MATH BASICS

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**ZERO RULES**

- If there is no whole number before a decimal point, place a zero (0) to the left of the decimal point to emphasize that the number has a value less than 1.
  
  
  (0.25 mL is Correct AND .25 mL is Incorrect).

- When writing decimals, unnecessary zeros should not be placed at the end of the number. This is a recommendation in order to avoid misinterpretation of a value and the overlooking of a decimal point.

  (20 mL is Correct AND 20.0 mL is Incorrect).
# MEMORIZE COMMON EQUIVALENTS

## COMMON EQUIVALENTS WITHIN SYSTEMS - METRIC

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kilogram (kg) = 1,000 grams (g)</td>
<td>1 liter (L) = 1,000 milliliters (mL)</td>
</tr>
<tr>
<td>1 gram (g) = 1,000 milligrams (mg)</td>
<td>1 milliliter (mL) = 0.001 liter (L)</td>
</tr>
<tr>
<td>1 milligram (mg) = 1,000 micrograms (mcg)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 meter (m) = 100 centimeters (cm) = 1,000 mm</td>
</tr>
</tbody>
</table>
# Household/Metric Equivalents

<table>
<thead>
<tr>
<th>UNIT</th>
<th>ABBREVIATION</th>
<th>EQUIVALENT</th>
<th>METRIC EQUIVALENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>teaspoon</td>
<td>t (tsp)</td>
<td>------------------</td>
<td>5 mL</td>
</tr>
<tr>
<td>tablespoon</td>
<td>T (tbs)</td>
<td>1 T = 3 t</td>
<td>15 mL</td>
</tr>
<tr>
<td>ounce (fluid)</td>
<td>oz</td>
<td>1 oz = 2 T</td>
<td>30 mL</td>
</tr>
<tr>
<td>cup</td>
<td>C</td>
<td>1 C = 8 oz</td>
<td>240 mL</td>
</tr>
<tr>
<td>pint</td>
<td>pt</td>
<td>1 pt = 2 C (16 oz)</td>
<td>480 mL</td>
</tr>
<tr>
<td>quart</td>
<td>qt</td>
<td>1 qt = 4 C = 2 pt = 32 oz</td>
<td>1,000 mL</td>
</tr>
<tr>
<td>pound (weight)</td>
<td>lb</td>
<td>1 lb = 16 oz</td>
<td>2.2 lb = 1 kg (1,000 g)</td>
</tr>
</tbody>
</table>
• **COMMON EQUIVALENTS BETWEEN SYSTEMS**

1 t = 5 mL

1 T = 3 t = 15 mL

1 oz = 30 mL (2T)

1 pt = 16 oz (480 mL)

1 qt = 32 oz (2 pt), (1,000 mL)

1 C = 8 oz (240 mL)

1 lb = 16 oz

2.2 lb = 1 kg (1.000 kg)

1 inch = 2.5 cm
CONVERSION BASICS

• Conversions within the metric system - done by moving the decimal point.

• When converting a smaller unit to a larger one, divide by 1,000 or move the decimal point 3 places to the left.  
  \(350 \text{ mg} = 0.350 \text{ gm} = 0.35 \text{ gm}\)

• When converting a larger unit to a smaller one, multiply by 1,000 or move the decimal point 3 places to the right.  
  \(0.750 \text{ L} = 750 \text{ ml}\).

• To convert from °C to °F:  
  \(\text{°F} = 1.8 (\text{°C}) + 32\)  
  \(\frac{9}{5} (\text{°C}) + 32\)

• To convert from °F to °C:  
  \(\text{°C} = \text{°F} - 32 \div 1.8 \left(\frac{\text{°F} - 32}{1.8}\right)\)  
  \((\text{°F} - 32) \div \frac{9}{5}\)
* EXAMPLE:

38.2°C = ________ °F
°F = 1.8 (°C) + 32
°F = 1.8 \times 38.2°C + 32
°F = 68.76 + 32
°F = 100.8
100.8°F

* EXAMPLE:

100.4°F = ________ °C
°C = °F – 32 ÷ 1.8
°C = 100.4°F – 32 ÷ 1.8
°C = 68.4 ÷ 1.8
°C = 38
38°C
DRUG LABELS

• THE NURSE MUST NOTE THE FOLLOWING COMPONENTS WHEN CALCULATING DRUGS:
  * NAME OF DRUG
  * FORM OF DRUG
  * DOSAGE STRENGTH/CONCENTRATION
  * TOTAL AMOUNT IN CONTAINER
  * TOTAL VOLUME
  * ROUTE OF ADMINISTRATION
HEPARIN SODIUM

25,000 USP Units per 250 mL
(100 USP Units/mL)
in 0.45% Sodium Chloride Injection

EACH 100 mL CONTAINS HEPARIN SODIUM 10,000 USP UNITS (PORCINE INTESTINAL MUCOSA); SODIUM CHLORIDE 0.45 g; EDTATE DISODIUM, ANHYDROUS 10 mg ADDED AS STABILIZER. ELECTROLYTES PER LITER: SODIUM 77 mEq; CHLORIDE 77 mEq. MAY CONTAIN SODIUM HYDROXIDE AND/OR HYDROCHLORIC ACID FOR pH ADJUSTMENT. STERILE.

USUAL DOSAGE: SEE INSERT.

ADDITIVES SHOULD NOT BE MADE TO THIS SOLUTION.

SINGLE DOSE CONTAINER. DISCARD UNUSED PORTION. FOR INTRAVENOUS USE ONLY.

Rx only

CONTAINS DEHP
IM-3488
HOSPIRA, INC., LAKE FOREST, IL 60045 USA
AUGMENTIN®
250 mg/5 mL
Directions for mixing:
Tap bottle until all powder flows freely. Add approximately 2/3 of total water for reconstitution (total = 65 mL); shake vigorously to wet powder. Add remaining water; again shake vigorously.
Dosage: See accompanying prescribing information.

AUGMENTIN®
AMOXICILLIN/CLAVULANATE POTASSIUM
FOR ORAL SUSPENSION
When reconstituted, each 5 mL contains: AMOXICILLIN, 250 MG, as the trihydrate CLAVULANIC ACID, 62.5 MG, as clavulanate potassium

75 mL
(when reconstituted)

Keep tightly closed. Shake well before using. Must be refrigerated. Discard after 10 days.

Rx only

Use only if inner seal is intact.
Net contents: Equivalent to 3.75 g amoxicillin and 0.398 g clavulanic acid.
Store dry powder at room temperature.

Mfr. By: Dr. Reddy's Laboratories Inc., Bridgewater, N.J. 08807
Pharmacode: 560

LOT EXP.
Each mL contains: Furosemide 10 mg, Water for Injection q.s., Sodium Chloride for isotonicity, Sodium Hydroxide and, if necessary, Hydrochloric Acid to adjust pH between 8.0 and 9.3

WARNING: Discard Unused Portion. Use Only If Solution Is Clear And Colorless, Protect From Light.

Store at 20° to 25°C (68° to 77°F); excursions permitted to 15° to 30°C (59° to 86°F) [see USP]

Directions for Use: See Package Insert

M. L. No.: G/1156

B. No.: 

Exp. Dt.: 10/2013
BASIC CALCULATION METHODS

There are 3 calculation methods that use the same basics (ordered/desired, availability, & quantity) for calculating oral and injectable medication:

- **RATIOS and PROPORTIONS:** Available dose : Quantity = Ordered dose : X Quantity
- **FORMULA METHOD:** Ordered dose ÷ Available dose x Quantity
- **DIMENSIONAL ANALYSIS:** Ordered dose x Available dose ÷ Quantity
• STEPS FOR CALCULATING USING RATIOS & PROPORTIONS:

1. DETERMINE THE DOSE ON HAND.

2. DETERMINE THE DOSE ORDERED.

* (Convert to like measurements before going to step 3, if needed.)

3. CROSS MULTIPLY AND DROP UNITS OF MEASUREMENT.

4. SOLVE FOR X.
RATIO & PROPORTIONS

• The left side of the equation represents the known quantities and the right side represents the desired dose and the amount of the desired dose to be given.

\[
\frac{H}{Q} = \frac{D}{X}
\]

(KNOWN) \hspace{1cm} (UNKNOWN)

\begin{align*}
H &= \text{DOSE ON HAND} \\
D &= \text{DESIRED DOSE} \\
Q &= \text{QUANTITY ON HAND} \\
X &= \text{UNKNOWN}
\end{align*}
RATIO & PROPORTIONS EXAMPLE

• ORDERED: VANCOMYCIN 250 MG IV

• ON HAND: VANCOMYCIN 500 MG/100 ML

• HOW MANY mL WILL THE NURSE ADMINISTER?

1. (KNOWN) \[
\frac{500 \text{ mg}}{100 \text{ ml}} = \frac{250 \text{ mg}}{X}
\] (UNKNOWN)

2. \[
\frac{25,000}{500X}
\]

3. \[
X = 50 \text{ ML}
\]
FORMULA METHOD

• This method is a quick way to solve dosage calculations.

\[
\frac{D}{H} \times Q = x
\]

Steps include:

1. Determine the dose desired (D).
2. Determine the dose on hand (H).
3. Determine the unit/quantity of the drug that contains the dose on hand (Q).
4. Solve for the amount to give (X).
FORMULA METHOD EXAMPLE

• ORDERED: VANCOMYCIN 250 mg IV
• ON HAND: VANCOMYCIN 500 mg/100 mL
• HOW MANY mL WILL THE NURSE ADMINISTER?

1. \[
\frac{250 \text{ mg}}{500 \text{ mg}} \times 100 \text{ mL} = x
\]

2. \[
\frac{1}{2} \times 100 \text{ mL} = x
\]

3. \[x = 50 \text{ mL}\]

4. The nurse will administer 50 mL.
DIMENSIONAL ANALYSIS

• ALL NECESSARY STEPS CAN BE DONE USING ONE EQUATION EVEN IF CONVERSION IS NEEDED.
• DOES NOT REQUIRE MEMORIZATION OF A FORMULA.
• MEMORIZATION OF THE COMMON EQUIVALENTS IS STILL NECESSARY.
• THE IDEA IS TO SET UP THE EQUATION SO THAT ALL UNNECESSARY UNITS OF MEASURE ARE CANCELED OUT, LEAVING ONLY THE UNIT OF MEASURE NEEDED TO ARRIVE AT THE CORRECT DOSAGE.
• DETERMINE THE DOSE DESIRED (D).

• DETERMINE THE DOSE ON HAND (H).

• DETERMINE THE UNIT OR QUANTITY OF THE DRUG THAT CONTAINS THE DOSE ON HAND (Q).

• PUT ABOVE ITEMS IN AN EQUATION, SOLVING FOR AMOUNT TO BE ADMINISTERED (X).

  (MULTIPLE ACROSS, THEN DIVIDE NUMERATOR BY DENOMINATOR).

• ONLY UNITS TO BE ADMINISTERED SHOULD REMAIN. OTHER UNITS SHOULD CANCEL OUT.
DIMENSIONAL ANALYSIS EXAMPLE

- ORDERED: VANCOMYCIN 250 MG IV
- ON HAND: VANCOMYCIN 500 MG/100 ML
- HOW MANY ML WILL THE NURSE ADMINISTER?

\[
\frac{250 \, mg}{1} \times \frac{100 \, ml}{500 \, mg} = \frac{25,000}{500} = 50 \, ml
\]
ADDITIONAL AREAS FOR CALCULATION

- CALCULATING INFUSION TIME IN HOURS AND MINUTES
- HEPARIN PROTOCOLS
- INSULIN THERAPY
- PEDIATRIC DOSING
- DROP FACTOR – ALWAYS APPEARS ON THE IV TUBING PACKAGE

MICRODROP = 60 GTT/mL

MACRODROP = Usually 20 gtt/mL. (Some manufacturers use 10 or 15 gtt/mL).
DOSAGE CALCULATIONS

- WHAT IS THE QUESTION ASKING ME TO DO?
- WHAT INFORMATION IS NEEDED TO ANSWER THE QUESTION?
- DO I HAVE ALL THE INFORMATION NEEDED TO ANSWER THE QUESTION?
- IS THE QUANTITY/VOLUME OF THE ORDERED DOSE GOING TO BE MORE THAN OR LESS THAN WHAT IS AVAILABLE?
- HOW DO I SET UP THE EQUATION SO ALL UNITS OF MEASURE CANCEL EXCEPT THE ONE NEEDED TO ANSWER THE QUESTION?