

Healthcare Math: Using the Metric System



Industry: Healthcare

Content Area: Mathematics

Core Topics: Using the metric system, converting measurements within and between the metric and US customary systems, using ratios and proportions, using decimals, solving multi-step problems

Objective: Students will be able to convert measurements within and between the metric and US customary systems, perform mathematical operations with measurements, and express measurements using the correct unit notations.

Materials included:

Instructor's notes
Scenario: Medical Assistant
Student worksheets
Handouts
Quiz
Answer Keys

Industry Overview:

According to the U.S. Department of Labor, the healthcare industry is expected to generate over 20% of all new jobs created in the U.S. economy between 2012 and 2022.* The healthcare industry is comprised of a vast array of jobs, ranging from nursing assistants to physicians. Mathematics and literacy skills are essential for students who plan to pursue a career in this field. The metric system is the most widely used measurement system in the world; it is also the primary measurement system used in the medical field. Healthcare professionals, including medical assistants, must have the ability to convert units of measurement within and between the metric and US customary systems. They must also be able to perform accurate calculations with measurements and express the results with the correct unit notations.

* Source: <http://www.bls.gov/news.release/ecopro.t06.htm>

Instructor's notes:

- The purpose of this module is to help students develop and apply math skills in a healthcare workplace setting. The learning activities were designed to be incorporated throughout multiple instructional periods as math concepts are taught in a healthcare context.
- After completing the module, students should be able to:
 - Identify metric and customary units of measurement and their abbreviations
 - Convert units of measurement within and between the metric and customary systems
 - Solve multi-step measurement problems
- **Setting the stage:** Provide students with background information about the typical responsibilities of a medical assistant. You may want to have students use the occupational outlook handbook, O*NET and/or other relevant websites to research the job responsibilities, educational/training requirements, salary, etc. for this position. . In addition, you could have students view a YouTube video depicting the typical responsibilities of a medical assistant. (See links below)

Bureau of Labor Statistics – Occupational Outlook Handbook:

<http://www.bls.gov/ooh/>

Occupational Information Network (O*NET)

<http://www.onetonline.org/link/summary/31-9092.00>

A day in the life of a medical assistant

<http://www.youtube.com/watch?v=6jbS5bLzQoU>

- **For Activity 1:** Introduce students to the metric system of measurement by having students measure various objects in the classroom with both customary and metric measuring devices for comparison and discussion purposes. Give students a copy of **Handout 1** and explain the metric prefixes, values, abbreviations and equivalents. Show students how to use the shortcut method of moving the decimal point from one unit to another to convert metric measurements. Work several examples with the students and have them practice this skill independently. You may also want to show them alternative conversion methods, such as multiplying and dividing by powers of 10, using a conversion factor, or using a proportion. Provide additional practice as needed. Have students complete **Worksheet 1**.
- **For Activity 2:** Give students a copy of **Handout 2** and explain US customary measurements, values, abbreviations, and equivalents. Discuss the approximate equivalents between metric and US customary measurements. Work the scenario examples with students. Answers to practice problems: 3 cups; 3 T; 113.6 kg; 5 days. Have students complete **Worksheet 2**.
- **For Activity 3:** Demonstrate how to add, subtract, multiply and divide metric units. Work examples with students. A few have been included in the scenario; provide additional practice as needed. Answers to practice problems: 4.5L; 8500mL; 10L; 14.2L; 7.75L; 6L; 13 btls; 2100mL; 2.1L; 8.1L Have students complete **Worksheet 3**.
- **Assessment: Quiz – Measurements and calculations**

Workplace Scenario:

You are a medical assistant working at a clinic in a large metropolitan area. Currently, you are training Sam, a new employee who has just joined the staff. Sam is taking classes in order to prepare for admission to the medical assistant program at a local community college. You are helping Sam learn some of the skills he will need as a medical assistant.

Activity 1: Understanding the metric system

This week, you are teaching Sam about the metric system of measurement. You give him a copy of **Handout 1** to help him learn about the metric system, the most widely used measurement system in the world. In addition, it is the primary system of measurement used in the medical field. The metric system is based on powers of 10 and there are three base units:

The **gram (g)** is the metric base unit of weight.

The **liter (L)** is the metric base unit for volume.

The **meter (m)** is the metric base unit for length.

You tell Sam that he will need to be able to convert units of measurement within the metric system. He will also need to learn the correct abbreviations for the most commonly used measurement units. The first chart on **Handout 1** shows the relationship between the units of metric measurement. From left to right, the units are in order from largest to smallest. Using a mnemonic device, such as “King Harry died from a disease called malaria,” will help Sam remember the order. The second chart on **Handout 1** shows some common metric units with their abbreviations and equivalencies.

A short cut method to convert from one metric unit to another is to draw a line and label it with the prefixes, as shown below; you can then write in the base you are working with: gram, liter, or meter.

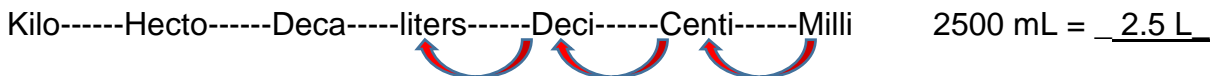
Kilo-----Hecto-----Deca-----[base]-----Deci-----Centi-----Milli

Next, draw an arrow from the prefix you are starting with to the prefix you want to convert to, stopping and counting each prefix as you go. This is the number of places and direction you move the decimal point in your starting number. To change from a larger unit to a smaller unit, move the decimal point to the right. For example, to convert 5 kilograms into milligrams, you would move the decimal point six places to the right, as shown in the diagram below.

 5 kg = 5,000,000 mg

To change from a smaller unit to a larger unit, you move the decimal point to the left. If you want to convert 2500 milliliters into liters, you would move the arrow (decimal point) three places to the left.

Kilo-----Hecto-----Deca-----liters-----Deci-----Centi-----Milli

 2500 mL = 2.5 L

Note: As you move the decimal point to the right, you are actually multiplying by a power of 10 and as you move the decimal point to the left, you are dividing by a power of 10.

$$5 \text{ kg} \times 1,000,000 = \underline{5,000,000 \text{ mg}} \quad \text{and} \quad 2500 \text{ mL} \div 1000 = \underline{2.5 \text{ L}}$$

Handout 1

Metric measurement chart

Prefix	Kilo-	Hecto-	Deca-	Base Unit	Deci-	Centi-	Milli-
Weight	kilogram			gram			milligram
Volume	kiloliter			liter	deciliter		milliliter
Length	kilometer			meter		centimeter	millimeter
Value to Base	1000	100	10	1	0.1	0.01	0.001

The most common prefixes and values used in healthcare are highlighted in yellow.

Another common healthcare prefix is **micro** = one millionth or 0.000001 of the base unit

One way to remember the order of metric units for conversions is to use a mnemonic device such as:

King Harry Died from a Disease Called Malaria
Kilo hector deca (base) deci centi milli

Common healthcare metric units with abbreviations and equivalents

	Unit	Abbreviation	Equivalents
Weight	gram (base unit)	g	1 g = 1000 mg = 1,000,000 mcg
	milligram	mg	0.001 g = 1 mg = 1,000 mcg
	microgram	mcg	0.000001 g = 0.001 mg = 1mcg
	kilogram	kg	1 kg = 1000 g
Volume	liter (base unit)	L	1 L = 1000 mL
	deciliter	dL	0.1 L = 1 dL
	milliliter	mL	0.001 L = 1 mL
Length	meter (base unit)	m	1 m = 100 cm = 1000 mm
	centimeter	cm	0.01 m = 1 cm = 10 mm
	millimeter	mm	0.001 m = 0.1 cm = 1 mm

Worksheet 1: Metric Measurements & Conversions

Name: _____

Give the metric prefix for the following parts of the base units.

1. 0.001 _____

3. 0.01 _____

2. 0.000001 _____

4. 1000 _____

Identify the metric base unit for the following.

5. Length _____

6. Volume _____

7. Weight _____

Write the correct abbreviation for each of the following units.

8. kilogram _____

10. liter _____

12. millimeter _____

14. gram _____

9. meter _____

11. milligram _____

13. centimeter _____

15. microgram _____

Which is larger? Circle the correct answer.

16. milligram or kilogram

17. centimeter or millimeter

18. milliliter or liter

Convert the following as indicated.

19. 4500 mL = _____ L

24. 2.5 g = _____ mg

20. 500 mg = _____ g

25. 40.5 cm = _____ mm

21. 0.04 L = _____ mL

26. 3 mg = _____ mcg

22. 800 mL = _____ L

27. 1.2 g = _____ mg

23. 2 kg = _____ g

28. 1.5 L = _____ mL

Questions 29 & 30: The doctor prescribes 500 mg of Amoxicillin to be taken 4 times per day.

29. What is the maximum number of milligrams per day? _____ mg

30. What is the maximum number of grams per day? _____ g

Activity 2: US Customary Measurements & Converting between Systems

You tell Sam that he will also need to learn some customary household measurements and their equivalents. Although these measurements are seldom used in a medical setting, they are sometimes used when giving patients instructions for administering medications at home. You give Sam a copy of **Handout 2**. Chart one has a list of some customary household measurements with their abbreviations and equivalents. Chart two has a list of customary measurements with their approximate metric equivalents. Unlike metric units, household measurements are not based on the decimal system. Therefore, other methods must be used to convert these units of measurement.

One method to convert customary units of measurement is to use a proportion. A proportion is two equal ratios. A ratio is a fraction that makes a comparison between two numbers. For example, you need to know how many tablespoons (T) are equal to 3 fluid ounces (fl oz). If you look at the equivalency chart, you find that 1 fl oz = 2 T. Use this information to set up a proportion. To solve a proportion, cross multiply and solve for x, as shown below. Remember to use labels and keep like units across from each other when setting up a proportion.

$$\frac{1 \text{ fl oz}}{2 \text{ T}} = \frac{3 \text{ fl oz}}{x \text{ T}} \quad \text{Cross multiply} \implies (1)x = (2)(3) \implies \text{Solve: } x = 6 \implies 3 \text{ fl oz} = \underline{6 \text{ T}}$$

How many cups are equal to 24 ounces? Set up a proportion to calculate the number of cups.

$$\frac{8 \text{ fl oz}}{1 \text{ cup}} = \frac{24 \text{ fl oz}}{x \text{ cups}} \implies (8)x = (1)(24) \implies 8x = 24 \implies x = 24 \div 8 \implies 24 \text{ oz} = \underline{\hspace{2cm}} \text{ cups}$$

You can also use the proportion method to convert units between measurement systems.

One of the clinic doctors gives a patient a bottle of liquid medication with orders to take 45 mL three times a day. You tell Sam he will need to calculate the number of tablespoons the patient needs to take for one dose of the medication. Sam uses the equivalency of 1 T = 15 mL from the chart to set up a proportion and calculate the correct number of tablespoons per dose.

$$\frac{15 \text{ mL}}{1 \text{ T}} = \frac{45 \text{ mL}}{x \text{ T}} \implies 15(x) = (1)(45) \implies 15x = 45 \implies x = 45 \div 15 \implies 45 \text{ mL} = \underline{\hspace{2cm}} \text{ T}$$

The doctor is prescribing medication for a patient based on weight in kilograms. The patient weighs 250 pounds. You tell Sam to use a proportion and convert the patient's weight into kilograms, rounding to the nearest tenths place, if necessary. 250 lb = kg

Some problems will require multiple conversions and steps. Example: A child is taking 24 mL of medication 4 times per day. If the full bottle contains 16 fluid ounces of the medication, how many days will the bottle last?

Step 1: Calculate the total mL per day. 24 mL/dose x 4 times per day = 96 mL/day

Step 2: Convert 96 mL into ounces. $\frac{30 \text{ mL}}{1 \text{ fl oz}} = \frac{96 \text{ mL}}{x \text{ fl oz}} \implies 30x = 96 \implies 96 \div 30 = \underline{3.2 \text{ fl oz/day}}$

Step 3: Calculate the number of days a 16 fl oz bottle will last if 3.2 fl oz/day are taken.

$$\frac{3.2 \text{ fl oz}}{1 \text{ day}} = \frac{16 \text{ fl oz}}{x \text{ days}} \implies 3.2x = 16 \implies 16 \div 3.2 = \underline{\hspace{2cm}} \text{ days}$$

Handout 2:

Customary Household Measurements

Unit	Abbreviation	Equivalents
drops	gtts	1 t = 60 gtts
teaspoon	t	
tablespoon	T	1 T = 3 t
ounce (fluid)	fl oz	1 fl oz = 2 T
cup	cup	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
ounce (weight)	oz	16oz = 1 lb
pound	lb	
inches	in	12 in = 1 ft
feet	ft	
yard	yd	1 yd = 3 ft = 36 in

Approximate Equivalents

1 t = 5 mL = 60 gtts
1 T = 3 t = 15 mL = $\frac{1}{2}$ fl oz
1 fl oz = 30 mL = 6 t
1 L = 1 qt = 32 fl oz = 2 pt = 4 cups
1 pt = 16 fl oz = 2 cups
1 cup = 8 fl oz = 240 mL
1 kg = 2.2 lb
1 in = 2.5 = cm

Worksheet 2: Converting Measurements

Name: _____

Write the abbreviation or term as indicated for each of the following.

1. pint _____

4. T _____

2. pound _____

5. qt _____

3. drops _____

6. fl oz _____

Complete the following equivalencies.

7. 1 kg = _____ lb

9. 1 in = _____ cm

8. 1 fl oz = _____ mL

10. 1 cup = _____ mL

Complete the following proportions.

11. $\frac{8 \text{ oz}}{16 \text{ T}} = \frac{x \text{ oz}}{3 \text{ T}}$

12. $\frac{1 \text{ fl oz}}{30 \text{ mL}} = \frac{4 \text{ fl oz}}{x \text{ mL}}$

Solve the following problems. Round your answers to the nearest tenths place, if necessary.

13. A patient voids 150 mL into the specimen cup. How many fluid ounces is this? _____ fl oz

Questions 14 – 15: Sam weighed and measured an infant at the clinic today. The baby weighed 8.5 kg and was 60.5 cm long. The baby's mother wanted to know the baby's weight in pounds and length in inches.

14. The baby weighs _____ lb. 15. The baby's length is _____ in.

16. A patient received stitches for a laceration that was 5 inches long. Sam needs to record the length in centimeters in his chart. The wound is _____ cm long.

17. A child threw up 2 cups of fluid in the examination room. How many mL is this? _____

Questions 18 – 20: Sam gave the mother of the sick child a 16 oz bottle of liquid medication and told her the child should take 30 mL twice a day.

18. How many tablespoons is one dose? _____

19. How many total mL will the child take in one day? _____ How many ounces is this? _____

20. How many days will the bottle of medication last? _____

Activity 3: Inventory calculations using metric measurements

One of Sam's responsibilities is to help maintain the inventory of medications and supplies used at the clinic. He frequently works with metric units of liters (L) and milliliters (mL) to perform these tasks. Memorizing the equivalency, **1 L = 1000 mL**, helps Sam make the unit conversions and calculations more efficiently.

When converting liters to milliliters, you may use the shortcut method of moving the decimal point three places to the right, or you may multiply by 1000. For example, to change 3.5 L to mL:

Kilo-----Hecto-----Deca-----[liter]-----Deci-----Centi-----Milli 3.5 L = 3500 mL

When converting milliliters to liters, you may use the shortcut method of moving the decimal point three places to the left, or you may divide by 1000. For example, change 7000 mL to L:

Kilo-----Hecto-----Deca-----[liter]-----Deci-----Centi-----Milli 7000 mL = 7 L

Convert the following measurements as indicated.

4500 mL = _____ L 8.5 L = _____ mL 10000 mL = _____ L

Inventory tasks at the clinic involve adding, subtracting, multiplying, and dividing unit measurements. Work through these examples with Sam.

$\begin{array}{r} 4 \text{ L } 750 \text{ mL} \\ + 2 \text{ L } 650 \text{ mL} \\ \hline 6 \text{ L } 1400 \text{ mL} = \underline{7.4 \text{ L}} \end{array}$	$\begin{array}{r} 10000 \text{ mL} \\ - 3400 \text{ mL} \\ \hline 6600 \text{ mL} = \underline{6.6 \text{ L}} \end{array}$	$\begin{array}{r} 2 \text{ L } 300 \text{ mL} \\ \times \quad \quad 4 \\ \hline 8 \text{ L } 1200 \text{ mL} = \underline{9.2 \text{ L}} \end{array}$	$\frac{1750 \text{ mL}}{250 \text{ mL/vial}} = \underline{7 \text{ vials}}$
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Help Sam work the following problems, simplifying your answers as indicated.

$\begin{array}{r} 5 \text{ L } 250 \text{ mL} \\ + 8 \text{ L } 950 \text{ mL} \\ \hline = \underline{\quad\quad} \text{ L} \end{array}$	$\begin{array}{r} 8500 \text{ mL} \\ - 750 \text{ mL} \\ \hline = \underline{\quad\quad} \text{ L} \end{array}$	$\begin{array}{r} 4 \text{ L } 250 \text{ mL} \\ \times \quad \quad 8 \\ \hline = \underline{\quad\quad} \text{ L} \end{array}$	$\frac{6500 \text{ mL}}{500 \text{ mL/btl}} = \underline{\quad} \text{ btl}$
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On Thursday morning, the office manager told Sam she needed to know how many liters of saline solution the clinic has on hand. Sam counted 6 liter containers in the storage cabinet and 6 vials containing 350 mL each of saline solution in the patient examination rooms. Since the office manager needed the amount in liters, Sam followed these steps:

Step 1: Multiply $350 \times 6 = \underline{\quad\quad\quad}$ mL

Step 2: Convert the mL from step 1 into liters: L

Step 3: Add the liters from step 2 to 6 liters to get the total: $6 \text{ L} + \underline{\quad\quad} \text{ L} = \underline{\quad\quad} \text{ L}$ on hand.

Questions 1 and 2: Sam counted 12 liters of hand sanitizer in the storage cabinet. He fills the dispensers in seven of the examination rooms as follows: 350 mL, 600 mL, 475 mL, 580 mL, 650 mL, 720 mL and 500 mL.

1. How many total milliliters did Sam use to fill the dispensers?
2. After filling the dispensers, how many liters of sanitizer remain in the storage cabinet?
3. Sam helped you prepare 35 sets of injections of dopamine for the clinic this week. Each injection is 50 milliliters. How many liters of dopamine did the clinic use this week?
4. The clinic used 9 liters 450 milliliters of saline solution during the last 4 weeks. On average, how many milliliters of saline solution does the clinic use each week?
5. Sam restocked 275 mL of children's ibuprofen in six of the exam rooms. What is the total amount of children's ibuprofen he used in liters?

Questions 6 and 7: The clinic has 3 liters of flu vaccine on hand. Each flu shot consists of 5 milliliters of the vaccine.

6. Sam needs to know how many 5 milliliter flu injections he can get from the 3 liter container.
7. If the clinic gives 350 flu shots this week, how many liters of the vaccine will be left?
8. Sam needs to refill the ammonium solution dispenser in one of the exam rooms with 1 liter 275 milliliters of the solution. If he fills the dispenser from a 6-liter container, how many liters of ammonium solution will be left in the container?

Questions 9 and 10: The clinic uses about 15 liters and 500 milliliters of disinfectant cleaner each month.

9. How many liters of disinfectant does the clinic use in 6 months?
10. After taking inventory, Sam found there was 32.5 L of disinfectant cleaner in the supply cabinet. How many liters of disinfectant cleaner should Sam order so that the clinic will have a 6-month supply?

Quiz: Using the Metric System

Name: _____

Convert the following as indicated.

1. 30 g = _____ mg 3. 6.5 in = _____ cm 5. .75 mL = _____ L
2. 5 fl oz = _____ mL 4. 60 mL = _____ T 6. 80 kg = _____ lb

Answer the following questions.

7. A liter is the metric base unit of measure for _____.
8. What is the mnemonic device you can use to remember the order of metric units?
9. An infant's head circumference is 40 cm. The parents want to know the measurement in inches. Sam tells the parents the infant's head circumference is _____ in.
10. As per the doctor's instructions, a patient weighs himself at home every Friday. He reports that he weighed 286 pounds last Friday. Sam needs to record the patient's weight in kilograms. The patient weighs _____ kg.
11. The doctor prescribed 30 mL of a medication per dose for a patient. How many tablespoons should Sam tell the patient to take per dose? _____ T
12. The doctor prescribed 10 mL of Betadine concentrate in 480 mL of warm water as a soak for a toe infection. Using common household measures, how should Sam instruct the patient to prepare the solution at home?
13. The total quantity of saline solution on hand at the clinic is 11 liters 750 milliliters. Dr. Sarah wants the clinic to have a total of 40 liters of saline solution in stock. How many liters of saline solution does Sam need to order?
14. The clinic has 400 mL of polio vaccine on hand. How many 0.5 mL polio injections can be prepared from this supply?
15. If Sam has 1 liter 650 milliliters of cleaning solution in each of the eight examinations rooms, how many liters of cleaner are there in all?

Give the metric prefix for the following parts of the base units.

1. 0.001 milli 3. 0.01 centi
 2. 0.000001 micro 4. 1000 kilo

Identify the metric base unit for the following.

5. Length meter 6. Volume liter 7. Weight gram

Write the correct abbreviation for each of the following units.

8. kilogram kg 10. liter L 12. millimeter mL 14. gram g
 9. meter m 11. milligram mg 13. centimeter cm 15. microgram mcg

Which is larger? Circle the correct answer.

16. milligram or kilogram 17. centimeter or millimeter 18. milliliter or liter

Convert the following as indicated.

19. 4500 mL = 4.5 L 25. 2.5 g = 2500 mg
 20. 500 mg = 0.5 g 26. 40.5 cm = 405 mm
 21. 0.04 L = 40 mL 27. 3 mg = 3000 mcg
 22. 800 mL = 0.8 L 28. 1.2 g = 1200 mg
 23. 2 kg = 2000 g 29. 1.5 L = 1500 mL

Questions 29 & 30: The doctor prescribes 500 mg of Amoxicillin to be taken 4 times per day.

29. What is the maximum number of milligrams per day? 2000 mg
 30. What is the maximum number of grams per day? 2 g

Worksheet 2: Converting Measurements

Answer Key

Write the abbreviation or term as indicated for each of the following.

16. pint pt

4. T tablespoon

17. pound lb

5. qt quart

18. drops gtts

6. fl oz fluid ounce

Complete the following equivalencies.

6. 1 kg = 2.2 lb

9. 1 in = 2.54 cm

7. 1 fl oz = 30 mL

10. 1 cup = 240 mL

Complete the following proportions.

$$11. \frac{8 \text{ oz}}{16 \text{ T}} = \frac{1.5 \text{ oz}}{3 \text{ T}}$$

$$12. \frac{1 \text{ fl oz}}{30 \text{ mL}} = \frac{4 \text{ fl oz}}{120 \text{ mL}}$$

Solve the following problems. Round your answers to the nearest tenths place, if necessary.

13. A patient voids 150 mL into the specimen cup. How many fluid ounces is this? 5 fl oz

Questions 14 – 15: Sam weighed and measured an infant at the clinic today. The baby weighed 8.5 kg and was 60.5 cm long. The baby's mother wanted to know the baby's weight in pounds and length in inches.

14. The baby weighs 18.7 lb. 15. The baby's length is 24.2 in.

16. A patient received stitches for a laceration that was 5 inches long. Sam needs to record the length in centimeters in his chart. The wound is 12.5 cm long.

17. A child threw up 2 cups of fluid in the examination room. How many mL is this? 480 mL

Questions 18 – 20: Sam gave the mother of the sick child a 16 oz bottle of liquid medication and told her the child should take 30 mL twice a day.

18. How many tablespoons is one dose? 2 T

19. How many total mL will the child take in one day? 60 mL How many ounces is this? 2 fl oz

20. How many days will the bottle of medication last? 8 days

Questions 1 and 2: Sam counted 12 liters of hand sanitizer in the storage cabinet. He fills the dispensers in seven of the examination rooms as follows: 350 mL, 600 mL, 475 mL, 580 mL, 650 mL, 720 mL and 500 mL.

1. How many total milliliters did Sam use to fill the dispensers? 3875 mL
2. After filling the dispensers, how many liters of sanitizer remain in the storage cabinet?
 $3875 \text{ mL} = 3.875 \text{ L}$, $12 - 3.875 = \underline{8.125 \text{ L}}$
3. Sam helped you prepare 35 sets of injections of dopamine for the clinic this week. Each injection is 50 milliliters. How many liters of dopamine did the clinic use this week?
 $35 \times 50 = 1750 \text{ mL} = \underline{1.75 \text{ L}}$
4. The clinic used 9 liters 450 milliliters of saline solution during the last 4 weeks. On average, how many milliliters of saline solution does the clinic use each week?
 $9 \text{ L} = 9000 \text{ mL}$, $9450 \div 4 = \underline{2362.5 \text{ mL}}$
5. Sam restocked 275 mL of children's ibuprofen in six of the exam rooms. What is the total amount of children's ibuprofen he used in liters?
 $275 \times 6 = 1650 \text{ mL} = \underline{1.65 \text{ L}}$

Questions 6 and 7: The clinic has 3 liters of flu vaccine on hand. Each flu shot consists of 5 milliliters of the vaccine.

6. Sam needs to know how many 5 milliliter flu injections he can get from the 3 liter container.
 $3 \text{ L} = 3000 \text{ mL}$, $3000 \div 5 = \underline{600 \text{ flu injections}}$
7. If the clinic gives 350 flu shots this week, how many liters of the vaccine will be left?
 $350 \times 5 \text{ mL/shot} = 1750$, $3000 - 1750 = 1250 \text{ mL} = \underline{1.25 \text{ L}}$
8. Sam needs to refill the ammonium solution dispenser in one of the exam rooms with 1 liter 275 milliliters of the solution. If he fills the dispenser from a 6-liter container, how many liters of ammonium solution will be left in the container?
 $6 - 1.275 = \underline{4.725 \text{ L}}$

Questions 9 and 10: The clinic uses about 15 liters and 500 milliliters of disinfectant cleaner each month.

9. How many liters of disinfectant does the clinic use in 6 months?
 $500 \text{ mL} = .5 \text{ L}$, $15.5 \times 6 = \underline{93 \text{ L}}$
10. After taking inventory, Sam found there was 32.5 liters of disinfectant cleaner in the supply cabinet. How many liters of disinfectant cleaner should Sam order so that the clinic will have a 6-month supply?
 $93 - 32.5 = \underline{60.5 \text{ L}}$

Quiz: Using the Metric System

Answer Key

Convert the following as indicated.

1. 30 g = 30,000 mg
2. 5 fl oz = 150 mL
3. 6.5 in = 16.25 cm
4. 60 mL = 4 T
5. .75 mL = .00075 L
6. 80 kg = 176 lb

Answer the following questions.

7. A liter is the metric base unit of measure for volume.
8. What is the mnemonic device you can use to remember the order of metric units?
King Harry Died from a Disease Called Malaria
9. An infant's head circumference is 40 cm. The parents want to know the measurement in inches. Sam tells the parents the infant's head circumference is 16 in.
10. As per the doctor's instructions, a patient weighs himself at home every Friday. He reports that he weighed 286 pounds last Friday. Sam needs to record the patient's weight in kilograms. The patient weighs 130 kg.
11. The doctor prescribed 30 mL of a medication per dose for a patient. How many tablespoons should Sam tell the patient to take per dose? 2 T
12. The doctor prescribed 10 mL of Betadine concentrate in 480 mL of warm water as a soak for a toe infection. Using common household measures, how should Sam instruct the patient to prepare the solution at home? 10 mL = 2 t and 480 mL = 2 cups; Sam should tell the patient to mix 2 teaspoons of Betadine concentrate in 2 cups of warm water to prepare the solution.
13. The total quantity of saline solution on hand at the clinic is 11 liters 750 milliliters. Dr. Sarah wants the clinic to have a total of 40 liters of saline solution in stock. How many liters of saline solution does Sam need to order? Convert 750 mL to .75 L; 40 – 11.75 = 28.25 L
14. The clinic has 400 mL of polio vaccine on hand. How many 0.5 mL polio injections can be prepared from this supply? 400 ÷ 0.5 = 800 polio injections
15. If Sam counted 1 liter 650 milliliters of cleaning solution in each of the eight examinations rooms, how many liters of cleaner are there in all?
Convert 650 mL to .65 L; 1.65 x 8 = 13.2 L