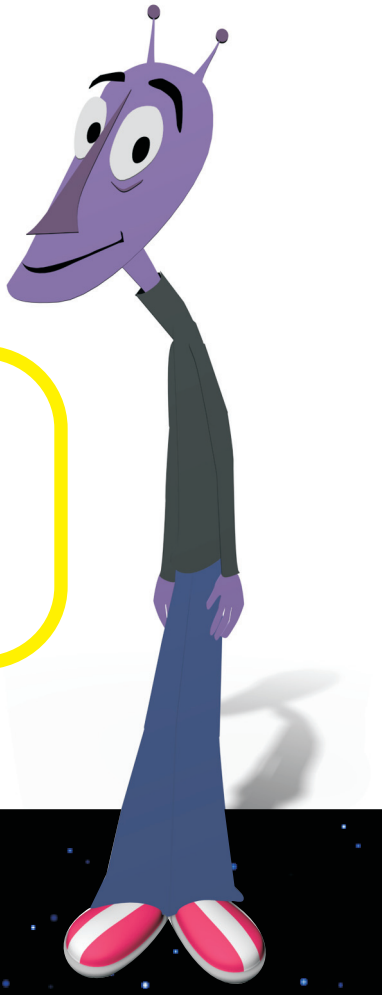
Measurement

★ Module 12 ★

Attributes and Tools

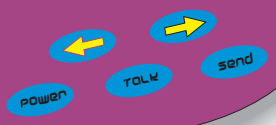


Lesson 5
Measurement:
Weight and Mass

Teacher Notes 12.5

Objectives

- Demonstrate how to read a scale and a balance.
- Determine when and how to measure customary weight.
- Determine when and how to measure metric mass.
- Determine which unit of measure or measurement tool matches the context for a problem situation involving weight and mass.
- Solve real-world problems involving weight and mass.



Prerequisites

Multiplying fractions and decimals

Converting units within the same measurement system

Vocabulary

Scale
Weight (12.1)
Mass (12.1)
Balance scale

Get Started

- Before class, make index cards with pairs of equivalent weights as shown on the next page. In class, have students work in groups of two or three to play a memory/matching game. Students first turn all the cards upside down and move them around so no one knows which card is which. Then they take turns flipping two over. If they are equivalent, they take the cards. If not, they flip them back over. All students in the group need to agree when two cards are indeed a match. The student with the most matches at the end is the winner.

12 lb	4,567 g	0.235 kg	2 lb 6 oz	3 kg	45 g
80 oz	3 lb 2 oz	5 lb	0.045 kg	4.567 kg	2.35 kg
8 lb 8 oz	38 oz	$8\frac{1}{2}$ lb	44 oz	50 oz	2,350 g
2 lb 12 oz	3,000 g	23.5 kg	23,500 g	192 oz	235 g

- Depending on the class size, teachers may want to make more cards and have the whole class play one game.

Subtopic 1 Using a Scale

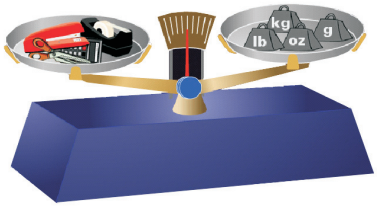
Expand Their Horizons

In this subtopic, students are shown some of the many types of scales used in the world. The most common are the physician's scale, the bathroom scale, and the kitchen scale. Ask students if they have ever seen any other type of scale such as a baby scale, a bench or platform scale (used in the shipping industry), or food and deli scales. Discuss why there is a need for so many different types of scales.

Despite being called a physician's scale, many people besides physicians can and do use them. In fact, some fitness clubs have them in their locker rooms so that members can weigh themselves. If the school nurse has a physician's scale, see if it can be brought into the classroom for a day so students can practice moving the weights. They can practice weighing themselves and/or stacks of books or other objects in the room.

Balance scales differ from other types of scales because instead of giving a reading for the weight of one object, it compares the weights of two objects. The object in the lower tray will be the heavier of the two objects; the objects are of equal weight when the trays are at the same level.

A laboratory balance compares an unknown mass with known standard weights. These weights have standard values like 1 oz, 1 lb, 1 g or 1 kg. The objects are placed in one tray, and standard weights are added or removed from the other tray until the two trays are balanced. They are balanced when the red needle is straight up and down.



1 On the bathroom scale, the dial is one mark after 115, so the weight is 116. On the physician's scales, the bottom weight is at 150, and the top weight is at 15. The weight shown is 150 + 15 = 165 pounds.

2 The orange is heavier because the tray it is on is lower than the tray that holds the banana.

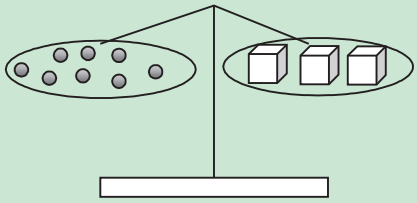
3 Use proportional reasoning. Twelve blocks are four times as many as three blocks. Eight balls are four times as many as two balls. Another option is to write and to solve a proportion: $\frac{2}{3} = \frac{x}{12}$, $3x = 24$, $x = 8$.

Additional Examples

1. Cierra is standing on a balanced physician's scale. If she moves the top weight to the left, will the balance rise or fall?

It will rise. The balance rises when the weight displayed is less than the person on the scale. It falls when it is greater than the weight of the person.

2. How many balls balance 36 blocks?



Multiply the right side by 12 to get 36 blocks. Multiply the left side by the same number to balance the scale: 8 × 12 = 96. Ninety-six balls balance 36 blocks.

Subtopic 2 — Customary Weight

Expand Their Horizons

In this subtopic, students add, subtract, multiply, and divide customary weights. Point out that there are several ways to express a customary weight. For example, $5\frac{1}{2}$ lb also can be expressed as 5 lb 8 oz or 88 oz.

In the lesson, students solve a problem by multiplying 4 × (3 lb 6 oz). Show how this is an example of the Distributive Property because 4(3 lb 6 oz) = 4(3 lb + 6 oz).

Common Error Alert:

Students may confuse ounces with fluid ounces and add eight instead of 16 when renaming. Remind students there are eight fluid ounces in a cup and 16 ounces in a pound.

4 To find the weight of the oranges, multiply 13 × 4 oz = 52 oz. Convert the weight of the bag of tangerines to ounces: 4 × 16 oz = 64 oz. Since 64 oz > 52 oz, the bag of tangerines weighs more. The problem can also be solved by converting the weight of the oranges to pounds: 52 oz ÷ 16 = 3 lb 4 oz and 4 lbs > 3 lb 4 oz.

5 Find the sum of the pounds and the sum of the ounces. Then, rename the ounces to pounds and ounces since 17 ≥ 16. The baggage weight is over the limit because 40 lb 1 oz > 40 lb.

Additional Examples

1. A bag of oatmeal cookies contains 28 cookies. Each cookie weighs 2 ounces. The contents of a box of ginger snaps weigh 3 pounds 2 ounces. Which weighs less, the oatmeal cookies or the ginger snaps?

Find the weight of all the oatmeal cookies.

28 × 2 oz = 56 oz and 56 oz = 3 lb 8 oz

3 lb 2 oz < 3 lb 8 oz, so the ginger snaps weigh less.

2. Subtract.

33 lb 8 oz
– 15 lb 9 oz

32 lb 24 oz
~~33 lb 8 oz~~
– 15 lb 9 oz

17 lb 15 oz

Subtopic 3 Metric Weight

Expand Their Horizons

In this subtopic, students review converting between grams and kilograms and learn to add, subtract, multiply, and divide metric weights.

When comparing or performing basic operations with metric units, students will need to make sure the units are consistent. Tell them they may convert to grams or to kilograms. Remind students when converting from a smaller unit to a larger unit, they can move the decimal to the left. Converting from a larger unit to a smaller unit, the decimal is moved right.

Either convert grams to kilograms or kilograms to grams:
2,200 g – 300 g = 1,900 g, or 2.2 kg – 0.3 kg = 1.9 kg.

Additional Examples

1. **Jeremy has two bags of dog food. One bag has a mass of 5.9 kg. The other bag has a mass of 2,268 g. How much dog food does Jeremy have in all?**

   Convert 2,268 g to kg: 2.268 kg. Then, add.

   5.9 kg + 2.268 kg = 8.168 kg or
   8 kg 168 g

   Jeremy has 8.168 kg, or 8,168 g, of dog food.

2. **Two children want to ride in a toy wagon which has a weight limit of 39 kg. If one child weighs 23 kg and the other weighs 15,250 g, will they both be able to ride together in the wagon without exceeding the weight limit?**

   Convert 15,250 g to kg: 15.250 kg. Then, add.

   23 kg + 15.25 kg = 38.25 kg
   38.25 kg < 39 kg

   Both children will be able to ride in the wagon.

Look Beyond

Students will learn more about weight, mass, and scales in their science classes. They will also learn new conversions for larger and smaller units, such as the megagram, which is 1,000,000 grams, and the microgram, which is 0.000001 gram. They will also convert between Fahrenheit and Celsius temperatures and will learn about the unit of temperature called the kelvin. Units of measure other than distance, mass, and capacity will be introduced. (For example, there are units of electric current, such as the ampere, and units of light intensity, such as the candela.)

Connections

Zoos have many different sizes and shapes of animals and use different kinds of scales to weigh them. Some large animals can be led to and will stand on a veterinary scale while others will require bench or platform scales. Smaller animals can be weighed using baby or food scales.