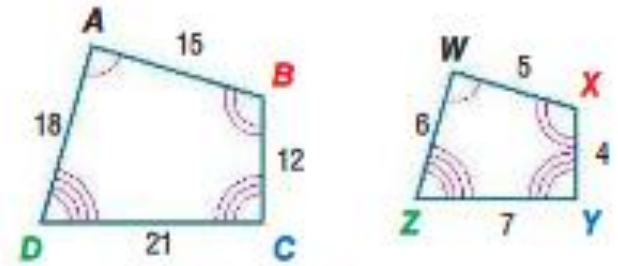
7.2 Similar Polygons

Goals aligned to common core state standards:
You will use the definition of similarity to decide if two objects are similar.
You will use the definition of similarity to solve for parts of polygons.
You will find areas, perimeters, or scale factors of similar figures.
MP 1, 2, 3, 4, 6, 7, 8

Similar polygons (~): polygons that have the same shape but may be of different size.

This means similar polygons must have ≅ angles and proportional sides.



$\frac{18}{6} = \frac{15}{5} = 3$

Corresponding angles

$\angle A \cong \angle W$ $\angle B \cong \angle X$, $\angle C \cong \angle Y$, and $\angle D \cong \angle Z$

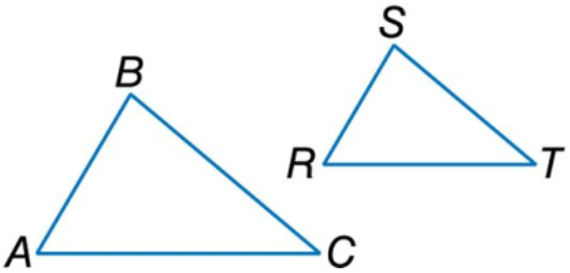
Corresponding sides

$\frac{AB}{WX} = \frac{BC}{XY} = \frac{CD}{YZ} = \frac{DA}{ZW} = \frac{3}{1}$ ← Scale factor

OR

$\frac{6}{18} = \frac{1}{3}$

If $\Delta ABC \sim \Delta RST$, list all pairs of congruent angles and write a proportion that relates the corresponding sides.



$\angle A \cong \angle R$
$\angle B \cong \angle S$
$\angle C \cong \angle T$

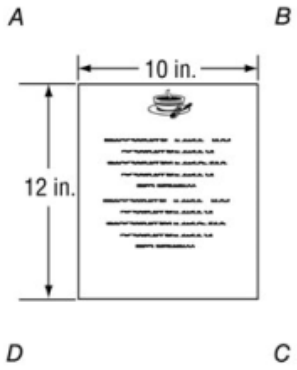
$\frac{BC}{ST} = \frac{AB}{RS} = \frac{AC}{RT}$

Scale Factor: compares lengths of corresponding sides of similar figures.

Where is it used in real life?

A. MENUS Tan is designing a new menu for the restaurant where he works. Determine whether the size for the new menu is similar to the original menu. If so, write the similarity statement and scale factor. Explain your reasoning.

Original Menu:



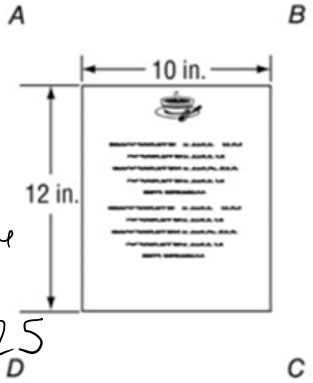
New Menu:

not Similar, sides aren't proportional

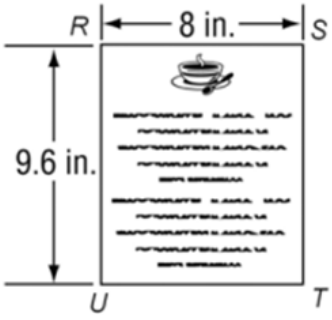
$\frac{10}{12} = \frac{12}{14}$

$\frac{5}{6} = \frac{6}{7}$

Original Menu:



New Menu:



$\frac{10}{8} = \frac{12}{9.6}$

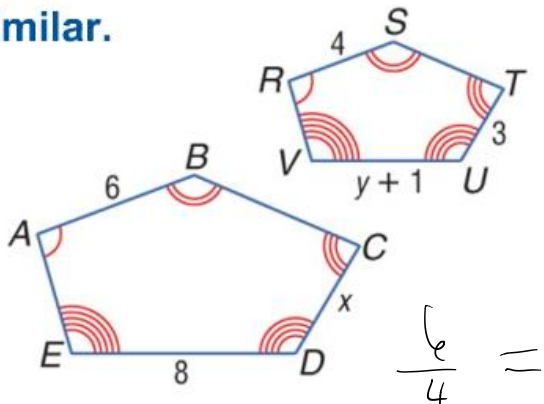
$1.25 = 1.25$

Similar

ABCD ~ RSTU

1.25 or $\frac{5}{4}$

A. The two polygons are similar.
Find *x*.
Find *y*.



$\frac{6}{4} = \frac{8}{y+1}$

$\frac{6}{4} = \frac{x}{3}$

$6(y+1) = 32$

$6y + 6 = 32$

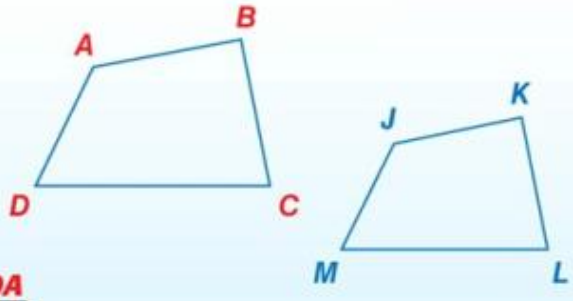
$6y = 24/6$

$y = 13/3$

$\frac{18}{4} = \frac{4x}{4}$

$4.5 = x$

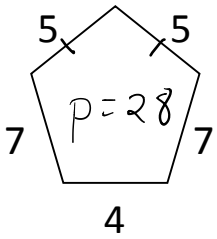
If two polygons are similar, then their perimeters are proportional to the scale factor between them.

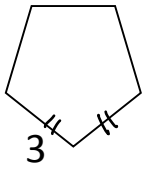


Example If $ABCD \sim JKLM$, then

$$\frac{AB + BC + CD + DA}{JK + KL + LM + MJ} = \frac{AB}{JK} = \frac{BC}{KL} = \frac{CD}{LM} = \frac{DA}{MJ}.$$

The two pentagons are similar. Find the perimeter of each of the pentagons.





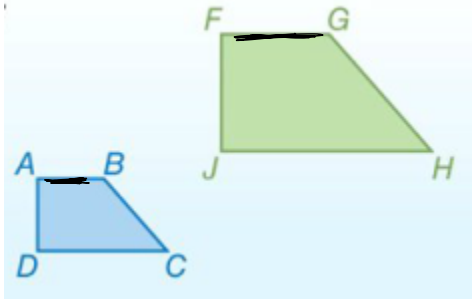
$$\frac{5}{3} = \frac{28}{x}$$

$$5x = 84$$

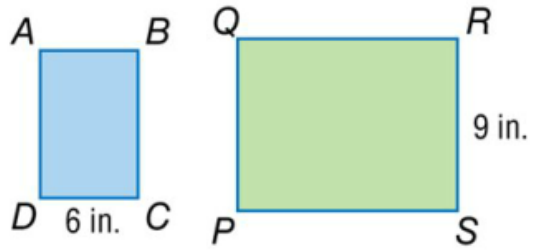
$$x = 16.8$$

If $ABCD \sim FGHJ$, then

$$\frac{\text{area of } FGHJ}{\text{area of } ABCD} = \left(\frac{FG}{AB}\right)^2.$$



If *ABCD* ~ *PQRS* and the area of *ABCD* is 48 square inches, find the area of *PQRS*.



$$\frac{x}{48} = \left(\frac{9}{6}\right)^2$$

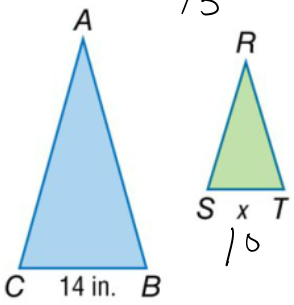
$$\frac{x}{48} = \frac{81}{36}$$

$$\frac{36x}{36} = \frac{3888}{36}$$

$$x = 108 \text{ in}^2$$

The area of Δ*ABC* is 98 square inches. The area of Δ*RTS* is 50 square inches. If Δ*ABC* ~ Δ*RTS*, find the scale factor from Δ*ABC* to Δ*RTS* and the value of *x*.

7/5



$$\frac{98}{50} = \left(\frac{14}{x}\right)^2$$

$$\frac{98}{50} = \frac{196}{x^2}$$

$$\frac{98x^2}{98} = \frac{9800}{98}$$

$$\sqrt{x^2} = \sqrt{100}$$

$$x = 10$$

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Homework:

7.2 Pg. 469 #9-15odd, 19, 20, 23 – 27odd, 35, 37

11.5 pg. 805 #7 – 13odd