

Measurement: Balance Activity

Scientific Background

The *mass* of an object is the amount of matter it is made of. An object's mass is not dependent on gravity, so the mass of an object on Earth is the same as its mass anywhere else in the universe. Mass is different from weight, because weight is subject to the forces of gravity. For example, a person's weight on Earth's moon is about one-sixth of their weight on Earth. Scientists often measure mass either in grams (g) or kilograms (kg).

Finding the mass of an organism can give clues about it as well as provide information about the general population of that type of creature. For instance, by finding the mass of a group of Monarch larvae, we can find out if there is a difference in mass between males and females. We could compare the masses of Monarch larvae living in one location to a different group living in another location. By collecting and comparing data about the mass of each larva in a group, students can make hypotheses about all the organisms in the group. These hypotheses can be tested through further investigation and data collection.

One way to measure mass is to use a *balance*. A balance is an instrument that can be used to measure the mass of an object.

There are two balance activities in Level 2 of Backyard Bugs. One can be found by navigating to the Monarch Butterfly screen, then clicking the balance icon at the bottom of the screen. The other can be found by navigating to the Monarch Caterpillar screen, then clicking the balance icon at the bottom of the screen.

Vocabulary

- adult
- caterpillar
- larva
- balance
- female
- male

*Vocabulary definitions can be found in the **Backyard Bugs** Glossary.*

Thinking Question

Why would there be a difference in masses between Monarch larvae that live in the same location?

Exploratory and Extension Activities
Additional Exploratory and Extension activities are available in the
Backyard Bugs Teacher’s Guide.

Monarch Butterfly Migration

Using a United States or world map and colored pins or dots, plot the migration path of a population of Monarch butterflies. Use data found at Journey North (“Engaging Students in a Global Study of Wildlife Migration”) (www.learner.org/jnorth) or other resources.

Using a world map and colored pins or dots, identify the countries around the world where Monarch butterflies have been sighted. Have students name the country, its capital, and the continent it is found on.

Name: _____

**Measurement: Balance Activity
Part 1**

Find the mass of each Monarch larva. Record the data in the table.						
	Larva 1	Larva 2	Larva 3	Larva 4	Larva 5	Larva 6
Mass (in Grams)	g	g	g	g	g	g

**What is the average mass of the Monarch larvae?
Explain how you found the answer.**

**Based on their masses,
what can you conclude about these six Monarch larvae?**

Name: _____

**Measurement: Balance Activity
Part 2**

Find the mass of each Monarch butterfly. Record the data in the table.						
	Female 1 (F₁)	Female 2 (F₂)	Female 3 (F₃)	Male 1 (M₁)	Male 2 (M₂)	Male 3 (M₃)
Mass (in Grams)	g	g	g	g	g	g

**What is the average mass of the Monarch butterflies?
Explain how you found the answer.**

**Based on their masses,
what can you conclude about these six Monarch butterflies?**

Answer Key
Measurement: Balance Activity
Part 1

Find the mass of each Monarch larva. Record the data in the table.						
	Larva 1	Larva 2	Larva 3	Larva 4	Larva 5	Larva 6
Mass (in Grams)	1.957 g	2.059 g	1.954 g	2.090 g	1.979 g	2.088 g

**What is the average mass of the Monarch larvae?
Explain how you found the answer.**

To find the average mass of the Monarch larvae, add the masses of each of the six larvae. Then divide by 6.

$$1.957 + 2.059 + 1.954 + 2.090 + 1.979 + 2.088 = 12.127$$
$$12.127 \div 6 = 2.021$$

The average mass of the six Monarch larvae is 2.021 grams.

**Based on their masses,
what can you conclude about these six Monarch larvae?**

Student answers will vary. There may have been a difference in the amount of food available to the larvae, and this is a factor in their masses.

Answer Key
Measurement: Balance Activity
Part 2

Find the mass of each Monarch butterfly. Record the data in the table.						
	Female 1 (F₁)	Female 2 (F₂)	Female 3 (F₃)	Male1 (M₁)	Male 2 (M₂)	Male 3 (M₃)
Mass (in Grams)	0.3563 g	0.3831 g	0.3440 g	0.4923 g	0.4403 g	0.5213 g

**What is the average mass of the Monarch butterflies?
Explain how you found the answer.**

To find the average mass of the Monarch butterflies, add the masses of each of the six butterflies. Then divide by 6.

$$0.3563 + 0.3831 + 0.3440 + 0.4923 + 0.4403 + 0.5213 = 2.5373$$
$$2.5373 \div 6 = 0.4229$$

The average mass of the six Monarch butterflies is 0.4229 grams.

**Based on their masses,
what can you conclude about these six Monarch butterflies?**

Student answers will vary. Some of the butterflies in the group may be males, and some may be females. There may be a difference in mass between males and females. There may have been a difference in the amount of food available to the Monarch butterflies when they were larvae, and this is a factor in their masses as adults.