Module 3: Understanding the Metric System

11) The length of a key is 50 ____.
12) The diameter of a nickel is about 2 ____.
13) The length of your index finger is about 7 ____.
14) The average length of an adult female femur bone is about 45 ____.
15) A cellular phone is approximately 120 ____ in length.
16) A plastic fork is approximately 16 ____ in length.
17) Your teacher is about 1.7 ____ tall.
18) A CD-ROM disk has a thickness of 1.2 ____.

2. Converting between Metric Units using Powers of 10

Looking at the meter stick diagrams below, we notice that the prefix *deci* is used to represent unit lengths that are \( \frac{1}{10} \) of a meter and therefore 10 dm = 1 m. Similarly, we see that *centi* is used to represent unit lengths that are \( \frac{1}{100} \) of a meter. Therefore, 100 cm = 1 m. Finally, we see that *milli* is used to represent unit lengths that are \( \frac{1}{1,000} \) of a meter and therefore 1,000 mm = 1 m.

You may have noticed that one-half of a meter, or 0.5 m, is equal to 5 dm. The diagrams below show us that 5 dm is equal to 50 cm, and that 50 cm is equal to 500 mm. Summarizing this, we get the relationship 0.5 m = 5 dm = 50 cm = 500 mm. Do you see a pattern?

\[
\begin{align*}
1 \text{ meter} & = 10 \text{ decimeters (dm)} \\
1 \text{ meter} & = 100 \text{ centimeters (cm)} \\
1 \text{ meter} & = 1,000 \text{ millimeters (mm)}
\end{align*}
\]
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Let’s now complete a table to demonstrate the pattern. Fill in the blank cells.

<table>
<thead>
<tr>
<th>Equivalent Lengths</th>
<th>0.5 m</th>
<th>5 dm</th>
<th>50 cm</th>
<th>500 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7 m</td>
<td>dm</td>
<td>cm</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>dm</td>
<td>35 cm</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td></td>
<td></td>
<td>625 mm</td>
<td></td>
</tr>
</tbody>
</table>

When moving across each row to the right, we see that the numbers are multiplied by a factor of 10. When moving across each row to the left, the numbers are divided by a factor of 10. Remember that multiplying a number by 10 moves the decimal point to the right one place value. Dividing a number by 10 moves the decimal point to the left one place value.

Now let’s apply what we have learned to the following questions.

Convert each measure to the indicated unit.

19) 25 cm to mm
20) 35 dm to mm
21) 0.2 m to cm
22) 0.7 cm to mm
23) 7.6 dm to cm
24) 278 mm to cm
25) 3.2 dm to m
26) 5 mm to dm
27) 1.5 m to cm
28) 17.5 dm to m
29) 1,578 mm to m
30) 349 cm to m

3. Understand Units of Length Greater Than 1 Meter

Up to this point we have mainly dealt with lengths that measure less than 1 meter. What about lengths that are more than 1 meter? In this case we again use a prefix on the word meter to represent measures of length that are greater than 1 meter.

The prefix **deka** is used to represent a length that is 10 meters. 1 dekameter = 10 meters
The prefix **hecto** is used to represent a length that is 100 meters. 1 hectometer = 100 meters
The prefix **kilo** is used to represent a length that is 1,000 meters. 1 kilometer = 1,000 meters

Again you may notice that there is a pattern involving powers of 10. Notice that the prefix **deka** is used to represent unit lengths that are 10 times that of a meter. Therefore, 1 dekameter = 10 m.
Next, we see that **hecto** is used to represent unit lengths that are 100 times that of a meter. Therefore, 1 hectometer = 100 m. Finally, we see that **kilo** is used to represent unit lengths that are 1,000 times that of a meter and therefore 1 kilometer = 1,000 m.