

Exploring Measurement with Multiplication

In this final module of Grade 4, students build their competencies in measurement as they relate multiplication to the conversion of measurement units.

Throughout the module, students explore multiple strategies for solving measurement problems involving unit conversion.

A number bond decomposes 30 ounces to make a mixed unit of 1 pound 14 ounces

Pounds	Ounces
1	16
2	32
3	48
4	64
5	80
6	96
7	112
8	128
9	144
10	160

A pound-ounce conversion table like those students create and use in Module 7

What Came Before this Module:

Students explored decimal numbers and their relationship to decimal fractions. They learned to express a given quantity in both fraction and decimal forms and compared decimal numbers using the place value chart.

New Terms in this Module:

Customary system of measurement: measurement system used in the United States that includes such units as yards, pounds, and gallons

Customary unit: e.g., foot, ounce, quart

Cup (c): customary unit of measure for liquid volume

Gallon (gal): customary unit of measure for liquid volume

Metric system of measurement: base ten system of measurement used internationally that includes such units as meters, kilograms, and liters

Metric unit: e.g., kilometer, gram, milliliter

Ounce (oz): customary unit of measure for weight

Pint (pt): customary unit of measure for liquid volume

Pound (lb): customary unit of measure for weight

Quart (qt): customary unit of measure for liquid volume

+ How You Can Help at Home:

- As often as possible, notice and discuss customary units like ounces and pounds with your student (in the grocery store, at home, etc.).
- Review time by asking questions such as “How many more minutes until the next hour?” or “How many hours until the next day?”

Key Common Core Standards:

- Use the four operations with whole numbers to solve problems.**
 - Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.
 - Multiply or divide to solve word problems involving multiplicative comparison.
 - Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations.
- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.**
 - Know relative sizes of measurement units within one system of units.
 - Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money.

Spotlight on Math Tools:

Two-Column Table

Students use this mathematical tool in Module 7 of A Story of Units.

Two different Two-Column Tables featuring customary measurements and time from Module 7

Quarts	Pints
1	
2	
6	
10	
16	

Minutes	Seconds
1	60
2	120
3	180
4	240
5	300
6	360
7	420
8	480
9	540
10	600

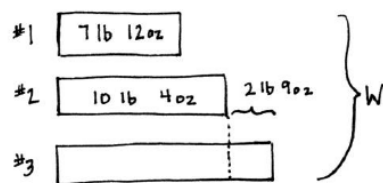
A Story of Units has several key mathematical tools that are used to solidify mathematical concepts.

Module 7 further tells the *Story of Units* by focusing on customary measurement units (gallons, pints, yards, etc.). Students decompose them, convert them, and strengthen their sense of what each customary unit represents. Two-column tables are an important organizational tool that helps students see how the larger and smaller units relate to each other, as well as what a “unit” means in each situation, e.g., 16 ounces = 1 pound.

Two-column tables also reappear as organizational tools in later years, such as when students learn simple linear functions and use the tables to calculate coordinate pairs. In this module, the structure of the table is provided for students in order to scaffold their learning, to record the conversion from larger to smaller units, and to see the multiplicative relationship between two units of measurement.

Sample Problem from Module 7:
(Example taken from Module 7, Lesson 10)

One pumpkin weighs 7 pounds 12 ounces. A second pumpkin weighs 10 pounds 4 ounces. A third pumpkin weighs 2 pounds 9 ounces more than the second pumpkin. What is the total weight of all three pumpkins?



The total weight of all 3 pumpkins is 30 pounds 9 ounces.

Solution A

$$\begin{array}{l}
 10 \text{ lb } 4 \text{ oz} \xrightarrow{+2 \text{ lb } 9 \text{ oz}} 12 \text{ lb } 13 \text{ oz} \\
 7 \text{ lb } 12 \text{ oz} \xrightarrow{+10 \text{ lb } 4 \text{ oz}} 17 \text{ lb } 16 \text{ oz} \xrightarrow{+12 \text{ lb } 13 \text{ oz}} 30 \text{ lb } 13 \text{ oz} \\
 W = 30 \text{ lb } 13 \text{ oz}
 \end{array}$$

Solution B

$$\begin{aligned}
 &10 \text{ lb } 4 \text{ oz} + 2 \text{ lb } 9 \text{ oz} = 12 \text{ lb } 13 \text{ oz} \\
 W &= 7 \text{ lb } 12 \text{ oz} + 10 \text{ lb } 4 \text{ oz} + 12 \text{ lb } 13 \text{ oz} \\
 &= 29 \text{ lb } 29 \text{ oz} \\
 &\quad \quad \quad \uparrow \\
 &\quad \quad \quad 16 \quad 13 \\
 W &= 30 \text{ lb } 13 \text{ oz}
 \end{aligned}$$