Section 8.2

Length, Area, and Volume

Length

- The meter is used to measure things that we normally measure in yards and feet.
- Centimeters and millimeters are used to measure what we normally measure in inches.
  - A centimeter is a little less than a half of an inch.
  - A millimeter is about the thickness of a dime.

Example: The length of a pair of scissors would be measured in centimeters.
Area

- Areas are always expressed in square units.

Example:
The length of a rectangular park is 82.5 m, and its width is 25.4 m. Find the area of the park.

Solution: Area = length \times width.

\[ A = 82.5\text{m} \times 25.4\text{m} \]
\[ A = 2095.5 \text{ m}^2 \]

Volume

- When a figure has three dimensions: length, width and height, the volume can be found.
- The volume of an item can be considered the space occupied by the item.
- Volume can be expressed in terms of liters or cubic meters.

<table>
<thead>
<tr>
<th>Volume in Cubic Units</th>
<th>Volume in Liters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cm(^3)</td>
<td>1 mL</td>
</tr>
<tr>
<td>1 dm(^3)</td>
<td>1 L</td>
</tr>
<tr>
<td>1 m(^3)</td>
<td>1 kL</td>
</tr>
</tbody>
</table>
Volume

- When the volume of a liquid is measured, the abbreviation cc is often used instead of cm$^3$ to represent cubic centimeters.

Example: An asthma patient must mix 0.25 cc of a bronchodilator with 2 cc of saline to use in an aerosol machine.

- How many milliliters of the bronchodilator will be administered?
- What is the total volume of drug and saline solution in milliliters?

Volume (continued)

Solution:

- Since 1 cc is equal in volume to 1 milliliter, there will be 0.25 milliliters of the bronchodilator.
- The total volume is 0.25 + 2 or 2.25 cc, which is equal to 2.25 mL.
Example: Volume Application

A cylindrical shampoo bottle has a diameter of 6 cm and a height of 12 cm. What is the volume in milliliters?

Solution: \( V = \pi r^2 h \)
\[
V = 3.14 \times 3^2 \times 12 \\
V = 339.12 \text{ cm}^3 \\
V = 339.12 \text{ mL}
\]