SCALE AND RATIO USING AIRCRAFT

Students will practice their knowledge of scale and ratio by looking at model aircraft.

LESSON PLAN

Learning Objectives:

The students will:

- Make observations, make measurements, and collect data using model aircraft.
- Understand the meaning of scale.
- Use the scale factor and the toy to make an outline of the life-size aircraft.
- Use proportional reasoning to make an enlarged drawing of their toy.
- Work cooperatively in groups.

Background

A ratio is a comparison of two quantities that tells the scale between them. Ratios may be expressed as quotients, fractions, decimals, percent, or given in the form a:b. An example of a ratio we use in this activity would be the ratio of the length of a side of a small figure or model to the corresponding side in a large figure where the large figure or real-life figure is 1/2. The ratio of the length of a side in the large figure to the corresponding side in the small figure is thus 2/1 or 2. The scale is the number a ratio is multiplied to find an equivalent ratio. Scaling a ratio produces any number of equivalent ratios, which all have the same units and the same average distribution. The scale factor is the factor by which a picture or object is enlarged or shrunk. The scale factor may be expressed as a fraction, decimal, or percent.

Grade Level: 6 – 7

Ohio Learning Standards/Mathematics (2017)

Mathematical Standards
6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
7.RP.2: Recognize and represent proportional relationships between quantities.

Mathematical Practices
MP.1: Make sense of problems
MP.4: Model with Mathematics
MP.5: Use appropriate tools strategically

Materials Required:

- Rulers and Calipers for measuring
- Toy Airplane, Model, Drawing or Photo for each group
- String
- Graph Paper

Procedure:

A. Warm-up
1. Conduct a discussion about scale. Use maps or various toys that have the scale indicated.

2. Discuss what scale means and how they would find the size of the real-life objects or how far a place is in real life compared to a map.

B. Activity
1. Give each group an airplane model or toy or a drawing or photo. Have students make any observations about the writing on their toy and what it means. (You may not find the scale on models of airplanes that are the cast metal models.)

2. Have students measure the critical dimensions of their aircraft. These include length, wingspan, and height. They could also include any other distinguishing dimensions for their toy, such as tail width, propeller length, wheel diameter, and any other part the group agrees to measure. Students may need guidance in getting accurate measurements. Inexpensive calipers may be helpful to use to get accurate measurements. Record the data.

3. Students should predict what the actual dimensions are for the things that they measured on their aircraft. Then they need to determine the size of the life-size aircraft by doing research.

4. Students should determine how many times bigger the toy would need to be to become life-size or how many times bigger the life-size aircraft is than the toy (scale factor).
   Have students see if the scale factor is the same for all dimensions.

5. Give each group string and go to a big enough space so that students can use what they have learned to make an outline of the life-size aircraft. They can use actual measurements or they can use the toy by laying it end to end the scale factor number of times.

6. Provide students with graph paper. Have them make an outline of their toy on the graph paper. Tell them that they need to figure out a way to enlarge their outline by 2, 3, 4, times, or whatever you determine it should be. You might let the groups decide how much to enlarge it.

C. Wrap-up
1. Make a comparison of the collected data from each group. Compare the scale for each toy.

2. Display each of the enlargements. Have each group show their toy and give the scale factor that they used.

Resources:

https://www.nationalmuseum.af.mil/

https://www.basic-mathematics.com/scale-drawings.html

https://emptyeasel.com/2017/12/11/how-to-scale-up-a-drawing/

https://www.wikihow.com/Scale-a-Drawing