Math 3305 Chapter 3, Sections 3.1 and 3.2 script

So now we'll expand from triangles to polygons. Much of what we'll learn is true for triangles - they inherit some of these characteristics because they are a proper subset of the set of all polygons! Let's look at similar polygons.

Polygons G1 and G2 are similar if there is a correspondence between them with corresponding angles congruent and corresponding sides having a ratio S, the same for each pair of sides. S is called the scale factor.

We use ~ to mean similar here. G1 ~ G2 means that the above definition is true.

Note the examples on page 95 and 96. They're really good.

Note that you take the ratio of sides by dividing S1G1 by S1G2. And following suit with each pair. If the ratio is the same number each time, then the number is the shape factor.

Suppose you have a 3-4-5 right triangle and a 6-8-10 right triangle. You can see that the shape factor is 2.

$\frac{3}{6} = \frac{4}{8} = \frac{5}{10}$ $\frac{1}{2}$ one way

$\frac{6}{3} = \frac{8}{4} = \frac{10}{5}$ 2 the other way

Popper 3.1 Question One

Suppose I have an equilateral triangle with side length 2.5. If I have a second equilateral triangle with side length 12.5, are they similar?

A. Yes

B. No

Now 3.2 shows applications of similar triangles. You may use shadows to get facts about an unknown height for example. The sun's rays shine equally on both objects making the smaller known lengths and the two shadows set up an equality with only one unknown. See the example on page 99.

If H is the height and S the length of the shadow. H and D are the larger object with the height we want to know. H1 and D1 are the height and shadow of a meter stick. We can measure the shadow of the larger object. Then we know S, H1, and D1. Put them together in an equation and you can solve for H.

$$\frac{H}{D} = \frac{H1}{D1}$$

Using a mirror gives a similar equation with only one unknown.

Now the important theorems in 3.2 are the AA Similarity Theorem (3.2.1). Study the proof carefully. It's Euclidean specific!

3.2 Essay One

Explicate the proof of Theorem 3.2.1 and write it out in your own words. Be careful! Make sure I can tell that you understand it. Finish up with a reason or two WHY this proof WON'T work in SG or HG.

Theorem 3.2.2 (SAS Similarity Theorem). Read it carefully.

3.2 Essay Two

Write a short list of reasons in an essay format about how this is different from the SAS Axiom! How will you ensure you'll never get confused between these two.

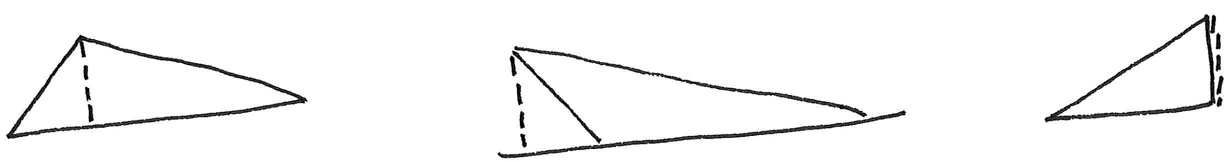
Theorem 3.2.3 SSS Similarity Theorem

If two triangles have all three pairs of corresponding sides in the same ratio, then the triangles are similar.

Now sometimes similar OTHER parts of similar shapes are similar.

For example:

An altitude of a triangle is the perpendicular line segment from a vertex to the opposite side or extension of the side. There are 3 cases to look at: interior altitudes, exterior altitudes, or a right triangle altitude side leg. Let's look at these.



It turns out that altitudes of similar triangles have the same scale factor as the sides!

Popper 3.1 Question Two

Suppose we have two similar triangles with a scale factor of 5 from the smaller to the larger. If the larger has an altitude of 10 cm, what is the length of the smaller triangle's altitude?

A. 20

B. 2

C. 5

Ms. Leigh's Question 1

Given two rectangles, one with side length 2 and longer side length 3. And the second larger one with a scale factor of 3 between them. Do the diagonals have a scale factor of 3 between them? Why or why not.

Wrapping up:

Popper 3.1 two questions

Two Essay questions

3.1 #4 and #12

3.2 #6