Name: Key

7.1-7.3 Similarity Notes

Prior Knowledge Needed: 7.1 Proportional Reasoning (Examples)

Ex 1) Ratios:

The total number of students who participate in sports programs at Central High School is 520. The total number of students in the school is 1850. Find the athlete-to-student ratio to the nearest tenth.

$\frac{\#\text{ of athletes}}{\#\text{ of students (total)}} = \frac{520}{1850} = \boxed{\frac{52}{185}}$

Ex2) Solving Proportions: Find x.

$\frac{4x-5}{3} = \frac{-26}{6}$

$6(4x-5) = 3(-26)$

$24x - 30 = -78$

$24x = -48$

$\boxed{x = 2}$

Ex 3) Solve Problems Using Proportions.

TRAINS: A boxcar on a train has a length of 40 feet and a width of 9 feet. A scale model is made with a length of 16 inches. Find the width of the model.

Proportions are = Ratios

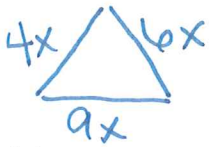
$\frac{\text{length ft}}{\text{length in}} = \frac{\text{width ft}}{\text{width in}}$

$\frac{40}{16} = \frac{9}{x}$

$40x = 144$

$\boxed{x = 3.6 \text{ inches}}$

Ex 4) In a triangle, the ratio of the measures of three sides is 4:6:9, and its perimeter is 190 inches. Find the length of the longest side of the triangle.



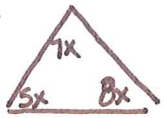
$4x + 6x + 9x = 190$

$19x = 190$

$x = 10$

$\boxed{\text{longest side} = 90 \text{ inches}}$

Ex 5) The ratios of the measures of three angles of a triangle are 5:7:8. Find the measure of each angle of the triangle.



$5x + 7x + 8x = 180$

$20x = 180$

$x = 9$

$\boxed{45°, 63°, 72°}$

7.2 Similar Polygons and 7.3 Similar Triangles Notes

- **Similar Polygons:** Polygons that are exactly the same shape but not necessarily the same size. http://www.youtube.com/watch?v=1O-ieOZ5y6s&feature=related

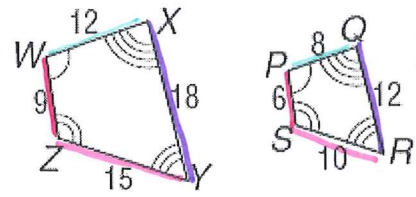
- **Side Length Ratio and Scale Factor:** When you compare the lengths of the corresponding sides of similar figures, you get a numerical ratio. This ratio is called the scale factor or Side Length Ratio(SLR) for the two figures. Vocab: SLR's being equal means scale factors are the same.

- **Determining if figures are similar:**
  1) All side length ratios are equal
  2) All corresponding angles are congruent

- **Notation:** The notation for similar is like a congruence symbol but without the =.
  ΔABC ~ΔXYZ reads "triangle ABC is similar to triangle XYZ".

- **Similar triangle shortcuts:**
  - **AA Similarity:** If 2 PAIRS of corresponding angles are congruent, then the triangles are similar.
  - **SSS Similarity:** If all three pairs of corresponding SLR's are equal, then the triangles are similar.
  - **SAS Similarity:** If 2 pairs of corresponding SLR's are equal and their included angles are congruent, then the triangles are similar.

Ex 6) **Is polygon $WXYZ \sim$ polygon $PQRS$?**



Show SLR's:

$\frac{WZ}{PS} = \frac{9}{6} = \frac{3}{2}$ $\frac{WX}{PQ} = \frac{12}{8} = \frac{3}{2}$

$\frac{XY}{QR} = \frac{18}{12} = \frac{3}{2}$ $\frac{ZY}{SR} = \frac{15}{10} = \frac{3}{2}$

(all side length ratios are =)

Show $\cong$ corresponding angles:

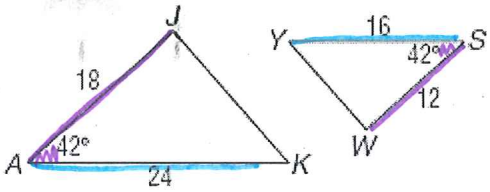
$\angle W \cong \angle P$
$\angle Z \cong \angle S$
$\angle Y \cong \angle R$
$\angle X \cong \angle Q$

∴ all corresponding angles are $\cong$.

Conclude with correct notation:

Yes, WXYZ ~ PQRS because Side length ratios are = 3/2 and corr. ∠s are ≅.

Ex 7) Determine if the triangles are similar. If similar, write a similarity statement, if not similar, white "not similar".



$\frac{JA}{WS} = \frac{18}{12} = \frac{3}{2}$

$\frac{AK}{YS} = \frac{24}{16} = \frac{3}{2}$

$\angle A = 42°$ $\angle S = 42°$

$\angle A \cong \angle S$ subs

$\triangle JAK \sim \triangle WSY$ by SAS Similarity

Ex 8) Scale Factor/SLR: (use correct units) ← must use the same units

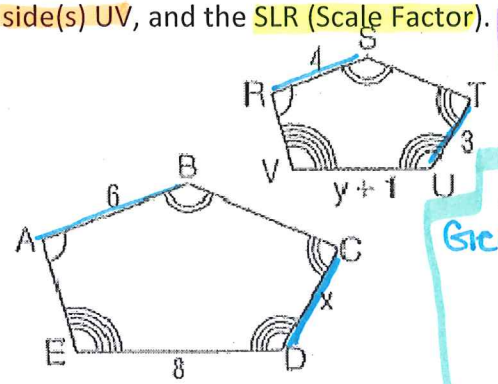
ARCHITECTURE An architect prepared a 12-inch model of a skyscraper to look like an actual 1100-foot building. What is the scale factor of the model compared to the actual building?

1ft = 12 inches

1100ft = 12(1100) = 13,200 in

model height in / actual height in $\Rightarrow \frac{12}{13,200} = \boxed{\frac{1}{1100} = SF}$ or $\boxed{\frac{1}{1100} = SLR}$

Ex 9) Each pair of polygons is similar. Write a similarity statement, and find x, the measure(s) of the indicated side(s) UV, and the SLR (Scale Factor).



Sim statement: ABCDE ~ RSTUV

Find x SLR = SLR

Geo: $\frac{CD}{TU} = \frac{AB}{RS}$

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

$4x = 18$

$\boxed{x = \frac{9}{2} = 4.5}$

Find Y

Geo: $\frac{AB}{RS} = \frac{BD}{VU}$ $\frac{6}{4} = \frac{8}{y+1} \Rightarrow 6(y+1) = 32$

$6y + 6 = 32$

$6y = 26$

$\boxed{y = \frac{13}{3}}$

Find UV

$UV = \frac{13}{3} + 1$

$\frac{13}{3} + \frac{3}{3}$

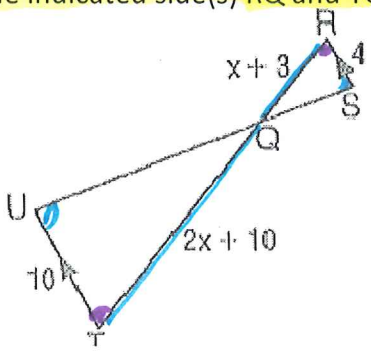
$\boxed{UV = \frac{16}{3}}$

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

Simplify

$\boxed{SLR = \frac{3}{2}}$

Ex 10) Write a similarity statement and explain why the two triangles are similar, and find x, the measure(s) of the indicated side(s) RQ and TQ, and the scale factor (SLR).



$\angle R \cong \angle T$ and $\angle S \cong \angle U$ // lines form $\cong$ alt int ∠s

∴ $\triangle TQU \sim \triangle RQS$ by AA similarity

Find x SLR = SLR

$\frac{RQ}{TQ} = \frac{RS}{TU}$ Geo

$\frac{x+3}{2x+10} = \frac{4}{10}$

$10(x+3) = 4(2x+10)$

$10x + 30 = 8x + 40$

$2x = 10$

$\boxed{x = 5}$

$RQ = 5 + 3$

$TQ = 2(5) + 10$

$\boxed{RQ = 8}$

$\boxed{TQ = 20}$

$SLR = SF$

$SF = \frac{RS}{TU} = \frac{4}{10} = \boxed{\frac{2}{5} = SF}$