Lesson 2.4 - Proportional Reasoning

Measurement – 2.4 – Converting Systems/Proportional Reasoning

In this unit we will:
- Solve problems that involve linear measurement using:
  - SI and imperial units
  - Estimation strategies
  - Measurement strategies
- Apply proportional reasoning to problems that involve conversion between SI and imperial units of measure.

Converting between SI and Imperial:

<table>
<thead>
<tr>
<th>Mile</th>
<th>Yard</th>
<th>Foot</th>
<th>Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>×1760 →</td>
<td>×3 →</td>
<td>×12 →</td>
<td></td>
</tr>
<tr>
<td>← ÷1760</td>
<td>← ÷3</td>
<td>← ÷12</td>
<td></td>
</tr>
<tr>
<td>×1.6 ↓</td>
<td>×0.9 ↑</td>
<td>×3.05 ↑</td>
<td>×2.5 ↑</td>
</tr>
<tr>
<td>↓ ×0.6</td>
<td>↓ ×1.09</td>
<td>↓ ×0.33</td>
<td>↓ ×0.39</td>
</tr>
</tbody>
</table>

| Km         | M          | dm         | cm         | mm         |
|------------|------------|------------|------------|
| ×1000 →    | ×10 →      | ×10 →      | ×10 →      |            |
| ← ÷1000    | ← ÷10      | ← ÷10      | ← ÷10      |            |

Example: The speed limit on hwy 2 is 110 km/hour

Estimate the speed in miles per hour.

\[
110 \text{ km} \rightarrow \text{mi}
\]

\[
110 \times 0.6 = 66
\]

\[
66 \text{ mi/h.}
\]

Example: Convert 5 ft. into centimeter.

\[
5 \times 12 \times 2.5 = 150 \text{ cm}
\]

\[
f \rightarrow \text{in} \rightarrow \text{cm} \rightarrow \text{dm} \rightarrow \text{cm}
\]

\[
5 \times 3.05 \times 10 = 152.5 \text{ cm}
\]

* Save system conversion for last step.
Lesson 2.4 - Proportional Reasoning

Proportional Reasoning (using a scale):

A world map has a scale of 1:4000. On the map, a distance of $3\frac{1}{8}$ inches is measured. What is that distance in miles?

Know:  
\[
\frac{1\text{ in}}{4000\text{ mi}} = \frac{3.125\text{ in}}{x_{\text{mi}}} 
\]

Don't know:  
\[
\frac{(1\text{ in})(x_{\text{mi}})}{4000\text{ mi}} = 3.125\text{ in}(4000\text{ mi})
\]

\[
\frac{1\text{ in}}{x_{\text{mi}}} = \frac{3.125\text{ in}}{1\text{ in}}
\]

\[
x_{\text{mi}} = 12500
\]

An inch on the map equals 2500 inches in the real world. You find a map drawn to this scale and measure a distance of $4\frac{7}{8}$ inches. What is this distance in kilometers, correct to the nearest tenth?

\[
\frac{x_{\text{km}}}{1\text{ in}} = \frac{4.875\text{ in.}(x_{\text{km}})}{0.0631\text{ km}}
\]

\[
2500\text{ in} ÷ 12 ÷ 3 ÷ 1400 ÷ 1.6
\]

\[
= 0.0631\text{ km}
\]

Louise is driving 105 km/h in California. She sees a sign telling her that San Francisco (her destination) is 194 miles away. Correct to the nearest minute, how long will her journey take if she can maintain her current speed?

\[
\frac{105\text{ km}}{60\text{ min}} = \frac{310.41\text{ km}}{x_{\text{min}}}
\]

\[
194\text{ mi} = 310.4\text{ km}
\]

\[
1\text{ h} = 60\text{ min}
\]
The Oilers score 2 goals in the first 27 min of the game. Using proportional reasoning, how many goals should they score? (don't round)

\[ \times \text{60 min a game.} \]