



Module 2 Lesson 14

Objective: Use decimal multiplication to express equivalent measurements

Fluency – Divide by Multiples of 10

- $420 \div 10 = \underline{42}$
- $42 \div 2 = \underline{21}$
- $420 \div 20 = \underline{420 \div 10} \div 2 = 21$
- Write the above statement as a three step problem.
- Write the following statements as a three step problem and solve.
- $960 \div 30$ and $680 \div 20$

$$960 \div 10 \div 3 = 32$$

$$680 \div 10 \div 2 = 34$$

Fluency – Unit Conversions

- 1 meter (m) = 100 centimeters(cm)
- 1 m 50 cm = 150 cm
- 1 m 5 cm = 105 cm
- 2 m = 200 cm
- 2 m 30 cm = 230 cm
- 2 m 70 cm = 270 cm
- 2 m 7 cm = 207 cm
- 3 m 90 cm = 390 cm
- 4 m 8 cm = 408 cm

Fluency – Unit Conversions

- 1 foot (ft) = 12 inches (in)
- 1 ft 1 in = 13 in
- 1 ft 3 in = 15 in
- 1 ft 10 in = 22 in
- 1 ft 8 in = 20 in
- 2 ft 1 in = 25 in
- 2 ft 10 in = 34 in
- 3 ft 8 in = 44 in
- 4 ft 2 in = 50 in

Fluency – Unit Conversions

- 12 inches (in) = 1 foot (ft)
- 13 in = 1 ft 1 in
- 14 in = 1 ft 2 in
- 19 in = 1 ft 7 in
- 24 in = 2 ft
- 28 in = 2 ft 4 in
- 39 in = 3 ft 3 in
- 46 in = 3 ft 10 in
- 49 in = 4 ft 1 in
- 54 in = 4 ft 6 in

Fluency – Decompose Decimals

- 3.184
 - Say the number
 - 3 and 184 thousandths
- How many tenths are in 3.184?
 - 31 tenths
- How many thousandths after you take the tenths out?
 - 31 tenths 84 thousandths
- How many tenths and thousandths for 6.723 and 9.246?
 - 67 tenths 23 thousandths
 - 92 tenths 46 thousandths

Application Problem

- Emma's class is preparing for a field trip to the Statue of Liberty. In math class, they are researching Lady Liberty's size. Help Emma finish this table.

The Statue of Liberty's	Convert to Inches
... mouth is 3 feet wide.	36 inches
... head is 10 feet from ear to ear.	120 inches
... height is 111 feet.	1332 inches

Application Problem - Optional

- Pass out one bag for every 2 students. Tell students that every bag has an exact match. If you do have access to scales, instruct students to measure the weight of their bag using the unit specified by the bag's color. After students determine the weight and discuss what the weight means with their partner, each pair finds their bag's match. If you do not have scales, students work in their new groups of four to determine the weight of the unknown bags based on the known weight.
- After all pairs have successfully found their match, students should compare and discuss their measurements. Prompt students to explain how the same sized bag could have two different measurements. Record the results.

Application Problem - Optional

- After results are recorded, discuss as a group what the findings teach us:
 - There are 16 ounces in every pound and 1,000 grams in every kilograms.
 - We must multiply to convert from large units (pounds and kilograms) to smaller ones (ounces and grams). (Generalized conversion equations might be recorded as well.)
 - We need more of a smaller unit and less of a larger unit to make the same amount.
- Note: Today's Application Problem provides a practical, hands-on way for students to see the conversion reasoning necessary for the lessons in this topic.

Concept Development – Problem 1

- 7.43 kilometers (km) = _____ meters (m)
- How is this different than lesson 13 problems?
 - In Lesson 13 we did large units to smaller units using multiplication but it was in different units.
- How will we solve this one?
 - We'll multiply again as we are going from larger to smaller units again.
- What are we going to multiply by and why?
 - 1000 because 1 km equals 1000 meters or we are moving to the right on our place value chart and making 3 jumps. Each jump is a power of 10, so 10 to the 3rd power.
- What is the answer to this problem?
 - 7,430 m

Concept Development – Problem 2

- 1.8 miles = _____ yards
- Looking at the reference sheet which part will we use to help solve this problem?
 - The part that tells us that 1 mile = 1,760 yards.
- If we think of 1.8 miles as 18, what will we need to remember about the size of our product?
 - It will be 10 times as much as the actual product and the product needs to 10 times smaller.
- You could also think of it as 18 tenths.
- Now solve the problem, independently.
- What did you do to solve the problem?
 - $(10 \times 1,760) + (8 \times 1,760) = 17,600 + 14,080 = 31,680$ yards (tenths) and then divide by 10 because the original problem has 1 place value to the right of the decimal.
 - Final answer: 3,168 yards

Concept Development – Problem 3

- Using your reference sheet solve this problem.
- $0.83 \text{ kg} = \underline{\hspace{2cm}} \text{ g} = \underline{\hspace{2cm}} \text{ mg}$
- How did you solve this problem?
 - First you multiply 0.83 by 1,000, which is 830 grams.
 - Second you multiply 830 by 1,000, which gives you 830,000 milligrams.
- Why did you multiply by 1,000 in each step?
 - $1 \text{ kg} = 1,000 \text{ grams}$ and $1 \text{ gram} = 1,000 \text{ milligrams}$
 - You can also visualize the place value chart to realize you are making 3 jumps to the right from kg to g and then another 3 jumps to the right from g to mg. Each jump is a power of 10, so you have 10^3 and then another 10^3 .
- Could we convert from kg to mg in one step? If so, what would we multiply by?
 - Yes by multiplying 0.83 by 10^6 because we are making 6 jumps to the right on our place value chart.
- Based on the above what can we say the relationship is of kilograms to milligrams?
 - $1 \text{ kilogram} = 1,000,000 \text{ milligrams}$

End of Lesson Activities

- Student Debrief
- Problem Set
- Exit Ticket
- Homework

Problem Set

- Convert. Use your Reference Sheet to help you remember the conversion factors.
 - $4.5 \text{ km} = \underline{\quad} \text{ m}$ $\underline{\quad} \text{ fl oz.} = 2.75 \text{ c}$ $\underline{\quad} \text{ mL} = 4.85 \text{ L}$
 - $8.25 \text{ g} = \underline{\quad} \text{ mg}$ $3.25 \text{ gal} = \underline{\quad} \text{ qt}$ $\underline{\quad} \text{ pt} = 16.5 \text{ qt}$
 - $0.5 \text{ mi} = \underline{\quad} \text{ ft}$ $7.9 \text{ m} = \underline{\quad} \text{ cm}$
- Cassidy figured out that she makes \$0.75 every minute at her job. She works 7 hours 15 minutes every day.
 - How many minutes does she work in 4 days?
 - How much will Cassidy earn in 4 days?

Problem Set

- Emma can't believe how huge the Statue of Liberty is. She finds more information about Lady Liberty. Help Emma fill in the rest of the chart and then answer the questions.

The Statue of Liberty's	Customary Units		Metric Units	
	Feet	Inches	Meters	Centimeters
Nose	4 ft 6 in		1.37 m	
Index Finger	8 ft		2.44 m	
Head	17 ft 3 in		5.26 m	
Eye	2 ft 6 in		0.76 m	

- Source: <http://www.nps.gov/stil/historyculture/statue-statistics.htm>
 - Emma is 52 inches tall. Which of Lady Liberty's body parts above is the closest to Emma's height? What is the difference between these two measurements in inches?
 - Emma's eye is 4 cm wide. How many of Emma's eyes lined up end to end would it take to stretch all the way across one of Lady Liberty's eyes?
 - The length of Emma's neighborhood block is 0.19 km. About how many of the statue's heads would it take to cover the length of her block?
 - Measured in meters, Lady Liberty's index finger is 4 times as long as Emma's leg. What is the length of Emma's leg in meters?

Exit Ticket

- Convert. Use your Reference Sheet if necessary. Show your work.
 - $3.9 \text{ km} = \underline{\hspace{2cm}} \text{ m}$
 - $\underline{\hspace{2cm}} \text{ lb} = 2.4 \text{ tons}$
 - $13.5 \text{ qt} = \underline{\hspace{2cm}} \text{ pt}$

Pick up a half sheet of paper from the book case. (Name and Exit Ticket 14 should be on the paper.)

Homework

- Convert. Use your Reference Sheet if necessary. Show your work.
 - $2.7 \text{ kL} = \underline{\quad} \text{ L}$ $\underline{\quad} \text{ fl oz} = 4.25 \text{ c}$ $\underline{\quad} \text{ m} = 1.45 \text{ km}$
 - $9.13 \text{ kg} = \underline{\quad} \text{ g}$ $4.75 \text{ gal} = \underline{\quad} \text{ qt}$ $\underline{\quad} \text{ pt} = 12.5 \text{ qt}$
 - $1.3 \text{ tons} = \underline{\quad} \text{ lb}$ $0.75 \text{ mi} = \underline{\quad} \text{ yd}$ $\underline{\quad} \text{ oz} = 8.5 \text{ lb}$
- Jennifer wants to convert 7.85 meters to centimeters, but she does not have paper, pencil or a calculator. Describe a method she can use.
- A standard hot tub holds 2.3 kiloliters of water. After filling up two of nine hot tubs, Johnson's water service truck empties. How many liters of water are still needed to fill the remaining tubs?