|                          |                                                              |
|--------------------------|--------------------------------------------------------------|
| **Lesson Title**         | Object Ratios in Life                                        |
| **Length of Lesson**     | 50 minutes                                                   |
| **Created By**           | Shane A Irvin                                                |
| **Subject**              | Geometry, Algebra, Math SL                                   |
| **Grade Level**          | $9^{th}$ – $12^{th}$                                         |
| **State Standards**      | 4c. Solve real-world and mathematical problems involving the lateral area, surface area and volume of three-dimensional figures, including prisms, cylinders, cones, pyramids, and spheres. |
| **DOK Level**            | DOK 2                                                        |
| **DOK Application**      | Inquiry, Formulations, Decipher, Correlation                |
| **National Standards**   | Make decisions about units and scales that are appropriate for problem situations involving measurement situations |
| **Graduate Research Element** | Ratio correlation and finding map scales through ratios are important to the GIS community for easy map assessment |

**Student Learning Goal:**
The goal for this lesson is for the students to use what they have learned in both linear and square measurements. By showing the students how to collect information about area through aerial imagery and photography (INSPIRE_LPs_Irvin_02_15_12), the students will be able to understand how to coordinate area collection to assumed lengths and distances.

The students will further this knowledge in this lesson by considering the ability to specifying a ratio relationship with the image to formulate maps and easy linear and square measurement assumptions. The idea of implementing a ratio in a map can allow the students to see how a scale can be formed. Since most maps only have a linear scale, it will be a unique to show the students that maps can have an area scale formulated as well (i.e. square area of a city in a 1:50000 scale)

This scaling will be discussed in the guided practice followed by the students taking their assumptions and working out errors and possibilities with their own maps.

**Materials Needed (supplies, hand-outs, resources):**
Aerial photography, normal map with scale, handout image, reference to Pythagorean Theorem lesson (INSPIRE_LPs_Irvin_09_15_11)

**Lesson Performance Task/Assessment:**
The students will be tasked to create a ratio dealing with one thing they use every day (i.e. this pencil's ratio to the desk is 1:10). The ratio they develop will help them reaffirm their knowledge of ratios. Once this relationship is established the lesson can begin by showing aerial photography and a standard road map.

The assessment is for the students to visualize the imagery and map and create assumptions on the ratio. The questions will then be presented to the students:

What is a ratio?

Where do we see ratios in our everyday life?

How are ratios formed?

How they figure out the specific ratio?

For more advanced students the specific question can be thrown in:
How the computer does know a specific zoom level is 1:4000?

**Lesson Relevance to Performance Task and Students:**
The task for this lesson is to get the students to understand the connection between area and ratios. Ratios are found in all facets of life and the students must be able to define a ratio for future testing such as the ACT and in their progression in mathematics.

**Anticipatory Set/Capture Interest:**
The anticipatory set for this lesson will be that of a specific ratio. I will ask the students how many pencils does it take to create a line from one wall in the classroom to another directly across. The students will be allowed to guess and formulate their guesses. The answer will then be given and guided practice will begin.

**Guided Practice:**
By showing the students how to collect information about area through aerial imagery and photography (INSPIRE_LPs_Irvin_02_15_12), the students will be able to understand how to coordinate area collection to assumed lengths and distances. The students will be tasked to create a ratio dealing with one thing they use every day (i.e. this pencil's ratio to the desk is 1:10). The ratio they develop will help them reaffirm their knowledge of ratios. Once this relationship is established the lesson can begin by showing aerial photography and a standard road map.

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**Independent Practice:**
The students will further this knowledge in this lesson by considering the ability to specifying a ratio relationship with the image to formulate maps and easy linear and square measurement assumptions. The idea of implementing a ratio in a map can allow the students to see how a scale can be formed. Since most maps only have a linear scale, it will be a unique to show the students that maps can have an area scale formulated as well (i.e. square area of a city in a 1:50000 scale)

This scaling will be discussed in the guided practice followed by the students taking their assumptions and working out errors and possibilities with their own maps.

**Remediation and/or Enrichment:**
Remediation:
In situations that remediation is needed the student can see the instructor for one on one tutoring. The student can also be paired with a high performing student with full understanding of the lesson.

Enrichment/Extension:
All of these extensions depend on the students' ability and knowledge of the subject matter. The student will have the opportunity dig further in ratio formulation by figuring out specific ratios in other imagery such as the ratio of Columbus High Schools to the city of Columbus, Mississippi. This formulation is tougher and can challenge the more advanced students.

**Check(s) for Understanding:**
Ask the same questions in the assessment category as well as ask the students a few more:

What is a ratio?

How are ratios formed?

Remembering what was accomplished today, how do you think you could apply this to your everyday life?

**Closure:**
The students will see lesson closure by asking them what they feel they got from the lesson.  This is different than most closures because the original teacher of this lesson wanted to know how much the students were absorbing during the specified teaching times.

**Possible Alternate Subject Integrations:**
Geography, Trigonometry, Cartography

**Teacher Notes:**
If this lesson is taught elsewhere implement specifics the students know about.  It's very surprising how many students are knowledgeable about specific road distances and areas around their hometown.  By changing maps and areas in this lesson, the students can really absorb the discussion of ratios better by directly connecting them to specific areas they have physically been to before.