Focus Area  Topic D:  

**Ratios of Scale Drawings**

**Example Problem and Answer**

Use the following figures to answer the questions below:

**Question:** Is the New Picture a reduction or enlargement from the Actual Picture?

**Answer:** It is a reduction because the New Picture is smaller than the Actual Picture.

**Question:** Which point on the New Picture corresponds to point A on the Actual Picture?

**Answer:** Point G; Corresponding points match from one picture to another.

**Task:** Complete the chart for corresponding measurements.

<table>
<thead>
<tr>
<th>Lengths of the Actual Picture</th>
<th>4 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lengths of New Picture</td>
<td>3 units</td>
</tr>
</tbody>
</table>

**Question:** Does the constant of proportionality exist? If so, how do you know?

**Answer:** Yes, because there is a constant value $\left(\frac{5}{3}\right)$ to get from each length to its corresponding length. (See work and values below).

\[
\frac{4}{25} = \frac{4 \times \frac{5}{12}}{12} = \frac{20}{12} = \frac{5}{3}
\]
Focus Area Topic D: Ratios of Scale Drawings

Students learn the term scale factor and recognize the constant of proportionality. With the scale factor, students make scale drawings of pictures and diagrams.

Question:
Given the figures below, find the scale factor.

Answer & Explanation:
The scale factor is 2. Create a ratio of corresponding lengths of the scale drawing to the original drawing.

\[
\frac{4}{2} = 2 \quad \frac{16}{8} = 2 \quad \frac{8}{4} = 2
\]

Question:
Reverse the process. If given the dimensions of the original drawing, compute the dimensions of the scale drawing if the scale factor is \( \frac{2}{3} \).

<table>
<thead>
<tr>
<th>Actual Length</th>
<th>Scale Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 inches</td>
<td>( \frac{2}{3} \times 12 = 8 ) inches</td>
</tr>
<tr>
<td>15 inches</td>
<td>( \frac{2}{3} \times 15 = 10 ) inches</td>
</tr>
</tbody>
</table>

Steps to check for proportionality for scale drawing and original object/picture:
1) Measure lengths of scale drawing. Record on table.
2) Measure corresponding lengths on actual picture/drawing. Record on table.
3) Check for constant of proportionality.

Scale Drawing Process:
1. Measure lengths and widths carefully with a ruler or tape measure. Record in an organized table.
2. Calculate the scale drawing lengths, widths and areas using what was learned in previous lessons.
3. Calculate the actual areas.
4. Begin by drawing the perimeter, windows and doorways.
5. Continue to draw the pieces of furniture making note of placement of objects (distance from nearest wall).
6. Check for reasonableness of measurements and calculations.

Example Problem and Solution
On the Ferris’ house blueprints, the master bathroom measures \( 4 \frac{1}{2} \) inches by \( 8 \frac{1}{4} \) inches. If the scale factor for the blueprint is \( \frac{1}{4} \) in = 1 ft.

Question:
What are the actual dimensions of the master bathroom?

Answer with solution:
\( \frac{1}{4} \) inches per foot or 4 feet per inch
Therefore: \( 4 \frac{1}{2} \times 4 = \frac{9}{2} \times 4 = 18 \) feet
And \( 8 \frac{1}{4} \times 4 = \frac{33}{4} \times 4 = 33 \) feet
The master bathroom is 18 feet by 33 feet

The Actual Area = 9 units x 6 units = 54 square units
The Scale Drawing Area = 2 units x 3 units = 6 square units

Ratio of Scale Drawing Area to Actual Area:
\[
\frac{6}{54} = \frac{1}{9}
\]

Notice: \( \left( \frac{1}{3} \right)^2 = \frac{1}{9} \) … the square (multiplying it times itself) of the scale factor is the ratio of the areas of the scale drawing and the actual picture.