Essentials of Medication Administration

VNSG 1227
Valley Grande Institute

Calculation of Drug Dosages

Chapter 6

Metric and Household Measurements

Learning Objectives

1. Review official program rounding policy
2. Introduce the metric, apothecary and household measurement systems.
3. Correctly convert units of measurement within and between the metric, apothecary, and household measurement systems.

Learning Objectives

4. Express metric measures correctly using rules of the metric system
5. State common equivalents in the metric system
6. Convert measures within the metric system

Learning Objectives

7. Differentiate apothecary and household system of measurement
8. Identify reasons for nonuse of apothecary measures and symbols
9. State the common household equivalents
10. State specific household system rules
11. Identify measures in the household system
12. Define other measures used in medication administration

Dr. Seuss COVID Hybrid Curriculum

I will teach you in a room.
I will teach you now on Zoom
I will teach you in your house
I will teach you with a mouse
I will teach you here and there
I will teach you because I care
So just do your very best
And do not worry about the rest.

Mathematics and Dosage Calculation Review

- The metric system
  - Volume—liters
  - Weight—grams
  - Length—meters
- The apothecary system
  - Volume—fluid ounce, pint, quart
  - Weight—grains, ounce, pound
- The household system
  - Teaspoon, tablespoon, ounce, cup

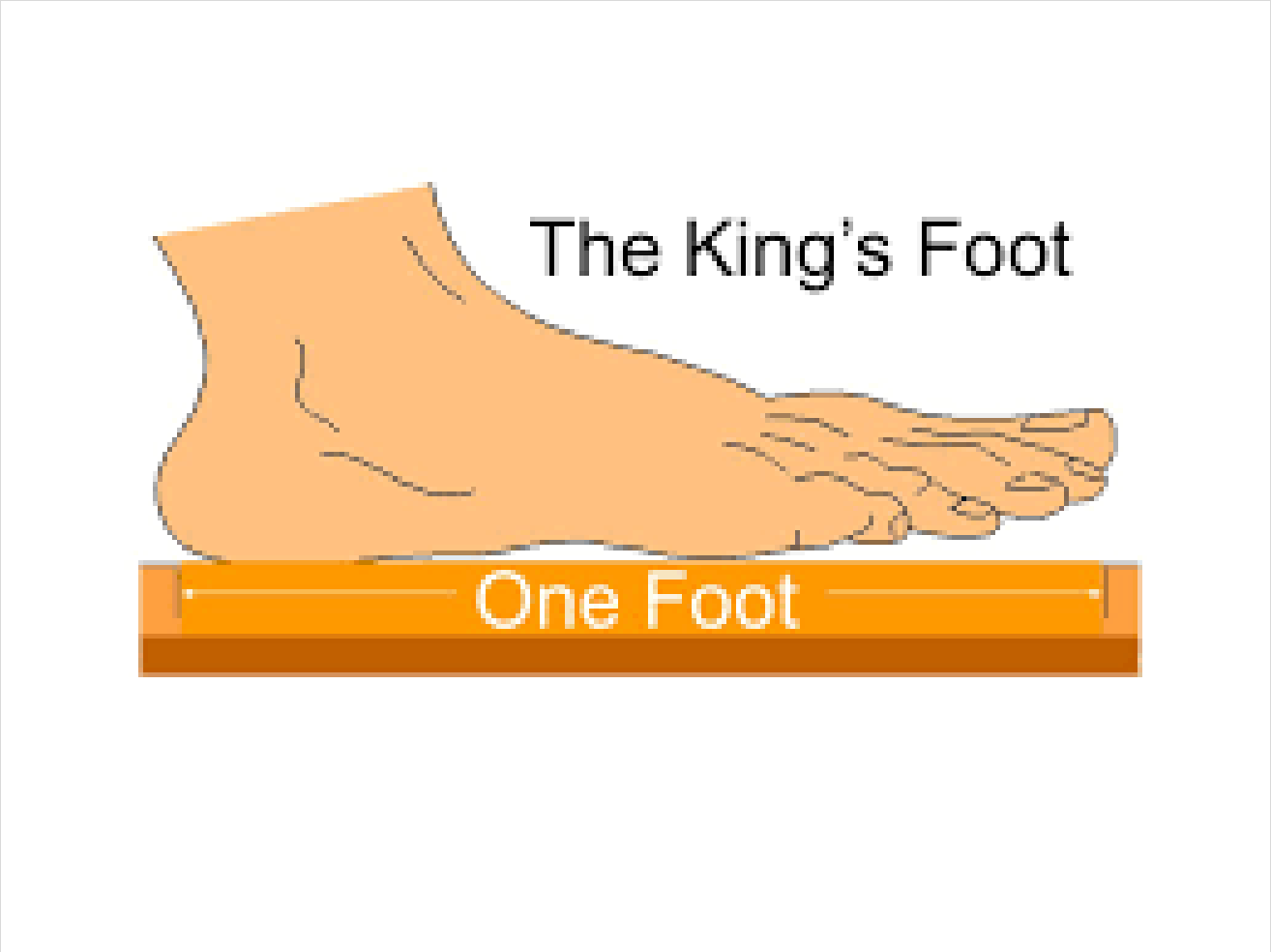
Volume vs Weight

- An **ounce** is measuring weight while a **fluid ounce** is measuring volume.
- “**Ounce**” has an “**oz**.” abbreviation
- “**Fluid ounce**” is abbreviated as “**fl**.**oz**.”
- Example:
  - One pound is equal to 16 **ounces**
  - One pint is equal to 16 **fluid ounces**

Three Systems of Weight and Measure

- Metric (simple system based on units of 10).
- Apothecary (based on the weight of one grain of wheat).
- Household (drops, teaspoons, tablespoons, etc.).

Standards of Measurement




n Supreme
Price per gallon $
Exxon Regular
Unleaded
PRICE PER GALLON $
Unleaded
Start
Stop


Washington State Department of Agriculture
Weights & Measures Program
(360) 902-1857
wtsmeasures@agr.wa.gov
AGR FORM 945-243M
(R/2/09)
TESTED AND APPROVED
1 2 3 4 5 7 8 9 10 11 12
09
11
DO NOT DETACH OR DEFACE – UNDER PENALTY

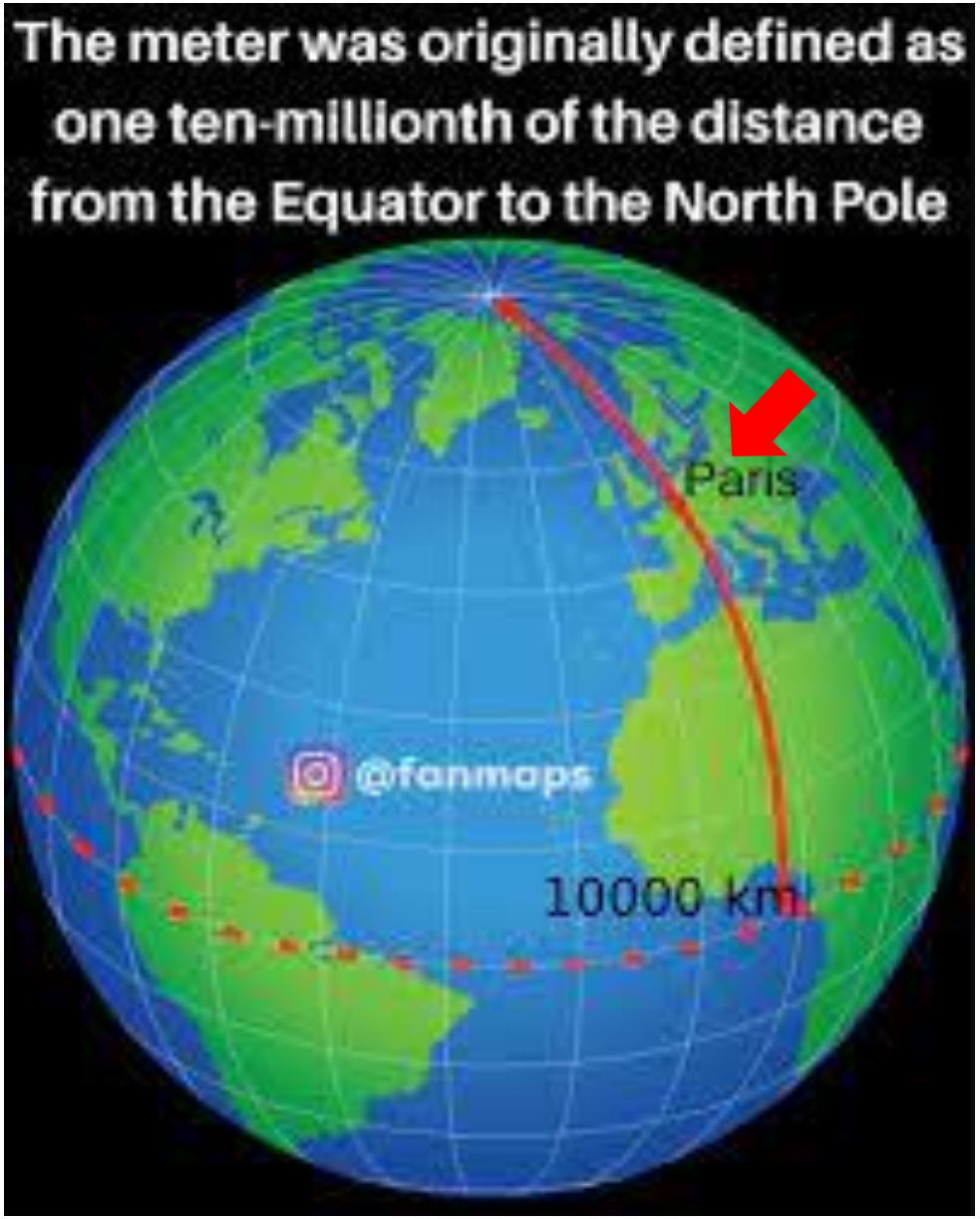
National Institute of Standards and Technology

Office of Weights and Measures

https://www.nist.gov/pml/owm#:~:text=The%20NIST%20Office%20of%20Weights,and%20laws%20enforcement%20to%20metrology.

Standards of Measurement

A new unit of length, the metre was introduced – defined as one ten-millionth of the shortest distance from the North Pole to **the equator** passing through Paris, assuming an Earth's flattening of 1/334. For practical purposes however, the standard metre was made available in the form of a platinum bar held in Paris.


The meter was originally defined as one ten-millionth of the distance from the Equator to the North Pole
Paris
@fanmaps
10000 km

Standards of Measurement

The meter was redefined by international agreement in 1983 as the **length of the path traveled by light in a vacuum in 1/299,792,458 of a second**. This definition also locked the speed of light at 299,792,458 meters per second in a vacuum.

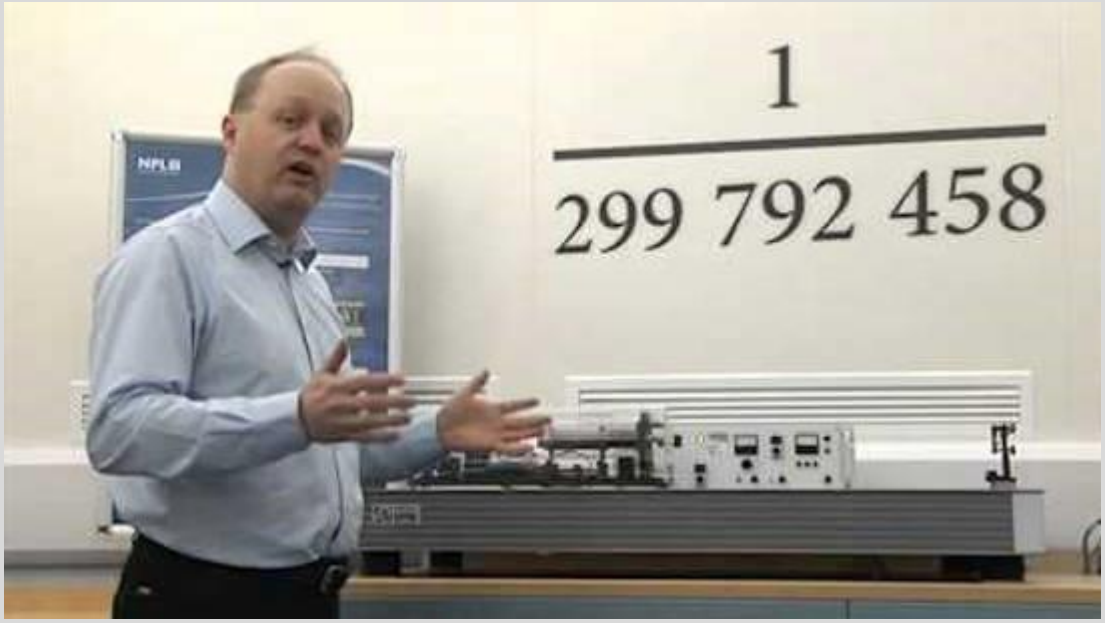


Table 5.2 Commonly Accepted Conversions Between Systems of Measurement

Metric System	Apothecary System	Household System
Solid Measure		
1 kg		2.2 lb
454 g	1	.0 lb
1 g = 1000 mg	15 gr (gr xv)	
60 mg	1 gr (gr i)	
30 mg	½ gr (gr ss)	
Liquid Measure		
1 L = 1000 mL		about 1 qt
240 mL	8 f oz (f oz viii)	1 c
30 mL	1 f oz (f oz i)	2 tbsp
15–16 mL	4 f dr (f dr iv)	1 tbsp = 3 tsp
8 mL	2 f dr (f dr ii)	2 tsp
4–5 mL	1 f dr (f dr i)	1 tsp = 60 gtt
1 mL	15–16 min (min xv or min xvi)	
0.06 mL	1 min (min i)	

Apothecary System

- Units of measure
  - ***Dram*** (ʒ) – common unit of volume
  - ***Grain*** – basic unit of weight
  - ***Minim*** (m) – common unit of volume
  - ***Ounce*** (ʒ) – fluid ounces of volume
  - ***Unit*** (USP Unit) – amount of medication to produce an effect

Household System of Measurement

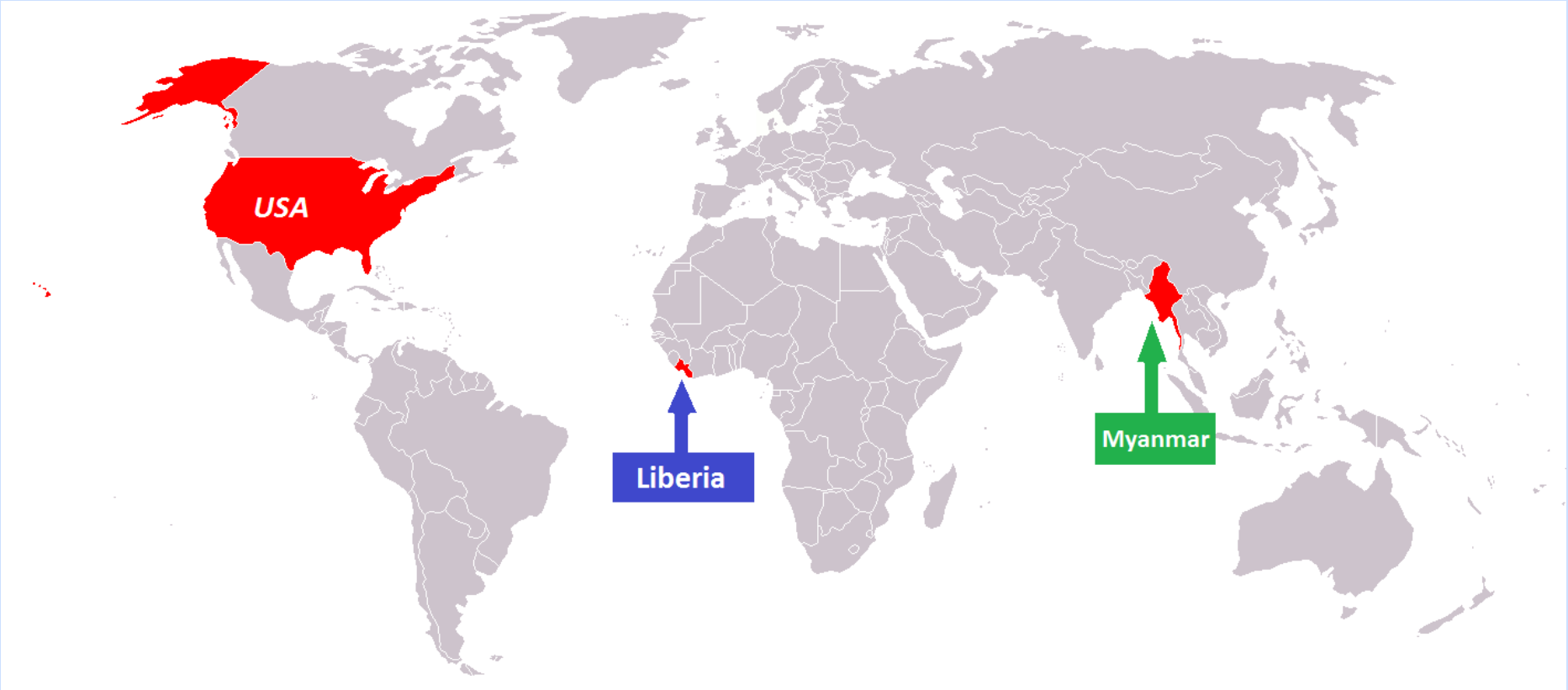
Unit	Abbreviation	Equivalents
drop	gtt	none
teaspoon	t (or tsp)	3 t = 1 T
tablespoon	T (or tbs)	1 T = 3 t
ounce (fluid) ounce (weight)	fl oz oz	2 T = 1 fl oz 1 lb = 16 oz
cup	cup (may see **c**)	1 cup = 8 fl oz
pint	pt	1 pt = 2 cups = 16 fl oz
quart	qt	1 qt = 2 pt = 4 cups = 32 fl oz
pound	lb	1 lb = 16 oz


measurement
CONVERSION CHART
ONE GALLON
4 QUARTS
8 PINTS
16 CUPS
128 OUNCES
ONE QUART
2 PINTS
4 CUPS
32 OUNCES
ONE PINT
2 CUPS
16 OUNCES
1 CUP
8 OUNCES
16 TBSP
1/2 CUP
4 OUNCES
8 TBSP
1 TBSP = 3 TSP
4 TBSP = 1/4 CUP

History

- Customary units of measure (regional)
  - Anglo-Saxon and Roman
  - English Units (based for the US system)
- Metric (1799)
- Imperial System (1824)
  - What is 1 chain? What is a stone?
- International System of Units (1970s)
- Example: 1 Cup comes in many sizes.

Countries that use the metric system



U.S., Liberia, and Myanmar

Why doesn't the United States use the metric system?

“A page of history is equal to a book of logic.”

The United State attempted to convert to metric in the 1980s and failed!


117.72
THIS SALE $
18.990
GALLONS
6.199
Price per Gallon


62.35
THIS SALE $
38.990
LITRES
1.599
Price per Litre

Metric Vs. English system

- Metric

-Basic Unit of:

Length- Meter
Mass (weight)- Gram
Capacity (volume)- Liter
Temperature- Celsius
Time- Seconds/Minutes

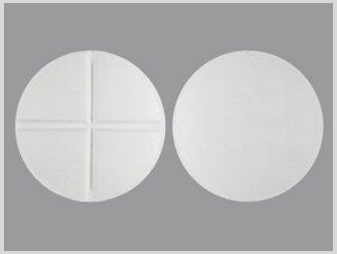
- English

-Basic Unit of:

Length- inch/foot/yard
Mass (weight)- ounces/pounds
Capacity (volume)- Ounce
Temperature- Farenheit
Time- Seconds/Minutes

Miscellaneous Rules:

- Unscored Tablets – answers must be written as whole numbers
- Scored Tablets - answers may be written as:
  - whole numbers - i.e.: (2)
  - a half - i.e.: (½) or (0.5)
  - or a mixture - i.e.: (3 ½) or (3.5)



- IV medications:
- Round to a whole number
- Gravity - answers are written in whole numbers [drops] i.e.: (30 gtt/minute)
- For Gravity problems, rounding may be either rounded up or down.
- (i.e.: 12.49 gtt/min = 12 or 13 gtt/min - both are acceptable answers)
  - Pump - answers are written in whole numbers i.e.: (200 ml/hr) or (50 ml/hr)

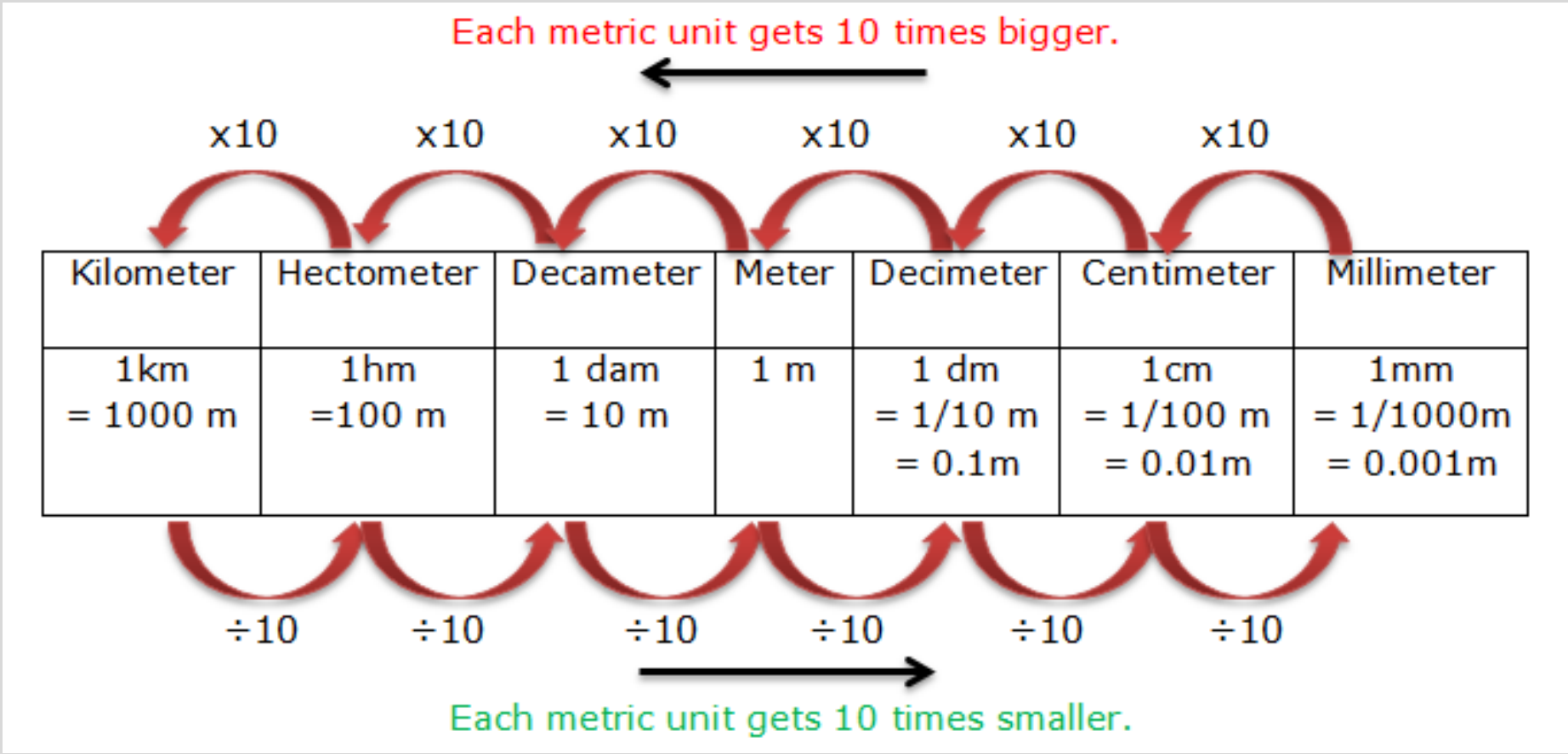
Reference:
Gray Morris, D. (2018). *Calculate with Confidence*, 7th Ed. Elsevier Mosby, St. Louis, Missouri.

Metric System: Background

- Also known as International System of Units or SI units (from Systéme International d’ Unités)
- Preferred system of measurement in the health care setting
- Simple and accurate because it is based on the decimal system
- The metric system should be used to prevent medication errors

Metrics: Particulars

1. Decimal system—multiples of ten (10)
2. Three basic units of measure
   - Gram (weight)—measure medications as solids
   - Liter (volume)—measure medications as solutions
   - Meter (length)—measure body parts, wounds, etc.
3. Prefixes—memorization is necessary
   - Kilo, centi, milli, micro
4. Name of basic unit is incorporated into measure
   - Milli*liter*, kilo*gram*, centi*meter*


Each metric unit gets 10 times bigger.
x10
x10
x10
x10
x10
x10
Kilometer
Hectometer
Decameter
Meter
Decimeter
Centimeter
Millimeter
1km = 1000 m
1hm =100 m
1 dam = 10 m
1 m
1 dm = 1/10 m = 0.1m
1cm = 1/100 m = 0.01m
1mm = 1/1000m = 0.001m
÷10
÷10
÷10
÷10
÷10
÷10
Each metric unit gets 10 times smaller.

B → S Rule

- Bigger units left
- Smaller units right
- Move decimal point to the right if converting big units to small units
- Move decimal point to the left is converting small units to big units

Big to Small Rule

1. Write down BIG → SMALL
2. Place the large unit under the word *big* and the small unit under the word *small*
3. Move the decimal point three places in the direction of the arrow; add zeros

BIG ➡ SMALL

1.7 g 1700. mg

Note: Only useful for converting dosages within the metric system

Big to Small Rule

One dollar = One hundred cents

$1.00 = 100 cents

Big to Small Rule Reversed (Small to Big)

1. Reverse the direction of the arrow:

   BIG ← SMALL

1. Place the large unit under the word *big* and the small unit under the word *small*
2. Move the decimal point three places in the direction of the arrow; add zeros

BIG ⬅ SMALL

1.7g 1700.mg

Metrics: Particulars (Cont.)

5. Abbreviations are first letter of the word
   - Gram = g
   - Liter = L (capital letter)
   - Meter = m
6. When prefixes are used with basic units, first letter of word is written in lower case
   - Milligram = mg
   - Microgram = mcg
   - Exception: Liter as in milliliter = mL

Metric System

TABLE 6-1 Basic Units of Metric Measurement

Table of Measure	Basic Unit	Abbreviation
Weight (solid)	Gram	g
Volume (liquid)	Liter	L
Length	Meter	m

TABLE 6-2 Common Prefixes Used in Health Care

Prefix	Numerical Value	Meaning
Kilo*	1,000	one thousand times
Hecto	100	one hundred times
Deka	10	ten times
Deci	0.1	one tenth
Centi*	0.01	one hundredth part of
Milli*	0.001	one thousandth part of
Micro*	0.000001	one millionth part of

*Prefixes used most often in medication administration.

Base (sometimes called Unit) = 1

Metrics: Particulars (Cont.)

- A mnemonic to help remember the important metric prefixes order from largest measurement to smallest:

Kitty	Hawk	Doesn't	Drink	Canned	Milk	Much
kilo	**h**ecto	**d**eka	**d**eci	**c**enti	**m**illi	**m**icro

"King Henry died drinking chocolate milk Monday"

Metrics: Particulars (Cont.)

- Examples of use of prefixes and suffixes
  - 67 milligrams
    - milli = thousandths, grams = unit of weight—therefore, 67 milligrams = 67 thousandths of a gram
  - Milli*liter* = one thousand*th* portion of a liter
  - Kilo*gram* = one thousand grams
  - *Deci*liter = one tenth of a liter
  - *Cubic m*illi*m*eter = mm^3 (length $\times$ width $\times$ height)
    - Used to count blood cells in fixed volume on slides

Metrics: Rules

1. Arabic number express quantity (1, 0.5)
2. Parts or fractions of a whole are expressed as decimals (0.4 g NOT 2/5 g)
3. Quantity precedes unit of measure (2 L)
4. A full space is used between number and abbreviation (5 mg)
5. Use leading zero before a decimal, but eliminate trailing zeros (0.4 mg NOT .4 mg, and 2 mg NOT 2.0 mg)

Metrics: Rules (Cont.)

6. DO NOT USE mu symbol “µ” with grams

   - mcg NOT “µg”
   - Institute for Safe Medication Practices (ISMP) and The Joint Commission (TJC) “Do Not Use” list
   - May still be seen on some medication labels
7. DO NOT USE “cc” for mL
   - 2 mL NOT 2 cc
   - ISMP and TJC recommendation – could be misread as “00”
   - May still be seen on some syringes
8. Avoid periods (mg NOT mg.)
   - Could be mistaken as a “1” if written poorly

Metrics: Rules (Cont.)

9. Place commas in values starting at one thousand (ISMP recommendation)
   - 1,000 NOT 1000
10. Do not add “s” to make plurals—could lead to misinterpretation
    - mg NOT mgs

Safety Point: These rules are designed to prevent medication errors and ensure accurate interpretation of metric annotations used in medication administration.

BOX 6-1 Common Metric Abbreviations

gram = g
microgram = mcg
milligram = mg
kilogram = kg
liter = L
*deciliter = dL
milliliter = mL

*Seen in the expression of laboratory values (e.g., hemoglobin, creatinine levels).

Metrics: Units of Measure Weight

- Gram—basic unit of weight
  - Milligrams and micrograms are multiple times smaller than a gram

    1 g = 1,000 mg

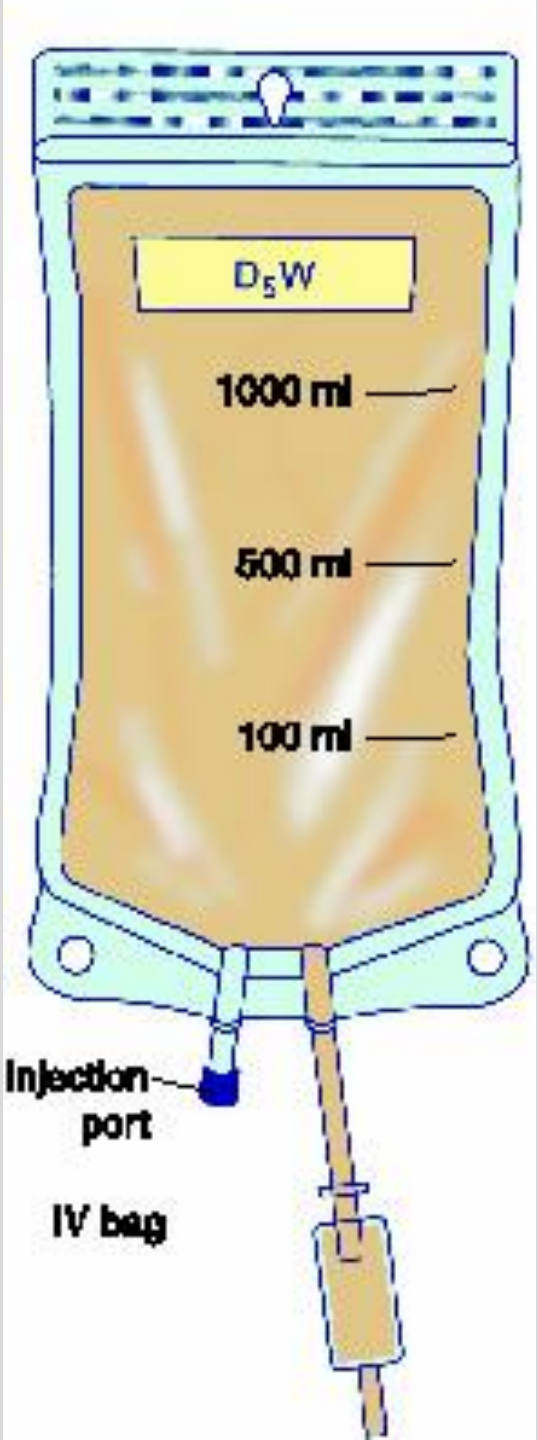
    and 1 g = 1,000,000 mcg

  - Kilogram is only unit typically used in medicine that is larger than the basic gram unit (used to measure client weight)

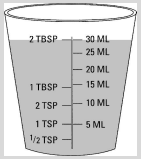
    1,000 g = 1 kg—so 1 kg is 1,000 times larger than 1 g

Metrics: Units of Measure Volume

- Liter—basic unit of volume
  - Milliliter (mL) is much smaller than a liter
  - 1 L = 1,000 mL, and 1 mL is 0.001 of a liter
  - Reminder: “cc” or cubic centimeter is no longer accepted by ISMP and TJC
- Pints and quarts (used in home care) are not metric but have metric equivalents
  - 1 quart ≈ 1,000 mL and 1 pint ≈ 500 mL

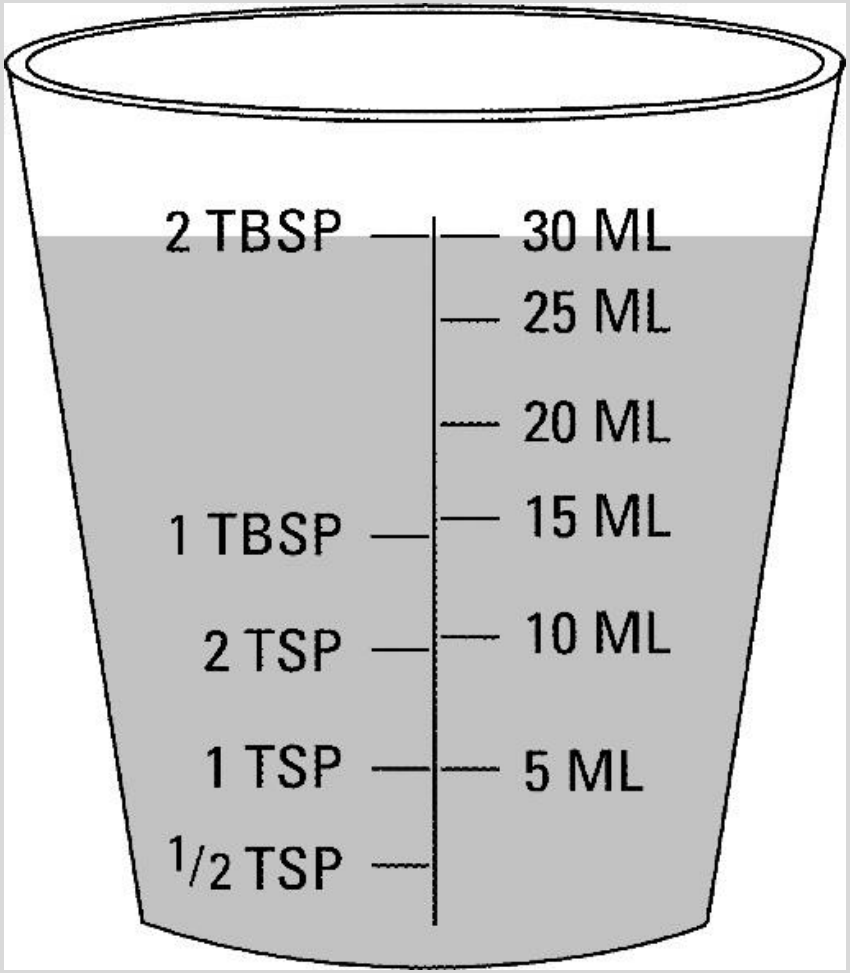


Volume Comparison



30 mL

Volume Comparison



2 T = 30 mL

BOX 6-3 Metric Equivalents to Memorize

Weight

1 kilogram (kg) = 1,000 grams (g)
1 gram (g) = 1,000 milligrams (mg)
1 milligram (mg) = 1,000 micrograms (mcg)

Volume

1 liter (L) = 1,000 milliliters (mL)
1 milliliter (mL) = 0.001 liter (L)

Length

1 meter (m) = 100 centimeters (cm) = 1,000 mm
1 millimeter (mm) = 0.001 meter (m) = 0.1 cm

Conversions Between Metric Units

- Convert means to change from one unit to another, such as mg to mcg
- Done by moving decimal
  - *Left* to divide—*Right* to multiply
- Each metric unit in health care differs by 1,000 or 3 decimal places
- Conversion factors:
  - 1 kg = 1,000 g 1 g = 1,000 mg 1 mg = 1,000 mcg
  - 1 L = 1,000 mL

Conversions Between Metric Units (Cont.)

- Smaller to larger—DIVIDE—move *left*
  - Example: 100 mL = ___ L (CF: 1,000 mL = 1 L)
    (smaller) (larger)
    Move decimal 3 places to left 100. = 0.1 L

- Larger to smaller—MULTIPLY—move *right*
  - Example: 0.75 g = ___ mg (CF: 1 g = 1,000 mg)
    (larger) (smaller)
    Move decimal 3 places to right 0.750 = 750 mg

Conversion Between Metric Units

- https://www.khanacademy.org/math/geometry-home/geometry-volume-surface-area/geometry-volume-rect-prism/v/conversion-between-metric-units

Safety Alert!

When converting quantities from one unit of measure to another, remember that **moving the decimal point incorrectly can result in a dangerous med error!**

Kimberly Hiatt

In Hiatt's 24-year career, all of it at Seattle Children's, dispensing 1.4 grams of calcium chloride — instead of the correct dose of 140 milligrams — was the only serious medical mistake she'd ever made.

https://nurseslabs.com/remembering-kimberly-hiatt-casualty-second-victim-syndrome/

https://www.nbcnews.com/health/health-news/nurses-suicide-highlights-twin-tragedies-medical-errors-flna1c9452213

Medication Error

Overdose

Order: 140 mg calcium chloride

Dose : 1.4 g calcium chloride

Result: Death of Patient

Complete the Following Problems

Convert the following metric measures:

a. 400 mg = _____ mcg
b. 49 mL = _____ L
c. 3.75 L = _____ mL
d. 0.08 kg = _____ g

Complete the Following Problems

Convert the following metric measures:

a. 400 mg = 400,000 mcg
b. 49 mL =
c. 3.75 L =
d. 0.08 kg =

Complete the Following Problems

Convert the following metric measures:

a. 400 mg = 400,000 mcg
b. 49 mL = 0.49 L
c. 3.75 L =
d. 0.08 kg =

Complete the Following Problems

Convert the following metric measures:

a. 400 mg = 400,000 mcg
b. 49 mL = 0.49 L
c. 3.75 L = 3,750 mL
d. 0.08 kg =

Complete the Following Problems

Convert the following metric measures:

a. 400 mg = 400,000 mcg
b. 49 mL = 0.49 L
c. 3.75 L = 3,750 mL
d. 0.08 kg = 80 g

Case Study

Mr. Hain will be admitted to the unit from the emergency department (ED) with nausea, vomiting, and diarrhea. You receive a report from the ED nurse and prepare to admit the patient. What was Mr. Hain's total output in milliliters in the ED?

- 250 mL yellow-tinged emesis
- 0.65 L urine
- 140 mL loose stool

Case Study (Cont.)

ANSWER:

Case Study (Cont.)

ANSWER:

1,040 mL

Case Study (Cont.)

Mr. Hain is dehydrated. The doctor orders 2 L of D5 NS to be given IV at a rate of 250 mL/hr. How many milliliters will the patient receive?

Case Study (Cont.)

ANSWER:

Case Study (Cont.)

ANS:

2,000 mL

Apothecary and Household Systems

Apothecary: Background

- English origin—considered to be oldest
- Also called “Fraction System”
- Notations and Roman numerals are potentially confusing
- Notations included in The Joint Commission (TJC) “Do Not Use” list
  - TJC recommends they NOT be used in medication administration. Discouraged by Institute for Safe Medication Practices (ISMP).
- Found on labels of older medications
- Always convert to metric

Apothecary System

- Units of measure
  - ***Dram*** (ʒ) – common unit of volume
  - ***Grain*** – basic unit of weight
  - ***Minim*** (m) – common unit of volume
  - ***Ounce*** (ʒ) – fluid ounces of volume
  - ***Unit*** (USP Unit) – amount of medication to produce an effect

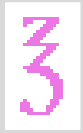
Safety Alert!

Do NOT use the following abbreviations and symbols:

gr (grains, apothecary unit of weight) confused with metric gram

m (minim) mistaken for mL

 (dram, apothecary drop) mistaken for 3

 (ounce, apothecary symbol) obsolete

ss, $\overline{ss}$ (apothecary symbol for ½) mistaken for 55

Apothecary: Units of Measure

- Minims and drams (ʒ) no longer used—some syringes or cups may still have markings
- Nurse needs to know
  - 1 pint = 16 fluid ounces
  - 1 quart = 32 fluid ounces = 2 pints
- Weight

  - Grain = gr
  - **Be careful not to confuse gr with g for gram!!!**
  - Metric equivalents: *gr 15 = 1 g* and *gr 1 = 60-65 mg*
    - Most meds are based on the equivalent gr 1 = 60 mg

Apothecary: Units of Measure (Cont.)

- Volume
  - Ounce = oz ℥
  - Metric equivalent: 1 oz = 30 mL
  - Medicine cups are 1 oz capacity
- Although apothecary measures may still be on syringes and containers, they should always be converted to metric

Household: Background

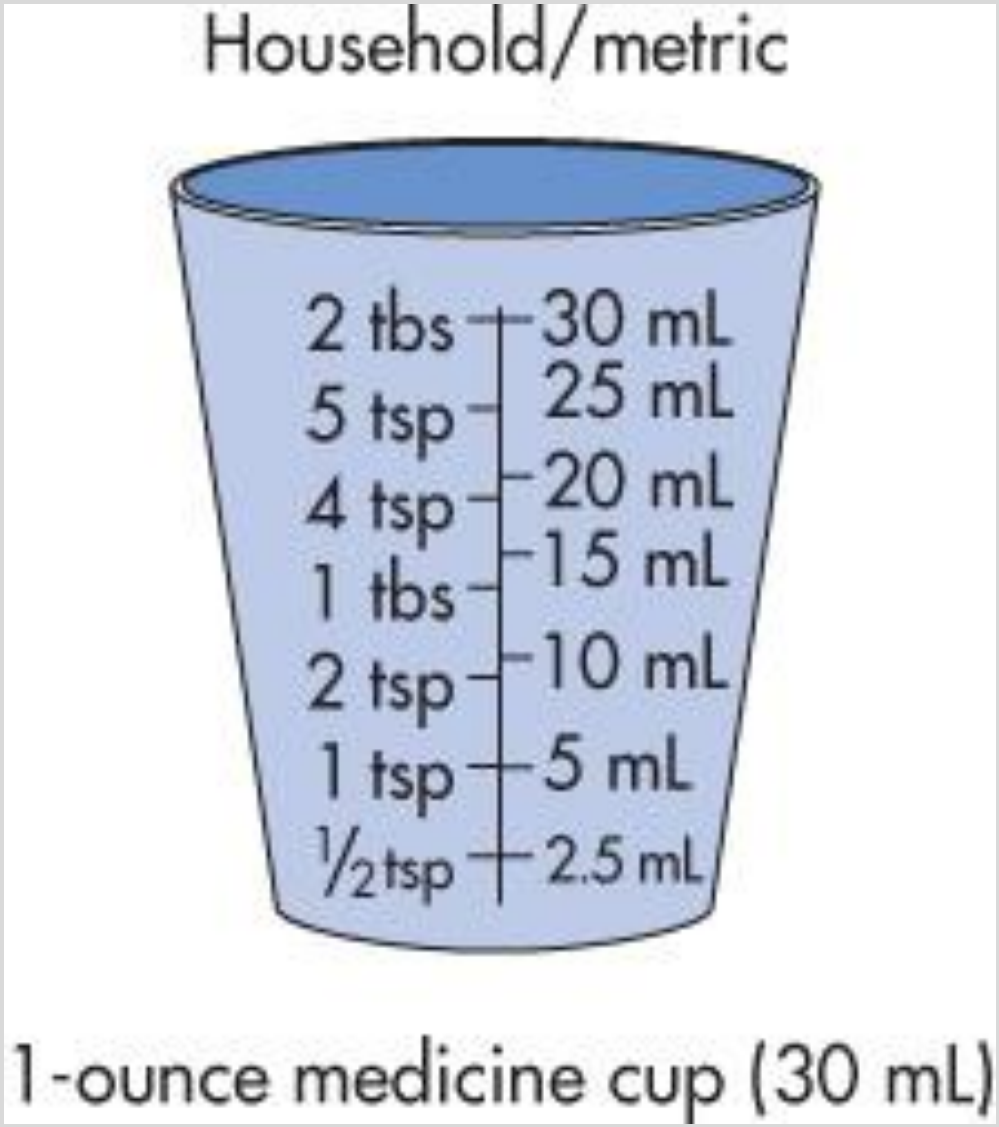
- Old system and least accurate
- Capacities of glasses and utensils vary by brand unless CALIBRATED
- Advise use of droppers and devices provided with medications for accurate dosing
- Memorize:
  - 1 teaspoon (t, tsp) = 5 mL
  - 1 tablespoon (T, tbs) = 15 mL
  - 1 measuring cup (c) = 8 oz

Household System of Measurement

Unit	Abbreviation	Equivalents
drop	gtt	none
teaspoon	t (or tsp)	3 t = 1 T
tablespoon	T (or tbs)	1 T = 3 t
ounce (fluid) ounce (weight)	fl oz oz	2 T = 1 fl oz 1 lb = 16 oz
cup	cup (may see **c**)	1 cup = 8 fl oz
pint	pt	1 pt = 2 cups = 16 fl oz
quart	qt	1 qt = 2 pt = 4 cups = 32 fl oz
pound	lb	1 lb = 16 oz

Households: Particulars

1. Some are same as apothecary measures
   - Pints and quarts
2. No standard rules for expressing measures
3. Cookbook abbreviations commonly used
4. Arabic numerals and fractions are used
5. Smallest unit of measure is drop (gtt)
   - Never use as unit of measure unless delivery device is calibrated (e.g., medicine dropper or IV tubing)
6. The unit ounce used to measure liquid is sometimes referred to as fluid ounce


Household/metric
2 tbs
30 mL
5 tsp
25 mL
4 tsp
20 mL
1 tbs
15 mL
2 tsp
10 mL
1 tsp
5 mL
½ tsp
2.5 mL
1-ounce medicine cup (30 mL)

Household/Metric Equivalents

BOX 7-1 Household/Metric Equivalents

Unit	Abbreviation	Equivalent	Metric Equivalent
teaspoon	t (tsp)	----------	5 mL
tablespoon	T (tbs)	1 T = 3 t	15 mL
ounce (fluid)	oz	1 oz = 2 T	30 mL
cup (standard measuring	C	1 cup = 8 oz	240 mL
pint	pt	1 pt = 2 cups (16 oz)	500 mL*
quart	qt	1 qt = 4 cups = 2 pt = 32 oz	1,000 mL*
pound (weight)	lb	1 lb = 16 oz	2.2 lb = 1 kg (1,000 g)

NOTE: The unit "ounce," which is used to measure liquid volume, is sometimes referred to as fluid ounce.
*Approximate equivalent in the metric system.

Case Study

When obtaining a history on Mr. Hain, he tells you that he started feeling sick after consuming 2 cups of fish soup. You know that he is using which system of measurement?

a. Metric

b. Apothecary

c. Household

Case Study 2 (Cont.)

ANSWER:

Case Study 2 (Cont.)

ANSWER:

C. Household

Household: Solutions

Use calibrated spoons and measuring cups!

- Normal saline (0.9%)
  - 2 teaspoons salt in 4 cups of water
- Acetic acid (0.25%)
  - 3 tablespoons of white vinegar in 4 cups of water
  - Used for some wound/dressing care and for cleaning equipment

Other Measurements Used in Dosage Calculation

- *Units*: amount of medication in 1 mL of solution. Measure specific medications in terms of action (examples: heparin, penicillin, and insulin).
- *International Units*: unit of potency. Represent the amount needed to produce a certain effect (examples: vitamins, chemicals).
- *Milliequivalents (mEq)*: used to measure electrolytes and ionic activity of a medication. One thousandth of the equivalent weight of an ion (examples: potassium, calcium).

Determine the Following Equivalents

1. 16 oz = _____ cup
2. 2 pts = _____ mL
3. 60 mL = _____ oz
4. 45 mL = _____ tbs

Determine the Following Equivalents

1. 16 oz = ___2___ cup
2. 2 pts = _____ mL
3. 60 mL = _____ oz
4. 45 mL = _____ tbs

Determine the Following Equivalents

1. 16 oz = ___2___ cup
2. 2 pts = ___1,000___ mL
3. 60 mL = _____ oz
4. 45 mL = _____ tbs

Determine the Following Equivalents

1. 16 oz = ___2___ cup
2. 2 pts = ___1,000___ mL
3. 60 mL = ___2___ oz
4. 45 mL = _____ tbs

Determine the Following Equivalents

1. 16 oz = ___2___ cup
2. 2 pts = ___1,000___ mL
3. 60 mL = ___2___ oz
4. 45 mL = ___3___ tbs

Which Unit of Measurement Should Not Be Abbreviated?

1. Drops (gtt)
2. Unit (U)
3. Milliequivalent (mEq)
4. Pound (lb)
5. Kilograms (kg)

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2. **Unit (U) – Always write entire word**
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Case Study

It is common for serum potassium levels or (K+) to decrease with vomiting and diarrhea. Normal serum potassium levels are 3.3–5.3 mEq/L. Mr. Hain's serum potassium level is 2.8 mEq/L. How will you read this value aloud when notifying the doctor?

Case Study (Cont.)

ANSWER:

Case Study (Cont.)

ANSWER:

“two point eight milliequivalents per liter”

Official VN Rounding Policy

- **Round only at the end of the problem for the final answer**.
- **Follow the directions of each problem**
- (i.e.: Round to the tenths place, or Round to the nearest hundredths place)
- **Oral & Parenteral Medications**
- Perform calculations to the hundredths place and round to the tenths place as needed.
- **IV Medications**
- Perform calculations to the tenths place and round to a whole number
- **Pediatric dosages:**
- Perform calculations and round to the hundredths place as applicable & administer using a TB syringe

Rounding Rules:

- Round to the tenths place - If the number in hundredths place is 5 or greater, increase the number to the left (tenths place) by 1.
- i.e.: (7.46 = 7.5) or (1.96=2)
- Round to the hundredths place – If the number in the thousandths place is 5 or greater, increase the number to the left (hundredths place) by 1.
- i.e.: (3.238 = 3.24)
- If directions say "round to the tenths place" then the answer should have a number in the tenths place.
  - i.e.: (5.73 = 5.7) or (3.38 = 3.4)
- If directions say 'round to the hundreds place" then the answer must have a number in the tenths and hundreds place.
- i.e: (1.637 = 1.64) or (2.249 = 2.25)

You round up to the nearest whole number if the tenths digit is 5,6,7,8 or 9.

4.7 is rounded up to 5

5.58 is rounded up to 6

17.872 is rounded up to 18

125.92 is rounded up to 126

46.6 is rounded up to 47

The End