Chapter 8 – Similarity

8.1 Similar Polygons

- 8.1.1 Working from proportions to scale factors and vice-versa
- 8.1.2 Perimeter and Area theorems involving similar polygons. (r, r^2, r^3)
- 8.1.3 Determining similarity using "brute force". All corresponding parts.

8.2 Proving Triangles are Similar Using AA~

- 8.2.1 Integrating vertical angles and parallel lines (Corresponding, AIA, AEA)
- 8.2.2 Once similarity is determined, students move to solving for unknown sides/angles.

8.3 Proving Triangles are Similar Using SSS~ and SAS~

- 8.3.1 Determining corresponding parts so the correct ratios are setup for SSS~
- 8.3.2 Taking care the angle in SAS~ is included

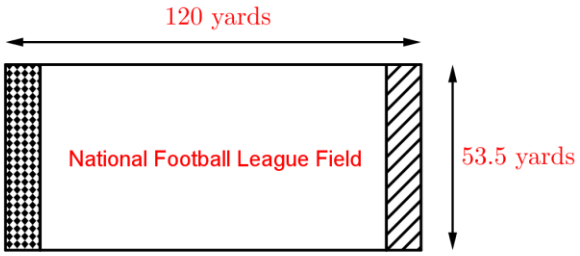
8.4 Proportionality Theorems

- 8.4.1 Triangle Proportionality Theorem. (converse) Parallel segments within a triangle
- 8.4.2 Construction of point along a line to a given ratio (The 'Z' construction)
- 8.4.3 Generalized version of TPT using three parallel lines and two transversals
- 8.4.4 Triangle Angle Bisector Theorem

Practice Performance Task – 8.1A
Football Fields

The size of a football field depends on the age of the players and the type of football. For example, a youth football field is typically smaller than a high school field. In addition, the Canadian Football League uses a different side field than the National Football League. The following performance task will investigate the possible similarity relationships between the different fields.

1. The diagram to the right shows the dimensions of an NFL regulation field (also the same for high school). Youth football programs (for children in 6^{th} or 7^{th} grade) will typically mark off a smaller section within a regulation field. Suppose a youth football coach wants to create a field similar to the one shown to the right using a scale factor of .75. Draw and label the dimensions of such a field.

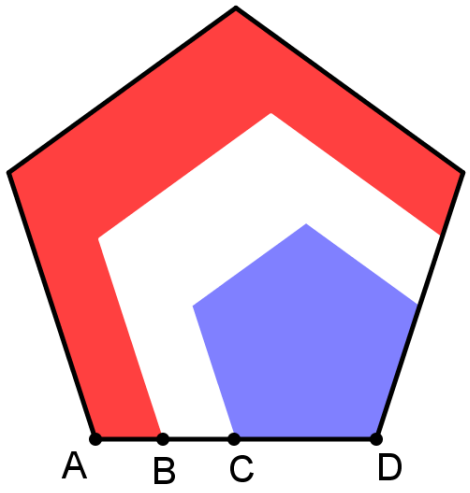


2. The Canadian Football League plays on a field that is larger than a regulation NFL field. The total length of the field is 150 yards with width of 65 yards. Is the CFL field similar to the NFL field? If so, what is the scale factor? If not, is the CFL field proportionally wider or skinnier than the NFL field?

3. The Arena Football League plays on a field that is 66 yards long. If the Arena Football Field was similar to the NFL field, then how wide would it be?

4. If the Arena Football field were similar to an NFL field, how many times bigger would the area of the NFL field be than the area of the Arena field?

Practice Performance Task 8.1B
Home Insurance Logo



A home insurance company known as Pinnacle Insurance uses the logo shown to the right (not including the letters at the bottom). The logo is made up of three similar, regular pentagons. Use the diagram to the right along with the information provided to answer the following problems.

1. Suppose $AB = 3.75$, $BC = 3.75$ and $CD = 7.5$, find the perimeter of each of the three pentagons.

   $Perimeter\ of\ Big\ =$

   $Perimeter\ of\ Medium\ =$

   $Perimeter\ of\ Small\ =$

2. Determine the scale factor between each of the following pentagons:

   Scale Factor between Big and Medium =

   Scale Factor between Medium and Small =

   Scale Factor between Big and Small =

3. The dimensions provided in question one are for a large sign the company plans on building for their main office. If the area of the medium pentagon (including the small one inside of it) is 217.75 square feet, then find the area of each of the remaining pentagons (including all the smaller pentagons inside).

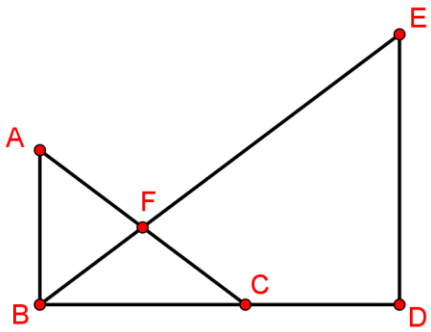
   Area of Large Pentagon (whole sign) =

   Area of Small Pentagon =

4. The material for the sign costs $28 per square foot and the border for each of the pentagons costs $80 per foot. How many will the materials for the sign cost?

Practice Performance Task – 8.2
So Many Triangles…

Oftentimes in geometry, things are not as simple as they appear. The following diagram is very common in chapters on triangle similarity.



1. How many triangles are shown in the diagram to the right? Name each of the triangles.

2. Suppose you are told $AB||ED$. A student in your class makes the following argument:

   IF AB and ED are parallel, then we know angle E is congruent to angle ABF because they are Alternate Interior Angles. Also, angle AFB is congruent to angle EFC because they are vertical angles. Therefore, I know triangle AFB is similar to triangle EBD by AA.

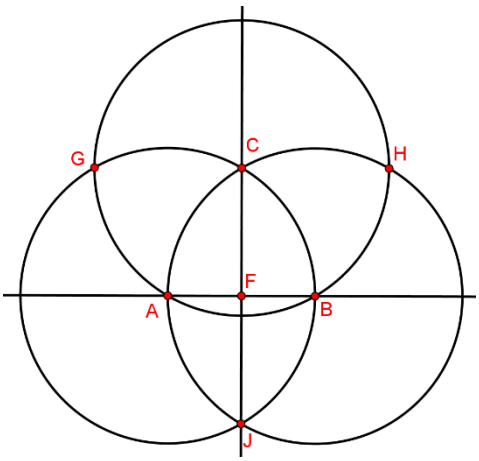
   Come to the aid of your fellow student! Describe his mistake and explain why we cannot prove $\Delta AFB \sim \Delta EBD$ by AA.

3. Suppose you are given the following information about the diagram. $AB||ED$ and $BD \perp AB$. Explain which angles must be congruent and why.

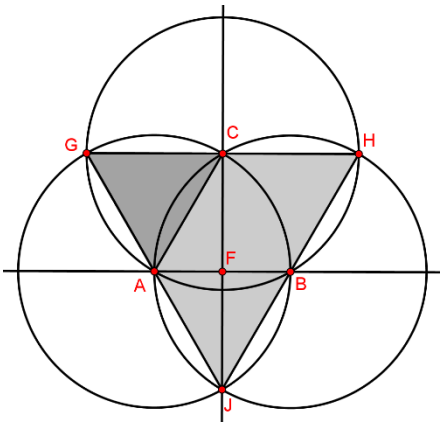
4. Given the information from part 3, is there sufficient information to prove any of the triangles in the diagram are similar? If so, explain which triangles are similar and why. If not, explain what angles you would need to know in order to prove two of the triangles are similar.

Practice Performance Task – 8.3
Constructions

One of the first constructions we learned this year involved congruent circles beginning from a line segment. The following performance task will explore potential similarity relationships present within this construction.



1. In the given diagram, the three circles are congruent. With this information, classify ΔABC and explain how you arrived at your answer.

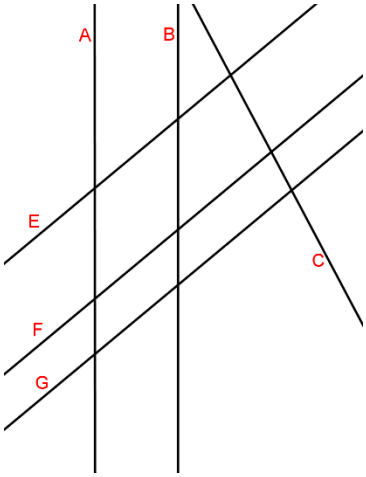


2. Consider the two triangles shaded in the diagram to the left: ΔGCA and ΔGHJ. Using only the fact that the three circles are congruent, prove $\Delta GCA \sim \Delta GHJ$ by SAS. (Hint: the diameter of a circle is twice its radius.)

3. Once again, consider the two triangles shaded in the diagram: ΔGCA and ΔGHJ. This time, explain how you could prove the two triangles are similar by SSS. (Hint: use the previous hint.)

4. Finally, you guessed it, prove $\Delta GCA \sim \Delta GHJ$ by AA. (Hint: look both ways before crossing the street.)

Practice Performance Task – 8.4
Route Planning



Each line on the drawing to the right represents a street. Each street is labeled with a single-letter name. You can assume that any streets that appear to be parallel are parallel. Label the diagram as you go to keep track of where different people live.

1. You live at the intersection of A and G. It takes you 12 minutes to walk to your friend Jason's house at the intersection of A and F and 30 minutes to walk to your friend Amelie's house at A & E. How long would it take Jason to walk to Amelie's house?

2. The mall is at the intersection of C & G, the movie theatre is at C & F, and the high school is located at C & E. After school, it takes you 25 minutes to walk to the mall. How long does it take you to walk from school to the movie theatre?

3. Suppose A, B, E and F form a rhombus. How long would it take you to walk from your house to the bus stop at the corner of B & E?

4. It takes you 40 minutes to walk from your house to the mall. How long would it take you to walk from your house to the movie theatre?