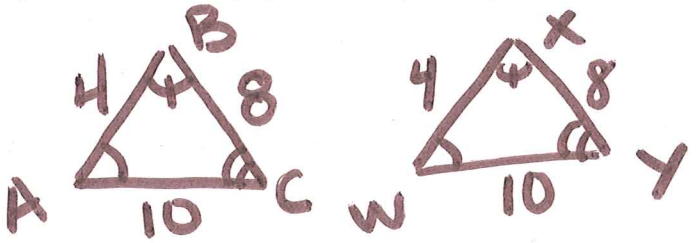
Acc Geometry
Triangle Similarity Notes (7.3, 7.4, 7.5)

Name_____
Date_____

Triangle Similarity- Shortcut Exploration

To begin exploring Triangle Similarity, we need to start with Triangle Congruence. What were the Triangle Congruence Shortcuts that we studied? SSS, SAS, ASA, SAA, HL,
Not working: AAA + SSA

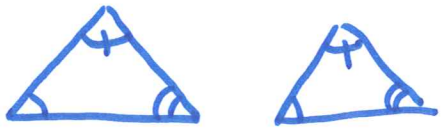
1. Question: If a triangle is congruent to another triangle, are the two triangles similar? Draw an example and write you scale factor (equal corresponding side length ratios).



$SLR = \frac{4}{4} = 1$

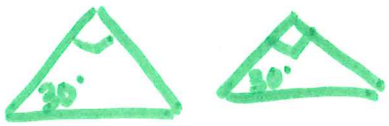
SLR=1

2. Question: If 3 angles of one triangle are congruent to 3 corresponding angles of another triangle, are the two triangles similar?



Yes, holds same shape

3. Question: If 2 angles of one triangle are congruent to 2 corresponding angles of another triangle, are the two triangles similar?



"obviously" both of the 3rd ∠s will = 60° by △ Sum

AA Similarity Conjecture: If two angles of one triangle are congruent to two angles of another triangle, then they are similar.

4. Let's take a look at shortcuts AAA, ASA, and SAA. Do we have to do investigations for each of these shortcuts? Why or why not? Do these shortcuts work?

No, they are covered by the AA similarity short cut.

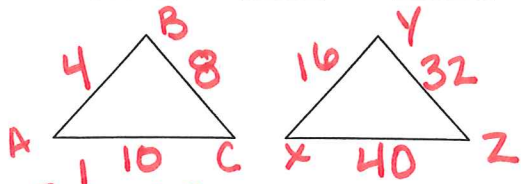
5. To determine if two polygons are similar, what must be true of the two polygons?

- ALL corresponding ∠s ≅
- ALL corresponding side length ratios are = or we could say sides are proportional.

Part 1: SSS Similarity

Draw triangles: ΔABC and ΔXYZ with lengths AB=_____ BC=_____ AC=_____ XY=_____

YZ=_____ XZ=_____



Are the side length ratios EQUAL? yes $= \frac{1}{4}$ or 4

Are the sides proportional? yes

Are the corresponding angles in your two triangles equal? yes (shown by GSP Demo)

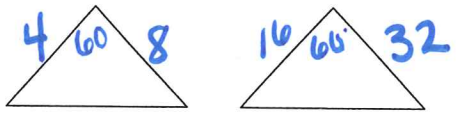
Are your two triangles similar? How do you know?

Yes, Corr. ∠s are ≅ and SLRs are =

Inductive reasoning:
Does SSS determine that triangles are similar? yes

Part 2: SAS Similarity

Draw the examples from the board:



Do the corresponding side lengths have equal ratios? yes $= \frac{1}{4}$

Are the sides proportional? yes (GSP)

Are the corresponding angles in your two triangles equal? yes (GSP)

Are your two triangles similar? How do you know?

Yes, Corr. ∠s are ≅ and SLR =

Does SAS determine that triangles are similar? yes

Part 3: ASS Similarity

Do the corresponding side lengths have equal ratios? yes

Are the sides proportional? yes

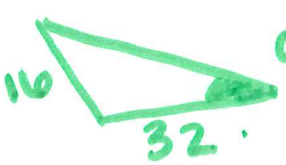
Are the corresponding angles in your two triangles equal? Not always!

Are your two triangles similar? How do you know?

NO, Corr ∠s are ≅

Does SSA determine that triangles are similar? NO

with:

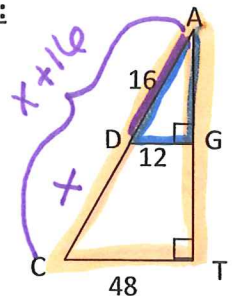


OR

NOT same

More Similar Triangles :

Ex 1:



AA similarity

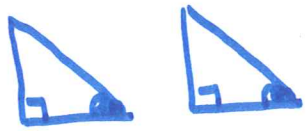
$\angle A \cong \angle A$

$\angle AGD = 90, \angle T = 90$

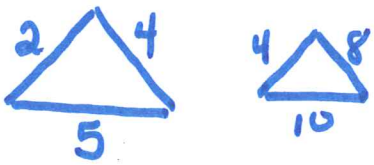
$\angle AGD \cong \angle T$

By AA similarity

$\triangle CAT \sim \triangle DAG$



SSS all SLR =



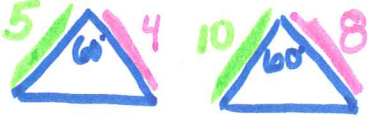
a). Explain why $\Delta CAT \sim \Delta DAG$.

b). What is the measurement of CD?

$\frac{AC}{AD} = \frac{CT}{DG}$ $\quad \frac{x+16}{16} = \frac{48}{12}$ $\quad 12(x+16) = 768$

$x = 48$

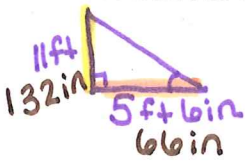
SAS

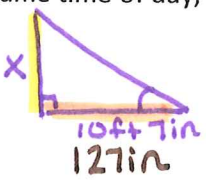


Indirect Measurement:

Ex 2: A flagpole that is 11 feet tall casts a 5 and a half foot shadow. At the same time of day, a nearby building casts a 10 ft, 7 in shadow. How tall is the building?

AA Similarity





$\frac{x}{132} = \frac{127}{66}$

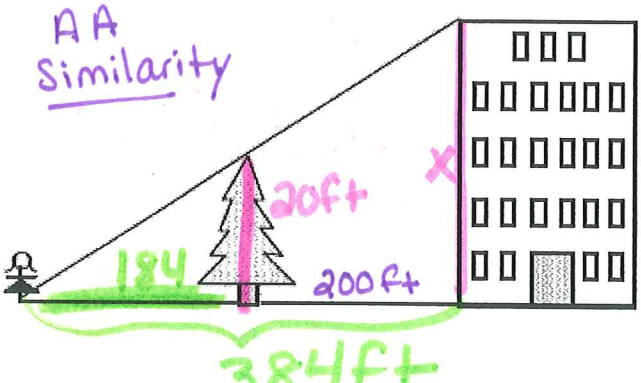
$x = 254$ in

21 ft 2 in

Ex 3:

Anna wants to find the height of the tallest building in her city. She stands 384 feet away from the building. There is a tree 200 feet in front of a building that is 20 feet tall. How tall is the building to the nearest foot? **SHOW ALL YOUR WORK.**

AA Similarity

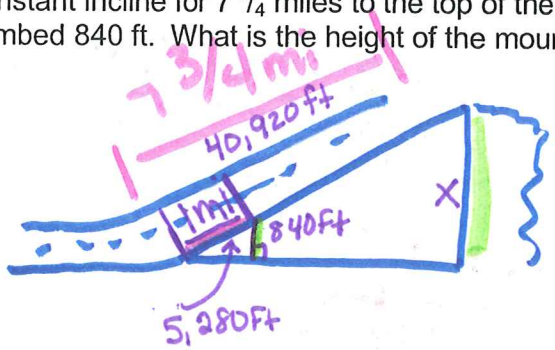


$\frac{x}{20} = \frac{384}{184}$

$x \approx 41.739$

$x \approx 42$ ft

4. Driving through the mountains, Dale has to go up and over a high mountain pass. The road has a constant incline for $7\,^3/_4$ miles to the top of the pass. Dale notices from a road sign that in the first mile, he climbed 840 ft. What is the height of the mountain pass? (5280 ft = 1 mile)



$7\frac{3}{4} \times 5280\text{ ft} = 40920\text{ ft}$

$\frac{x}{840} = \frac{40920}{5,280}$

$x = 6,510$ ft

Perimeters, Areas, and Volumes of Similar Figures

Objective: To find perimeters, areas and volumes of similar figures.

Perimeter & Area

Perimeter –

Area –

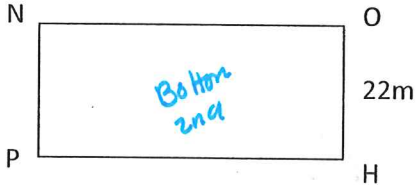
Volume-

$$\underbrace{PR}_{\text{Perimeter Ratio}} = \underbrace{SLR}_{\text{side length ratio}} = \underbrace{SF}_{\text{Scale factor}}$$

$$\underbrace{AR}_{\text{Area Ratio}} = (SLR)^2$$

$$\underbrace{VR}_{\text{volume Ratio}} = (SLR)^3$$

Ex 5: **Rectangle TELA (1st) Rectangle PHON (2nd) and the ratio of the areas is 1/4. Find EL.**



$AR = SLR^2$

$\frac{1}{4} = SLR^2$

Need SLR! $\sqrt{\frac{1}{4}} = \sqrt{(SLR)^2}$

$\frac{1}{2} = SLR$

$\frac{LE}{OH} = \frac{1}{2}$

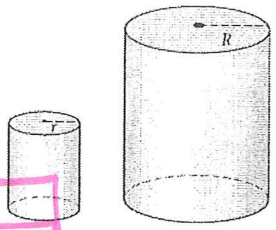
$\frac{LE}{22} = \frac{1}{2}$ $\quad LE = 11m$

Ex 6 The right cylinders are similar and $r = 10$ cm.

Volume of large cylinder = 64 cm

Volume of small cylinder = 8 cm

$R =$ _____ SLR needed!



$VR = SLR^3$

$\sqrt[3]{\frac{64}{8}} = \sqrt[3]{SLR^3} \Rightarrow SLR = \frac{4}{2} = 2$

$\frac{R}{10} = \frac{2}{1}$

$R = 20cm$

Example 7:

The corresponding heights (SLR) of two similar cylinders is 2:5. What is the ratio of their volumes?

$VR = SLR^3$ $\quad \left(\frac{2}{5}\right)^3 = \frac{8}{125}$ $\quad VR = \frac{8}{125}$

Example 8: The area ratio of a geometric solid is 9:16, find the volume ratio.

$AR = \frac{9}{16}$ Need VR so $VR = SLR^3$ Find SLR 1st!

$AR = SLR^2$

$\sqrt{\frac{9}{16}} = \sqrt{SLR^2}$

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

$VR = \left(\frac{3}{4}\right)^3$

$VR = \frac{27}{64}$

Example 9: The volume ratio of a triangular prism (3D solid) is 512/216. Find the area ratio.

Need SLR to Find AR

$\sqrt[3]{\frac{512}{216}} = SLR$ $\quad SLR = \frac{8}{6}$ $\quad SLR = 4/3$

$AR = \left(\frac{4}{3}\right)^2$ $\quad AR = (14/9)$