Medical Assistant (part 2)

Math Module

Using the Metric System at the Clinic

Most afternoons Lindsay performs other duties related to patient care. She spends much of her time preparing medications, shots, and other solutions. In order to do this job effectively, she has to be familiar with the Metric System. Often times these tasks require that she can convert from one unit of measurement to another.

In particular, Lindsay frequently uses liters and milliliters when completing her everyday tasks at the clinic. Lindsay has learned to become very familiar with all metric units and how to convert among them.

Before we begin looking at the kinds of conversions that Lindsay may do at the clinic, let's practice converting units of measurement by using a metric conversion chart.

Using the Metric System at the Clinic

Table of Metric Unit Conversions

This table can be used to convert from one metric unit to another.

Prefixes of Metric System	Kilo (k)	Hecto (h)	Deca (da)	BASE UNIT Meter(m) Gram (g) Liter (L)	Deci (d)	Centi (c)	Milli (m)
Place Value in Decimal System	1,000	100	10	1	0.1	0.01	0.001

Using the Metric System at the Clinic

To use the chart, locate the unit of measurement you are starting with and the unit measurement that you are converting into. Make a note whether the unknown unit is to the right or left of the known unit. The decimal point in the known unit will be moved in that same direction. In short, the number of places to move the decimal point can be determined by counting the number of bars that are crossed when going from the known quantity to the unknown quantity. Zeros may be added if additional places are needed.

Prefixes of Metric System	Kilo (k)	Hecto (h)	Deca (da)	BASE UNIT Meter(m) Gram (g) Liter (L)	Deci (d)	Centi (c)	Milli (m)
Place Value in Decimal System	1,000	100	10	1	0.1	0.01	0.001

Listen

Listen and follow along as Lindsey explains how she used the conversion chart.

"In order to convert 65 kilometers into meters, I looked at the conversion table. A meter is 3 places to the right of a kilometer. All I do is move the decimal point to the right three places. Even though the number 65 doesn't show a decimal point, there is still a decimal point at the end of the whole number so you can just write one in.

Think of it like this: It's like if I said I had 65 dollars. There is no decimal point in that number. But 65 dollars is the same as 65.00 dollars with no cents. 65 dollars is the same as saying 65 dollars and no cents."

Listen

"After I moved the decimal point three places to the right, I inserted three zeros to fill in the gap between the 65 and the decimal point and came up with the answer 65,000 meters. 65 kilometers is equal to 65,000 meters.

Looking at the chart above, we can see that meter (m) [a meter is approximately equal to three feet] is to the right of kilometer (km) [a kilometer is a way to measure long distances – 1 mile is a little more than 1 and a half kilometers]. The two units of measurement are separated by three (3) places. Therefore, you move the decimal point three places to the right.

Listen

"It's important to remember that even though you don't see a decimal point in the number 65, a decimal point still exists at the end of the whole number.

Here's another example – in order to convert 3.8 centigrams to grams, I looked at the conversion table above. I noticed that the gram is two places to the left of the centigram so I moved the decimal in 3.8 two places to the left. Then I inserted an extra zero between the decimal point and the 3 since the decimal ended up one place away from the three and found 0.038 to be my answer. Therefore, 3.8 centigrams is equal to 0.038 grams.

The gram (g) [a gram is a unit that weighs about as much as an envelope] is a total of two (2) places to the left of the centigram (cg) [a centigram is a very small way to measure weight – it's a hundred times smaller than a gram]. Therefore, in order to convert these units of measurement you must move the decimal two (2) places to the left."

Listen


"Here is one more example. In order to find out how many liters are equal to 7,500 milliliters I looked at the conversion table again. I saw that the liter was three places to the left of the milliliter so I moved the decimal point three places to the left. The answer I got was 7,500 milliliters is equal to 7.500 liters.

The liter (L) [a liter is a measurement of liquid that is a little more than one quart] is a total of three (3) places to the left of the milliliter (mL) [a milliliter is a very small measurement of liquid used commonly to dispense medication – 5 milliliters equals approximately one teaspoon]. In order to convert from milliliters to liters you move the decimal point three (3) places to the left.

The answer I got was 7,500 mL= 7.5 L"

For more practice converting metric units, click here.

Think About It!

Is there any other way to convert between these units? What is the best way for you to convert these units?

When you use the Table of Metric Conversions and move the decimal point, you are really multiplying or dividing by powers of ten. (The U.S. system of measurement is much more complicated because each unit of measurement has a unique conversion, i.e., 16 grams = 1 ounce, 4 quarts = 1 gallon, 12 inches = 1 foot, etc.) For example, you know that there are 100 centimeters in 1 meter. By moving the decimal point two spaces to the left, you are dividing by 100.

In some cases, multiplying or dividing by the appropriate number may be easier for you. When you know that you should multiply or divide by a power of 10, go ahead and do it this way. If you get confused, go back and use the conversion chart, counting the number of decimal places to help you.

Using the Metric System at the Clinic

Table of Metric Unit Conversions

Prefixes of Metric System	Kilo (k)	Hecto (h)	Deca (da)	BASE UNIT Meter(m) Gram (g) Liter (L)	Deci (d)	Centi (c)	Milli (m)
Place Value in Decimal System	1,000	100	10	1	0.1	0.01	0.001

Now let's take a look at some of the math Lindsay might use while doing these medical tasks.

Task One: Doing Inventory

Adding Liters & Milliliters

Dr. Turkoglu wants to know how much saline solution the clinic currently has. He has asked you to give him the total in liters. After checking the storage area and the individual patient rooms, you find 11 liter containers and a total of fifteen 250 milliliters vials of saline solution. How much saline solution, in liters, does the clinic have?

Listen

Here are the steps Lindsay followed to find out how much saline solution the clinic has:

"I knew that in order to find the total amount of milliliters I had to multiply, so I multiplied 15 times 250 milliliters. My answer was 3,750 milliliters.

Then I converted the 3,750 milliliters into liters. After looking at the conversion table, I realized that the liter is three places to the left of milliliters so I moved the decimal point to the left three places.

3750 milliliters is equal to 3.75 liters.

The last thing I did was I add 3.75 liters to my original amount of liter containers, which was 11. I got 14.75 liters as my answer.

I should tell Dr. Turkoglu that there are a total of 14.75 liters of saline solution at the clinic."

Steps

Look at the steps again.

Step 1: In order to find the total amount of milliliters, multiply 15 vials by 250 milliliters per vial.

$$\begin{array}{rr} & 250 \text{ mL per vial} \\ \times & 15 \text{ vials} \\ \hline & 3750 \text{ mL} \end{array}$$

Step 2: Now convert milliliters into liters. In order to help you, refer to the conversion chart above.

3750 mL = _____ liters

According to the conversion chart, liters are three places to the left of milliliters, so you move the decimal point to the left three places. Thus, 3750 milliliters is equal to 3.75 liters (we could also refer to this as 3 liters and 750 milliliters).

Steps

Step 3: Add your total 3.75 liters to the original amount of liters (11).

11.00liters
+ 3.75 liters
14.75 liters

Answer: Lindsay can report to Dr. Turkoglu that there are a total of 14.75 liters of saline solution (14 liters and 750 milliliters is another representation for this quantity, however since the quantity was asked for in liters, the answer should be 14.75 liters).

Practice

A: Add these Quantities (Simplify all Answers)

1)
3 liters 250mL
\+ 800 mL
4 liters 50 mL

2)
5 liters 660 mL
\+ 3 liters 600 mL
9 liters 260 mL

3)
35 liters 1200 mL
\+ 50 liters 150 mL
86 liters 350 mL

Practice

4)
$$\begin{array}{r} 6 \text{ liters } 700 \text{ mL} \\ +\ 2 \text{ liters } 320 \text{ mL} \\ \hline 9 \text{ liters } 20 \text{ mL} \end{array}$$

5)
$$\begin{array}{r} 1250 \text{ liters } 2000 \text{ mL} \\ +\ 2750 \text{ liters } 1500 \text{ mL} \\ \hline 4003 \text{ liters } 500 \text{ mL} \end{array}$$

6)
$$\begin{array}{r} 14 \text{ liters } 1550 \text{ mL} \\ +\ 5 \text{ liters } 600 \text{ mL} \\ \hline 86 \text{ liters } 350 \text{ mL} \end{array}$$

Task Two: Doing Inventory

Subtracting Liters & Milliliters

Lindsay needs to refill the 450 milliliter bottles of ammonium in eight of the patient waiting rooms. She plans to refill each bottle from a 20 liter canister. If each bottle is completely empty when she fills them up, how much of the 20 liter canister of ammonium will be left after filling all eight of the 450 milliliter bottles?

Listen


Listen and follow along as Lindsay explains the steps she followed to find out how much of the 20 liter canister of ammonium the clinic will have left after she restocks the eight patient waiting rooms:

"I knew that in order to find the total amount of milliliters of ammonium I had to multiply 8 bottles by 450 milliliters per bottle. I found 3,600 milliliters to be the total amount of ammonium I would need to fill the bottles in the eight patient waiting rooms.

Then I converted the 20 liters from the canister into milliliters. After looking at the conversion table, I noticed that the milliliters are three places to the right of the liters on the chart. So I moved the decimal point – which was just to the right of the 0 in 20 - to the right a total of three places. Therefore, 20 liters is equal to 20,000 milliliters."

Listen


"My next step was to subtract 3,600 milliliters from 20,000 milliliters. My answer was 16,400 milliliters.

Then I converted 16,400 milliliters back to liters. I got 16 liters and 400 milliliters.

There would be 16 liters and 400 milliliters of ammonium left from the 20 liter canister after filling the bottles in the eight patient waiting rooms."

Steps

Look at the steps again.

Step 1: In order to find the total amount needed to fill of all 8 ammonium bottles, multiply 8 bottles by 450 milliliters per bottle.

$$\begin{array}{rl} & 450 \text{ mL per bottle} \\ \times & \underline{8 \text{ bottles}} \\ & 3{,}600 \text{ mL} \end{array}$$

Step 2: Now convert the larger unit you need to subtract from (liters) to the smaller unit you will be using (milliliters). Use the conversion chart to assist you.

20 liters = _____ mL

Steps

Since milliliters are three places to the right of liters on the chart, move the decimal point (20.0) to the right a total of three places. (You could also multiply 20 by 1000, since you know that there are 1000 milliliters in a liter. Do it this way if you're comfortable.)

20 liters = 20,000mL

Thus, 20 liters is equal to 20,000 milliliters.

Step 3: Subtract the total in Step 1 (3,600 mL) from the total in Step 2 (20,000 mL).

20,000 mL
- 3,600 mL
16,400 mL

Steps

Step 4: Convert the answer from Step 3 (16,400 mL) back to liters.

16,400 mL = _____ liters

Use whichever method you prefer to convert the smaller unit (milliliters) to the larger unit (liters). Just remember, you can either use the conversion chart or divide by 1,000 because you know that there are 1,000 milliliters in a liter.

16,400 mL = 16.4 liters

Thus, 16,400 mL is equal to 16.4 milliliters You could also say "16 liters and 400 milliliters."

Answer: After refilling the eight bottles of ammonium, Lindsay discovered that there was 16 liters and 400 milliliters of ammonium left from the 20 liter canister.

Practice

A: Subtract these Quantities (Simplify all Answers)

1) 3 liters 200mL
- 500 mL

2 liters 700 mL

2) 5 liters 350 mL
- 2 liters 500 mL

2 liters 850 mL

3) 15 liters 1050 mL
-11 liters 2550 mL

2 liters 500 mL

Practice

4) 26 liters 725mL
- 19 liters 820 mL
26 liters 905 mL

5) 525 liters 1200 mL
- 275 liters 1500 mL
249 liters 700 mL

6) 105 liters 200 mL
- 9 liters 255 mL
95 liters 945 mL

Task Three: Computing a Total Quantity of a Substance

Multiplying Liters & Milliliters

During a typical week, the clinic uses 2 liters 750 milliliters of saline solution. After 4 weeks, how much saline solution does the clinic typically use?

Listen and follow along as Lindsay explains the steps she followed to find out how much saline solution the clinic typically uses in 4 weeks:

"I knew that it would be easier to multiply with only one unit, so first I converted the 2 liters into milliliters. According to the conversion chart, milliliters are three places to the left of liters, so I moved the decimal point to the right three places. Once I did that, I found that 2 liters is equal to 2,000 milliliters."

Listen


"Then I added 2,000 milliliters and 750 milliliters to get 2,750 milliliters.

Next I multiplied 2,750 milliliters per week by 4 weeks and got 11,000 milliliters.

Then I converted the milliliters back into liters. I knew that I needed to divide by 1,000 since I knew that there are 1,000 milliliters in a liter. My answer was 11 liters.

I found that after 4 typical weeks, the clinic would use a total of 11 liters of saline solution."

Steps

Look at the steps again.

Step 1: Convert the larger unit (liter) into the smaller unit (milliliter). Refer to the conversion chart above if you like.

2 liter = _____ mL

(This step is not necessary…many people would leave it in the larger unit so they don't have to convert back and forth.)

According to the conversion chart milliliters are three places to the left of liters, so you move the decimal point to the right three places.

Thus, 2 liter is equal to 2,000 milliliters.

Steps

Step 2: Add 2,000 milliliters to the number of milliliters you began with (750 mL).

2,000 mL
+ 750 mL
2,750 mL

Step 3: Multiply 2750 milliliters per week by 4 weeks like this:

2750 mL per week
× 4 weeks
11,000 mL

Steps

Step 4: Convert the smaller unit (milliliters) into the larger unit (liters). Refer to the conversion chart above if you like.

11,000 mL = _____ liters

Since liters are three places to the left of milliliters, move the decimal three places to the left (you should also be comfortable dividing by 1,000 since you know that there are 1,000 milliliters in a liter).

11,000 mL= 11 liters

Thus, 11,000 mL may be simplified to 11 liters.

Answer: After 4 typical weeks, the clinic uses a total of 11 liters of saline solution.

Practice

A: Solve these problems.

1) 7 liters 500 mL

× 5

37 liters 500 mL

2) 5 liters 250 mL

× 6

31 liters 500 mL

3) 2 liters 800 mL

× 15

42 liters

Practice

4) 7 liters 50 mL

× 9

63 liters 450 mL

5) 13 liters 850 mL

× 5

69 liters 250 mL

6) 20 liters 1245 mL

× 3

63 liters 735 mL

Task Three: Restocking Medication

Dividing Liters & Milliliters

Lindsay needs to replace 250 milliliters of children's Motrin in each of the eight waiting rooms. If she has 1 liter and 750 milliliters, how many of the eight rooms can she restock with children's Motrin?

Listen and follow along as Lindsay explains the steps she followed to find out how many rooms Lindsay could restock with children's Motrin.

"In order to divide 250 milliliters into 1 liter and 750 milliliters, first I converted the one liter to milliliters. This was easy since I knew that there are 1,000 milliliters in a liter. So now I had 1,000 milliliters."

Listen

“Next I added 1,000 mL to the 750 milliliters I started with. My answer was 1,750 milliliters.

Now that I had all my units the same, I divided 1,750 milliliters by 250 milliliters. I got a total of 7.

Since I was trying to find out how many rooms I could restock, I knew that the number 7 represented the number of rooms. I can completely restock seven of the eight rooms’ vials of children’s Motrin.”

Steps

Look at the steps again.

Step 1: Divide these two numbers.

1 liter 750 mL ÷ 250 mL =

In order to divide 250 milliliters into 1 liter and 750 milliliters, you must first convert the larger unit (liter) to the smaller unit (milliliters).

1 liter = _____ mL

Use whatever strategy you are most comfortable with in order to convert these units. (By now you should know two different strategies for converting metric units.)

1 liter = 1,000mL

(As you know, one liter equals 1,000 milliliters)

Steps

Now add 1,000 mL to the amount of milliliters you began with (750 mL).

$$\begin{array}{r} 1{,}000\ \text{mL} \\ +\ 750\ \text{mL} \\ \hline 1{,}750\ \text{mL} \end{array}$$

Step 2: Now that you have all your units the same, you can now divide 1,750 milliliters by 250 milliliters.
1,750 mL ÷ 250 mL = 7

Answer: Lindsay can completely restock seven of the eight rooms' vials of children's Motrin.

Practice

A: Divide these Quantities (Simplify all Answers)

1) 2 liters and 800 mL ÷ 200 mL = 14

2) 3 liters and 450 mL ÷ 150 mL = 23

3) 4 liter and 900 mL ÷ 350 mL = 14

4) 10 liters and 675 mL ÷ 25 mL = 427

5) 11 liters ÷ 550 mL = 20

6) 24 liters and 300 mL ÷ 150 mL = 162

Practice

B: Solve these Word Problems (you will either add, subtract, multiply or divide using liters and milliliters – simplify all answers)

1) Lindsay was directed to find out how much saline solution was left in each of the eight patient waiting rooms. In the first room there was 1 liter, and 200 milliliters. In the second room there was 750 milliliters. In the third room there was 350 milliliters left. In the fourth room there was 1 liter and 450 milliliters. In the last four rooms, there were quantities of 600 milliliters, 850 milliliters, 2 liters and 150 milliliters, and 375 milliliters, respectively. How much saline solution was left in all?

7 liters 725 milliliters

2) If she added 1 liter & 250 milliliters of saline solution to each of the eight rooms, how much more saline solution would the clinic have in all?

17 liters 725 mL
(you are adding to what was currently in the room)

Practice

3) Lindsay needs to refill all eight of the 750-milliliter ammonium solutions in the eight patient waiting rooms every week. If each vial in each room has an average of 420 milliliters of ammonium, how much more ammonium solution will she need in order to fill up all eight of the 750 milliliter vial? (Hint: First find the total quantity available in all eight waiting rooms. Then find the total quantity that each room already has. Finally, subtract the two totals.)

2 liters 640 milliliters

4) Lindsay needs to refill one room's ammonium solution which holds 1 liter 350 milliliters of the solution. If she refills this room from a 5-liter canister, how much ammonium solution will be left?

3 liters 650 milliliters

Practice

5) During a typical week, Lindsay prepares 30 sets of injections of dopamine for the clinic. Each injection is 50 milliliters. How much total dopamine does Lindsay prepare each week?

1 liter 500 milliliters

6) If all eight bathrooms in the clinic go through 1 liter 300 milliliters of hand sanitizer each week, how much total hand sanitizer will the clinic go through in after 6 weeks? (Hint: First find the total amount of hand sanitizer for each week. Then find the total amount of hand sanitizer used in six weeks).

62 liters 400 milliliters

Practice

7) Lindsay has a 2-liter container of the MMR (Measles, Mumps & Rubella) vaccination. How many 5-milliliter injections can she get from the 2-liter container?

400 total injections

8) The clinic typically goes through about 16 liters and 400 milliliters of cleaning solution per month. Approximately how many liters of cleaning solution does the clinic go through in a week if there are 4 weeks in a month? (Hint: In order to find the average per week, you need to divide.)

4 liters 100 milliliters

Quiz – for both Part 1 and Part 2

Computing & Converting Time

Work the following problems:

1) 5 hrs 32 mins
+ 6 hrs 43 mins

12 hrs 15 mins

2) 13 hrs 47 mins
+ 9 hrs 25 mins

23 hrs 12 mins

3) 35 hrs 35mins
- 6 hrs 43 mins

28 hrs 52 mins

4) 13 hrs 38 mins
- 9 hrs 55 mins

3 hrs 43 mins

5) 5 hrs 13mins × 6 = **31 hrs 18 mins**

6) 3 hrs 28 × 7 mins = **24 hrs 16 mins**

7) 12 hrs 15 mins ÷ 5 = **2 hrs 27 mins**

8) 65 hrs 27 mins ÷ 3 = **21 hrs 49 mins**

Quiz

Solve these Word Problems (Simplify all Answers):

9) Lindsay had to determine the total amount of time that the doctors spent on patient care during one week. On Monday, the total amount of time spent on patient care was 14 hours 25 minutes. On Tuesday, the total amount of time was 16 hours. On Wednesday, the time spent on patient care was 15 ½ hours. On Thursday, the doctors spent 12 hours 45 minutes and on Friday, the doctors combined 13 hours 55 minutes on patient care. What was the total number of time spent on patient care for the week?

72 hours and 35 minutes

Quiz

10) If Dr. Ramos spent an average of 7 hours 15 minutes per day on patient care during a five day work week, how much time did Dr. Greenberg and Dr. Turkoglu spend together on patient care during the same week? (Hint: use your answer to #5 to answer this question.)

36 hours 20 minutes

11) Dr. Greenberg wants to meet with 15 patients the next Tuesday she is scheduled to be at the clinic. She plans to spend a total of 8 hours on patient care that day. Approximately how much time should Dr. Greenberg spend with each patient next Tuesday?

32 minutes

Quiz

Computing & Converting Using the Metric System

Table of Metric Unit Conversions

Prefixes of Metric System	Kilo (k)	Hecto (h)	Deca (da)	**BASE UNIT Meter(m) Gram (g) Liter (L)**	Deci (d)	Centi (c)	Milli (m)
Place Value in Decimal System	1,000	100	10	1	0.1	0.01	0.001

Use the table to complete the following problems:

1) 5 liters 250 mL
+ 2 liters 750 mL
8 liters

Quiz

2) 15 liters 450 mL
+ 3 liters 650 mL

19 liters 100 mL

3) 5 liters 660 mL
- 780 mL

4 liters 880 mL

4) 12 liters 450 mL
- 5 liters 950 mL

6 liters 500 mL

5) 13 liters 850 mL × 5 = **69 liters 250 mL**

Quiz

6) 20 liter 1245 mL × 3 = **63 liters 735 mL**

7) 2 liters 800 mL ÷ 200 mL = **14**

8) 15 liters ÷ 250 mL = **60**

9) If Lindsay has 2 liters 350 milliliters of saline solution in each of the eight patient waiting rooms, how much saline solution does she have in all?

18 liters 800 milliliters

10) The clinic has quantities of 1250 milliliters, 800 milliliters, 2 liters 700 milliliters, 450 milliliters, and 1 liter 680 milliliters of a vaccination. How much of the vaccination does the clinic have in all?

6 liters 880 milliliters

Quiz

11) The clinic uses approximately 1 liter 850 milliliters of a liquid painkiller during a 5-day work week. On average, how much liquid painkiller does the clinic use per day? (Hint: In order to find the average per day, you need to divide by the number of days.)

370 milliliters per day

12) The saline solution at the clinic needs to be reordered. The total quantity at the clinic was 12 liters 850 milliliters. Dr. Ramos likes to have 30 liters of saline solution at all times. How much saline solution does Lindsay need in order to get to a total of 30 liters?

17 liters 150 milliliters

Key Math Terms

- Add
- Subtract
- Multiply
- Divide
- Convert
- Unit of Measurement
- Schedule
- Time
- Minute
- Hour
- Metric System
- Base Unit
- -liter (L)
- -gram (g)
- -meter (m)
- Metric Prefixes
- -kilo (k)
- -hecto (h)
- -deka (da)
- -deci (d)
- -centi (c)
- -milli (m)

Congratulations!

You have completed the Medical Assistant parts1 and 2.

The End