Chapter 7: Similar Polygons

View the lecture and complete the interactive exercises and independent practice problems for Chapter 7.

7.1: Ratio and Proportion

The examples in this section are excellent. Study them carefully before completing the assignment.

Assignment 7.1: p. 243 #1-23 odd, 24-27

Even Solutions	
24. 40, 50	26. 45, 60, 75

7.2: Properties of Proportions

The <u>means-extremes property</u> of proportions enables us to solve proportions quickly. For example, if $\frac{4}{x} = \frac{2}{5}$, then we can solve this by using the equation $4 \cdot 5 = x \cdot 2$. (This is also called "cross-multiplying".) This gives $20 = 2x$. So $x = 10$.

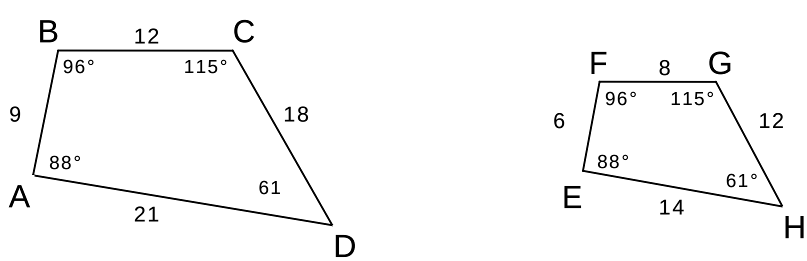
Assignment 7.2: p. 247 #1-29 odd

7.3: Similar Polygons

To determine if polygons are **similar**, you must do two things:

(1) Verify that corresponding <u>angles</u> are congruent, and
(2) verify that corresponding <u>sides</u> are proportional.

Example: Are the two quadrilaterals similar? If so, state the similarity, and give the scale factor.



Since corresponding angles are congruent and the sides are proportional ($\frac{9}{6} = \frac{18}{12} = \frac{12}{8} = \frac{21}{14} = \mathbf{\frac{3}{2}}$), the quadrilaterals are similar. The similarity is written as quad ABCD ~ quad EFGH, and the <u>scale factor</u> is $\frac{3}{2}$.

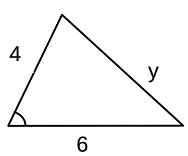
Note: As with congruency, similarity is written so that corresponding angles and sides are in the same position in the similarity statement. In other words, it would be incorrect to say that quad ABCD ~ quad FGHE, since $\angle A \neq \angle F$, $\angle B \neq \angle G$, etc.

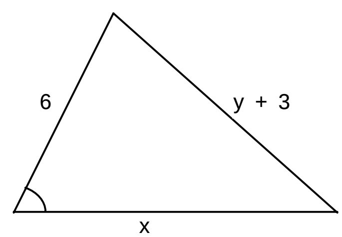
Assignment 7.3: p. 250 #1-21 odd, 24-27 Hint for #24: The scale factor $\neq \frac{20}{18}$.

Even Solutions
24. x = 28, y = 24, z = 36
26. x = 30, y = 24, z = $20\sqrt{3}$

7.4: A Postulate for Similar Triangles

When working with similar triangles that overlap each other, it is often helpful to redraw the triangles. Look at Written Exercise #12 as an example. The triangles can be redrawn as follows:





The proportions are $\frac{4}{6} = \frac{6}{x}$ and $\frac{4}{6} = \frac{y}{y+3}$. The solutions are:

$$\frac{4}{6} = \frac{6}{x}$$
$$4x = 36$$
$$x = 9$$

$$\frac{4}{6} = \frac{y}{y+3}$$
$$4(y+3) = 6y$$
$$4y + 12 = 6y$$
$$2y = 12$$
$$y = 6$$

Note: The proofs in the assignment are similar to the sample proof in this section.

Assignment 7.4: p. 257 #1-15, 23, 24

Even Solutions:

2.	Similar	4.	Similar
6.	Similar	8.	Similar
10a.	$\triangle MLN$	10b.	ML, MN, LN
10c.	20, x; 20, y	10d.	24, 16
12.	x = 9, y = 6		
14a.	$\triangle ACD$, $\triangle CBD$	14b.	x = 15, y = 9

24.

Statements	**Reasons**
1. $\overline{BN} \parallel \overline{AC}$	1. Given
2. $\angle B \cong \angle C$; $\angle N \cong \angle L$	2. If 2 parallel lines are cut by a transversal, then alt. int. angles are congruent
3. $\triangle BMN \sim \triangle CML$	3. AA Similarity Post.
4. $\frac{BN}{CL} = \frac{NM}{LM}$	4. Corr sides of ~ triangles are in proportion
5. $BN \cdot LM = CL \cdot NM$	5. A prop of proportions

Note: Step 4 could also be $\frac{CL}{BN} = \frac{LM}{NM}$

7.5: Theorems for Similar Triangles

The example in this section is excellent. Make sure you understand each part before completing the assignment.

Assignment 7.5: p. 266 #1-9, 11-13, 15

Even Solutions:

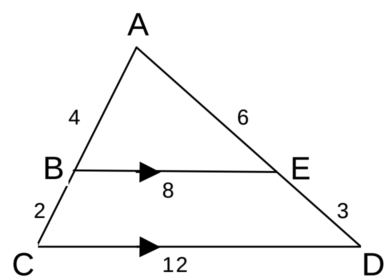
2.	$\triangle ABC \sim \triangle THJ$; AA	4.	$\triangle ABC \sim \triangle XRN$; SSS
6.	$\triangle ABC \sim \triangle ARS$; SAS	8.	No

12.

Statements	**Reasons**
1. $\frac{DE}{GH} = \frac{EF}{HI}$; $\angle E \cong \angle H$	1. Given
2. $\triangle DEF \sim \triangle GHI$	2. SAS Similarity Thm
3. $\frac{EF}{HI} = \frac{DF}{GI}$	3. Corr sides of ~ triangles are in proportion

7.6: Proportional Lengths

The *Triangle Proportionality Theorem* justifies several proportions. (Study the list after the proof of the theorem.) However, notice that none of these proportions include the **parallel segments**. This is a common error that geometry students make. Let's look at an example. From the following diagram, the Triangle Proportionality Theorem gives the following proportions:



$$\frac{4}{6} = \frac{2}{3} \qquad \frac{4}{2} = \frac{6}{3} \qquad \frac{4}{4+2} = \frac{6}{6+3}$$

But notice that $\frac{4}{2} \neq \frac{8}{12}$ and $\frac{6}{3} \neq \frac{8}{12}$. When using the parallel segments ($\overline{BE}$ and $\overline{CD}$), the only proportions that can be used are $\frac{BE}{CD} = \frac{AB}{AC} = \frac{AE}{AD}$ or $\frac{CD}{BE} = \frac{AC}{AB} = \frac{AD}{AE}$. The first proportion gives $\frac{8}{12} = \frac{4}{6} = \frac{6}{9}$, which is equivalent to $\frac{2}{3}$, the scale factor of the similar triangles.

Assignment 7.6: p. 272 #1-3, 5-17 odd, 20

Even Solutions:	
2a. No	2b. No
2c. Yes	2c. Yes
20. x = 15	

Take the Chapter 7 Quiz.

Take the Chapter 7 "Prove It" Quiz.