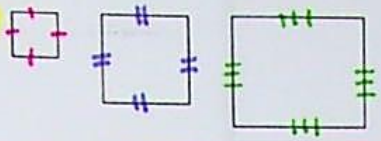
Name: _____ Date: _____

Geometry Worksheet: 8.2 – Scale Factor

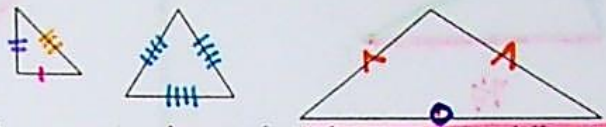
★ *Definition*: Two figures are **similar** (~) if they have the same shape, but not necessarily the same size.

The following figures are similar:



Notice they have the same shape, but different sizes.

The following figures are **not** similar:



Notice that all three are triangles, yet their shapes are very different.

3 Properties of Similar Figures:

(1) If 2 figures are ~, then their corresponding angles are **congruent.**

(2) If two figures are ~, then their corresponding sides are **in proportion** (are **proportional**).

(3) If two figures are ~, then the ratio of their perimeters is equal to the scale factor.

Pay attention to ORDER!

★ *Definition*: The **scale factor** is the ratio (simplified) of the lengths of the corresponding sides of similar figures.

1. Given: $\Delta ABC \sim \Delta DEF$

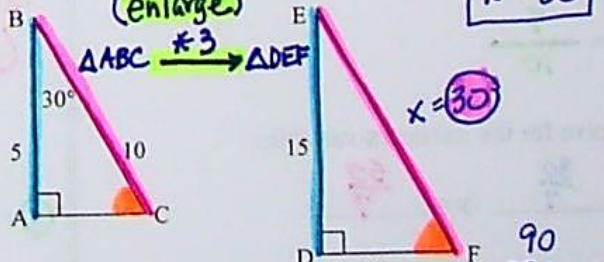
a. What is $m\angle F$? $90 - 30 = 60°$

b. What is the scale factor from ΔABC to ΔDEF? $\frac{15}{5} = 3$ enlargement

c. Find EF. 30u

d. What is the ratio of the perimeter of ΔABC to ΔDEF? small : large

$\frac{5:15}{10:30} = 1:3$ or $\frac{1}{3}$



ⓒ EF: $\frac{1}{3} = \frac{10}{x}$

$x = 30$

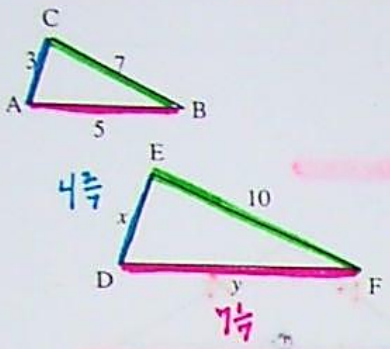
$90 - 30 = 60°$

★ To find the scale factor:

1. Determine which sides are corresponding. Use any tick marks (measures) to assist you. (or by names)
2. Write a complex proportion. Be consistent as to which values go in the numerator and denominator. For example, set up: $\frac{\text{small figure}}{\text{large figure}}$ or $\frac{\text{large figure}}{\text{small figure}}$. order is important!
3. The scale factor will be the ratio that contains real numbers in both the numerator and denominator. REDUCE!
4. Set the scale factor equal to the other ratios in the complex proportion to solve for the unknown variables.

★Problems: Given that each pair of figures is similar, solve for the unknown variables.

2. Given: $\Delta ABC \sim \Delta DFE$



✓Complete each complex proportion:

$$\frac{\bullet\ AB}{\bullet\ DF} = \frac{\bullet\ BC}{\bullet\ EF} = \frac{\bullet\ CA}{\bullet\ ED}$$

✓Substitute in the known values:

$$\frac{5}{Y} = \frac{7}{10} = \frac{3}{X}$$

✓Determine the scale factor (SF):

$$SF = \frac{7}{10}$$

✓Solve for the unknown variables.

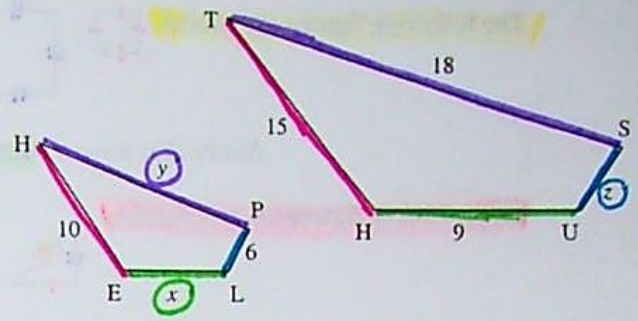
$x = \frac{30}{7}$ $y = \frac{50}{7}$

$\frac{7}{10} = \frac{3}{x}$ $\frac{7}{10} = \frac{5}{y}$

$\frac{7x}{7} = \frac{30}{7}$ $\frac{7y}{7} = \frac{50}{7}$

$x = \frac{30}{7}$ or $4\frac{2}{7}$ $y = \frac{50}{7}$ or $7\frac{1}{7}$

3. Given: $HELP \sim THUS$



$$\frac{\bullet\ HE}{\bullet\ TH} = \frac{\bullet\ EL}{\bullet\ HU} = \frac{\bullet\ LP}{\bullet\ US} = \frac{\bullet\ HP}{\bullet\ TS}$$

$$\frac{10}{15} = \frac{x}{9} = \frac{6}{z} = \frac{y}{18}$$

$\frac{10 \div 5}{15 \div 5}$

$SF = \frac{2}{3}$

$x = 6$ $y = 12$ $z = 9$

$\frac{2}{3} = \frac{x}{9}$ $\frac{2}{3} = \frac{y}{18}$ $\frac{2}{3} = \frac{6}{z}$

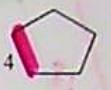
$\frac{3x}{3} = \frac{18}{3}$ $\frac{3y}{3} = \frac{36}{3}$ $\frac{2z}{2} = \frac{18}{2}$

$x = 6$ $y = 12$ $z = 9$

Geometry: 8.2 – Similar (~) Figures Name _____

Similar figures are figures that have the same shape, but not necessarily the same size.

Scale Factor – the ratio of corresponding sides for similar figures



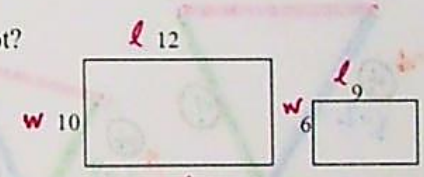
If the two pentagons shown are similar, what's the *scale factor* of the small pentagon to the large pentagon?

$\frac{\text{small}}{\text{large}} = \frac{4}{18} = \boxed{\frac{2}{9}}$

For two polygons to be similar:

1. The **corresponding angles** are Congruent
2. The **corresponding sides** are proportional

(1.) Are the two rectangles shown similar? Why or why not?



LW $\frac{10}{6} \stackrel{?}{=} \frac{12}{9}$ LL $10(9) \stackrel{?}{=} 12(6)$

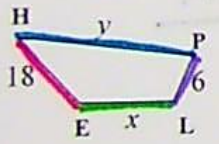
SW SL $90 \neq 72$

No

$\frac{w}{\ell}$ $\frac{10}{12} \stackrel{?}{=} \frac{6}{9}$

Corresponding sides are NOT proportional

(2.) Given: HELP ~ KIDS. Complete the complex proportion, and solve for the variables.



$\frac{3}{4} = \frac{x}{30}$

$\frac{4x}{4} = \frac{90}{4}$

$\boxed{x = 22.5}$

$x =$ 22.5

$y =$ 30

$z =$ 8

s. factor? $\frac{3}{4}$

- $\frac{HE}{KI} = \frac{EL}{ID} = \frac{HP}{KS} = \frac{PL}{SD}$

$\frac{3}{4} = \frac{y}{40}$

$\frac{4y}{4} = \frac{120}{4}$

$\boxed{y = 30}$

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

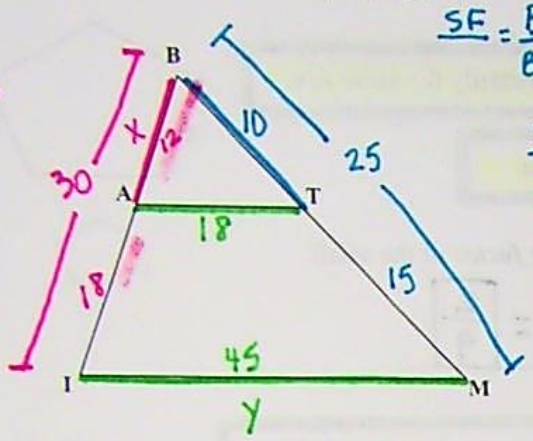
$\frac{3z}{3} = \frac{24}{3}$

$\boxed{z = 8}$

$\frac{18}{24} = \frac{x}{30} = \frac{y}{40} = \frac{6}{z}$

SF $\frac{18}{24} = \boxed{\frac{3}{4}}$

3. $\Delta BAT \sim \Delta BIM$. BI = 30, BT = 10, TM = 15, AT = 18. Find the scale factor of ΔBAT to ΔBIM, then find AB, AI, and IM.



AI: 30 − 12 = 18

$SF = \frac{BT}{BM} = \frac{10}{25} = \frac{2}{5}$

$\frac{2}{5} = \frac{x}{30}$

$\frac{5x}{5} = \frac{60}{5}$

$x = 12$

$\frac{2}{5} = \frac{18}{y}$

$\frac{2y}{2} = \frac{90}{2}$

$y = 45$

s. factor = $\frac{2}{5}$

AB = 12

AI = 18

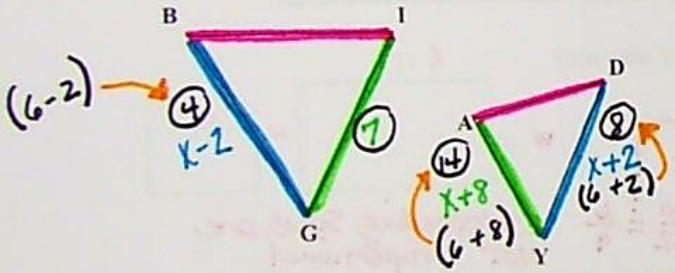
IM = 45

$\frac{12}{18} \overset{?}{=} \frac{10}{15}$

$180 = 180$ ✓

Is $\overline{AT} \parallel \overline{IM}$? yes, by (Side-Splitter Thm) (8.5) topic the segments are proportional

4. $\Delta BIG \sim \Delta DAY$. IG = 7, DY = x + 2, AY = x + 8, and BG = x − 2. Find x.



$\frac{7}{x+8} = \frac{x-2}{x+2}$

$(x+8)(x-2) = 7(x+2)$

$x^2 - 2x + 8x - 16 = 7x + 14$

$x^2 + 6x - 16 = 7x + 14$

$-7x - 14 \quad -7x - 14$

$x^2 - x - 30 = 0$

$(x+5)(x-6) = 0$

$x = \{-5, 6\}$

Check:

$\frac{4}{7} = \frac{8}{14}$ ✓ | $\frac{4}{8} = \frac{7}{14}$ ✓ | $\frac{4+7}{7} = \frac{8+14}{14}$, $\frac{11}{7} = \frac{22}{14}$ ✓

5. On a map of Geometry City, every 2 inches represents 3 miles (or in other words, the scale is 2:3). If the RhomBus Station is 13 inches away from the Factoring Factory on the map, how far apart are they in real life?

$\frac{\text{MAP}}{\text{Actual}} \frac{\text{in}}{\text{mi}}$

$\frac{2}{3} = \frac{13}{m}$

$\frac{2m}{2} = \frac{39}{2}$

$m = 19.5$ → 19.5 miles

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