|--------------------------------|---|---|
| Perimeters of Similar Polygons | If two polygons are similar, then their perimeters are proportional to the scale factor between them. | <p>If <math>JKLM \sim TSRQ</math>, then</p> $\frac{JK+KL+LM+MJ}{TS+SR+RQ+QT} = \frac{JK}{TS} + \frac{KL}{SR} + \frac{LM}{RQ} + \frac{MJ}{QT}$ |
|--------------------------------|---|---|

4. Given  $ABCDE \sim PQRST$ , find the scale factor of  $ABCDE$  to  $PQRST$  and the perimeter of each polygon.



\*scale factor  
ABCDE to PQRST

$$\text{scale factor} \rightarrow \frac{15}{21} = \frac{5}{7}$$

$$ABCDE \text{ Perimeter} = 10 + 20 + 10 + 10 + 15 = 65$$

$$\frac{\text{Perimeter } ABCDE}{\text{Perimeter } PQRST} = \frac{5}{7}$$

$$\frac{65}{x} = \frac{5}{7}$$

$$65(7) = 5x$$

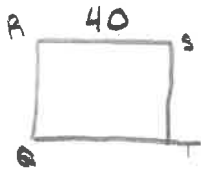
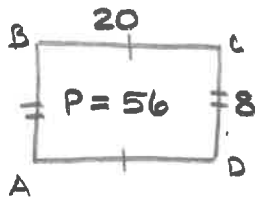
$$455 = 5x$$

$$91 = x$$

$$\boxed{\begin{array}{l} \text{Per. } PQRST = 91 \\ \text{Per. } ABCDE = 65 \end{array}}$$

Geometry CP  
7.2 Similar Polygons

5. Rectangle ABCD has a width of 8 yards and a length of 20 yards. Rectangle QRST, which is similar to rectangle ABCD, has a length of 40 yards. Find the scale factor of rectangle ABCD to rectangle QRST and the perimeter of each rectangle.



$$\text{scale factor} = \frac{20}{40} = \frac{1}{2}$$

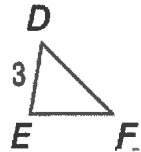
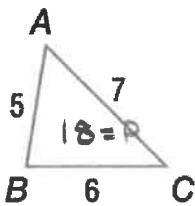
$$\frac{\text{Per. ABCD}}{\text{Per. QRST}} = \frac{1}{2}$$

$$\frac{56}{x} = \frac{1}{2}$$

$$112 = x$$

Per. ABCD = 56 y  
Per. QRST = 112 y

6. Find the perimeter of  $\triangle DEF$ , if  $\triangle ABC \sim \triangle DEF$ ,  $AB = 5$ ,  $BC = 6$ ,  $AC = 7$ , and  $DE = 3$ .



$$\text{scale factor} = \frac{5}{3}$$

$$\frac{\text{Per. ABC}}{\text{Per. DEF}} = \frac{5}{3}$$

$$\frac{18}{x} = \frac{5}{3}$$

$$54 = 5x$$

$$10.8 = x$$

Per ABC = 18  
Per DEF = 10.8

7. This is a miniature replica of a 1923 Checker Cab. The length of the model is 6.5 inches. If the length of the cab is 13 feet, what is the scale factor of the model compared to the car?



$$\frac{\text{model}}{\text{car}} = \frac{6.5}{13} = \frac{1}{2}$$