LESSON

What's Happening to the Pikas?

Grade Levels: K-3
Duration: 50 min

In this unplugged computational thinking activity, learners will work in teams to investigate how human actions have impacted pikas. They will look for patterns to explore how climate change is threatening the pika's survival.

Outline

Frame the Activity	**20 min total**
Activate Prior Knowledge	15 min
Introduce Computational Thinking	5 min
Computational Thinking Activity	**25 min total**
Pika Patterns Card Sorting Activity	10 min
Share Out	15 min
Closing	**5 min**
Debrief	5 min

Grade Levels: K-3

Duration: 50 min

Concepts/Skills

Computational thinking, pattern recognition, climate change

Objectives

Students will:

- Learn about the American pika.
- Use pattern recognition to sort cards containing information about the pika and its environment.
- Share the patterns they found and develop theories as a class on why the pika population is dwindling.

Materials and Preparation

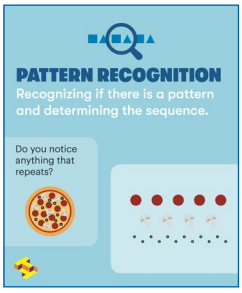
Materials

For the classroom:

- ☐ Whiteboard/chart paper and marker
- ☐ Pika Pattern Cards (1 set per pair)
- ☐ Device to project a video
- ☐ *Optional*: Materials for creating informational posters
  - ☐ Poster paper (1 per pair)
  - ☐ Writing and coloring utensils (pencils, markers, etc.)
- ☐ *Optional*: Computational Thinking Elements posters (**English** and **Spanish**)







Preparation

1. Print and cut the Pika Pattern Cards.
   - Each pair of students will need one set of the double-sided cards.
   - ***Note***: For beginning engineers cards can be printed single-sided without text.
2. *Optional*: Hang up The Tech's Computational Thinking Poster on Pattern Recognition

Background Information

What are Pikas?

The **American pika** is a small mammal that resembles a hamster, but is more closely related to rabbits and hares. They live in the cool, mountainous regions of Western North America. They are well-adapted to these cold environments and do not hibernate in the winter. However, this also means that the pika can not survive in temperatures above 78 degrees Fahrenheit, making global warming a direct threat to their survival. This also means the pika is an excellent **indicator species,** or a plant or animal group whose population reflects the environmental health of an ecosystem. By investigating what is happening to the pika, we can better understand the effects of climate change on mountainous ecosystems in general.

What is Computational Thinking?

Computational thinking is a problem-solving process that can be used in everyday life and applied to a wide range of tasks and problems. Although we may not commonly associate it with a field like wildlife science, computational thinking skills like pattern recognition can help younger learners to interpret the world around them and explore what is happening within it. This activity is designed to guide younger learners in using pattern recognition specifically.

The Tech Academies

This lesson was developed in partnership with educators from The Tech Academies Fellowship program. Tech Academy Fellows learn to be leaders of engineering education while designing and testing STEM resources to be shared with other educators.

Frame the Challenge

Activate Prior Knowledge *(15 min)*

1. Start by exploring what learners already know about human effects on wild animal populations.
   - **Guiding Questions** could include:
     - *Do you think the number of animals in the wild is getting bigger or smaller? Why?*
     - *Can you think of ways that human activity could harm the environment?*
     - *What could happen to wildlife if the climate and place they live in changes too fast?*
   - If learners need more context, see **Content Connections.**
2. Let learners know that today they are going to explore what is happening to a specific wild animal called the American pika.
   - Unfortunately, scientists are finding that there are less pikas than there used to be.
   - Their job is to **investigate** what could be happening to the pikas.
3. Project "**Pikas in the Rockies steal from their neighbours to survive**," Canadian Broadcasting Corporation, YouTube video *(4:28 min)*, that introduces the pika and shows how they create haystacks to eat during the winter.
   - Lead a short discussion on what learners observed from the video.
     - *What do the pikas eat?*
     - *What does their **habitat** (home) look like?*
     - *How does the pika survive during the winter?*
   - As students share their observations, write them on the board or chart paper.
4. Introduce the **design scenario:**

> *You and your team of forest rangers are on a mission to figure out what is happening to the pikas! Your job is to figure out why pikas are disappearing by learning more about them and looking for patterns.*

Introduce Computational Thinking *(5 min)*

1. Let learners know that they are going to be using **computational thinking** to investigate what is happening to the pikas.
   - *When I say computational thinking, what does that make you think of?*
   - *What words do you recognize in computational thinking?*
   - *You may have noticed the words "computer" and "thinking;" how does a computer think?*
2. Explain to learners that today they are going to be using one of the skills of computational thinking called **pattern recognition**. This means that they will be looking for patterns.
   - Ask learners to share examples of patterns they see in their own life.
   - *Optional*: If you have The Tech's **Computational Thinking Poster on Pattern Recognition** up, refer to it at this time.

3. Show learners a set of **Pika Pattern Cards**. Let them know they will be working in teams to group the cards by the patterns they discover.
   - Practice by asking the class to look for places around the room where they see color patterns.
   - Emphasize that there is no right or wrong way to group the cards as long as they can explain their thinking.

Pattern recognition: Recognizing if there is a pattern and determining the sequence.

Real-world examples of patterns:

- Honeycomb
- Fish scales
- Shapes on a quilt
- Spirals on sea shells

See The Tech's resources on **Computational Thinking** for more information.

Career Connection: Wildlife Conservation Research

Ever wondered what a job in wildlife conservation looks like? Meet Dr. Jessica Castillo Vardaro, an Assistant Professor of Ecology and Evolutionary Biology in the Biological Sciences Department at San Jose State University. She studies the American pika to learn how human impacts like climate change are affecting native wildlife. She first got interested in studying the pika as an undergraduate at UC Berkeley, where she participated in the Grinnell Resurvey Project, which aimed at assessing how California's wildlife have responded to environmental changes a century following the original survey.

Dr. Castillo Vardaro's research includes a combination of fieldwork and lab work, allowing her to spend summers working outdoors in high elevation meadows and the school year using molecular genetic approaches to investigate what is happening to the pika. Since pikas can not survive in warmer climates, her work exploring how climate change is affecting the pikas persistence is important for conservation of all wildlife.

Check out the **Castillo Vardaro Lab** website to learn more about Dr. Castillo Vardaro and her research on the American pika. Visit the **The Grinnell Resurvey Project** to learn more.

Computational Thinking Activity

Pika Patterns Card Sorting Activity *(10 min)*

1. Put learners into pairs. Pass out a set of **Pika Pattern Cards** to each team.
2. Walk around the room and observe the groups as they decide how to sort the cards. Ask open-ended questions to encourage learners to consider different ways of grouping.
   - *Where do you see cards with similar pictures?*
   - *Do you see any pictures that show us what is happening to the environment?*
   - *What do we already know about the pika that could help us find patterns?*
3. If learners get stuck, remind them that there is no correct answer and there may be more than one way to group the cards.
4. Bring the class back together when the time is up.

Adaptations for Younger Engineers

- Looking for patterns might be brand new for young engineers. Consider including time for learners to explore what patterns look like before attempting the card sorting activity, such as reviewing AB patterns or trying a sorting activity.
- Try breaking down the activity into a week-long lesson. Shortened sections each day could include:

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Talk about endangered or threatened animals.	Introduce the pika by watching the video or reading a picture book.	Explore pattern recognition.	Learners try Pika Pattern Card Sorting Activity.	Learners draw pictures of the pika and what they think it needs from its environment, then share out with the class.

Share Out *(15 min)*

1. Have each team share what patterns they discovered by grouping the cards.
   - Ask teams to explain their reasoning by including a prompt.
     - *E.g.: "We put these together because __."*
   - Write each new grouping mentioned on the board or chart paper.
2. After all the teams have shared, ask learners to look at the list of groupings and consider if any of the patterns they discovered might help them figure out what could be happening to the pikas.
   - Write down their theories on the board or chart paper.
   - If learners do not include a theory around temperatures getting too warm, add it to the list.
3. Write the following sentence frame on the board or chart paper: *If their environment gets ___, then there are ___ pikas.*
   - Ask learners to consider the theories on the board or chart paper to help them complete the sentence as a class.
     - *If their environment gets warmer, then there are less pikas.*

STEM Storytime

Climate change can be a scary topic. Try introducing students to the effects of global warming on pikas through one of these picture books. These stories share about the lives of pikas while asking questions about the ways our changing climate affects their environment.

- *Cony the Pika's Warming World* by Sylvester Allred
- *Posie The Pika* by Mehnaz Nazeer
- *Pika Country: Climate Change at the Top of the World* by Dorothy Hinshaw Patent and Marlo Garnsworthy

Content Connections

This activity aligns well with content on climate change and other effects human populations have on the earth's wildlife populations. Check out these websites...

Learn more about the American pika and how climate change is threatening this species.

- **"Pikas have some fight in them yet,"** Anthropocene Magazine website
- **"American Pika,"** National Wildlife Federation website
- **"Pikas in Peril: Tiny Mountain Mammal Faces Uncertain Future,"** Natural Resource Stewardship and Science Directorate (U.S. National Park Service) website

Investigate the impact human actions have had on wildlife populations.

- **"Human Pressures Have Shrunk Wildlife Populations by 60 Percent,"** Scientific American website
- **"Animal species are disappearing, and we the people are the problem,"** Washington Post

Find more resources to engage young learners:

- **"A Guide to Climate Change for Kids,"** NASA website
- **"A Kids guide to climate change,"** NPR website
- **"10 Climate Change Activities for Kindergarten."** Subject to Climate website

Explore solutions to the climate crisis by visiting the **Solve for Earth** exhibit at The Tech Interactive.

Debrief *(5 min)*

1. Lead a short debrief in which students reflect on the key concepts. Possible **Debrief Questions** include:
   - *What was challenging about looking for patterns?*
   - *Did you notice any patterns between human activity and what is happening to the pikas?*
   - *Can you think of an example you have seen where someone looks for patterns to solve a mystery?*

Extension

- **Inform**: Help raise awareness about the pika's dwindling population by creating an informational poster. Ask students to include ways that human actions have impacted them and suggestions on how humans can help save the pika.
- **Take Action**: Create real-world connections by introducing learners to community science projects striving to save the pika, such as **"Colorado Pika Project,"** Pika Partners website, or **"High Country Citizen Science Project,"** National Park Service website.

Standards Connections

Next Generation Science Standards

Grade	Performance Expectation	Description
K	ESS3-3	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
1	LS1-2	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
3	LS4-4	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
Science and Engineering Practices		Obtaining, Evaluating, and Communicating Information
Cross Cutting Concepts		Cause and Effect

California Computer Science Standards

Grade	Performance Expectation	Description
K-2	DA.9	Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4.1)
3-5	DA.9	Use data to highlight and/or propose relationships, predict outcomes, or communicate ideas. (P7.1)

Vocabulary

- **American pika:** A small, mountain dwelling mammal related to rabbits and hares
- **Computational thinking:** A way to solve problems that uses logic and thinking that a computer can understand
- **Habitat:** A place where an animal makes its home
- **Indicator species:** A plant or animal group whose population reflects the environmental health of an ecosystem
- **Investigate:** To explore or find out about something
- **Pattern recognition:** Recognizing if there is a pattern and determining its sequence

Pika Pattern Cards (Front)

Instructions

Print double-sided and cut out cards. Each set includes 24 cards.

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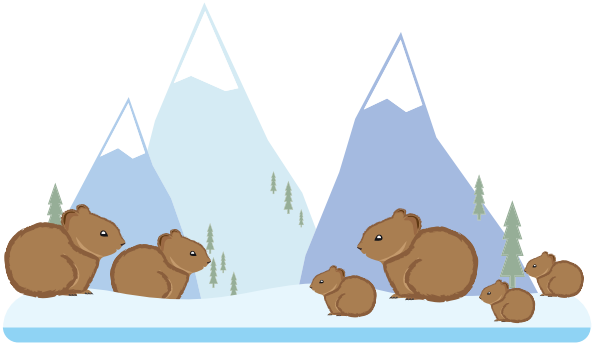

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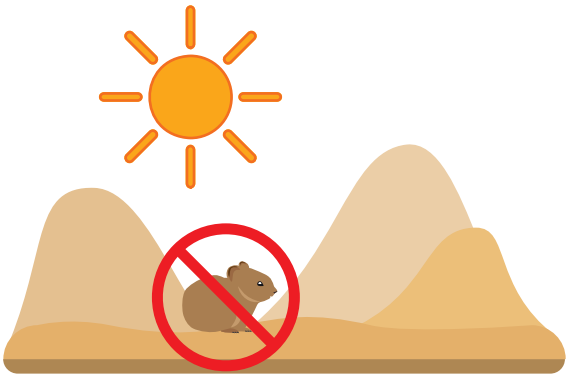

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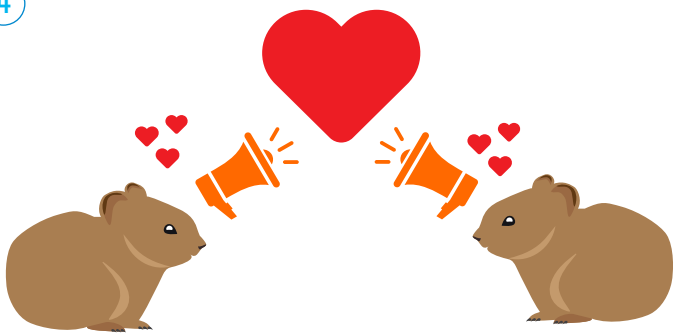

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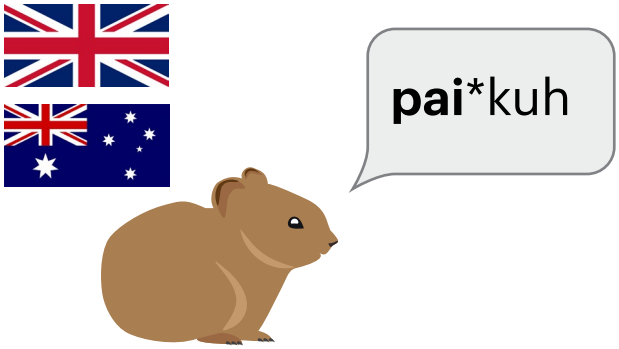

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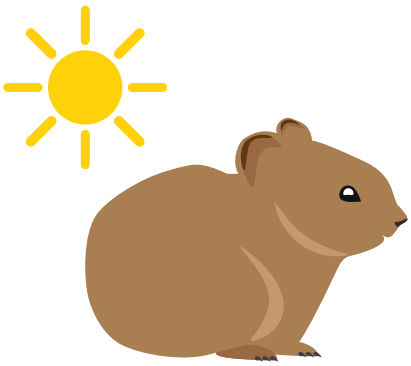

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Pikas cannot survive outside cold environments.

1

Pikas are well adapted to cold environments.

4

Pikas make squeaky calls to attract mates.

3

Pikas are often heard before they are seen.

6

In the United States of America pika is pronounced: pee·kuh

5

Pikas make squeaky calls to alert other pikas to dangers.

8

Pikas have a lighter fur coat in the summer.

7

In the United Kingdom and Australia pika is pronounced: pai·kuh

Pika Pattern Cards
(Front)

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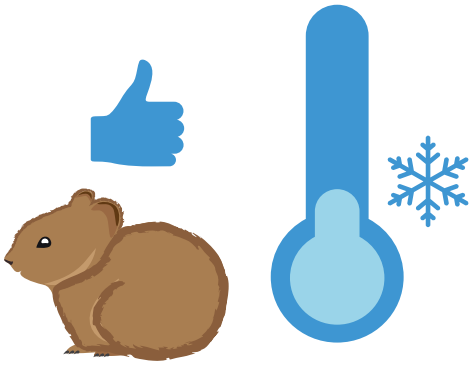

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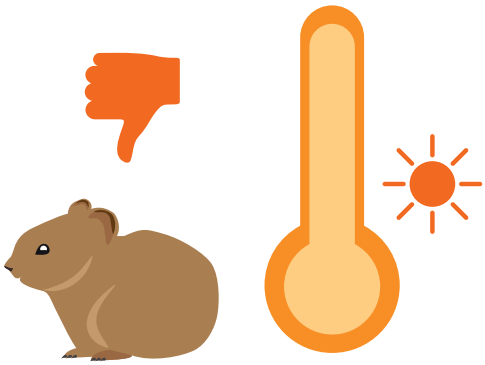

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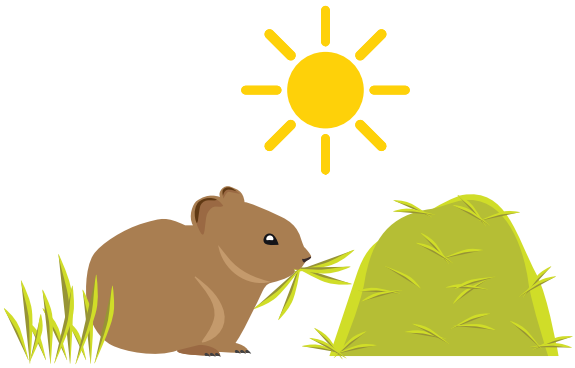

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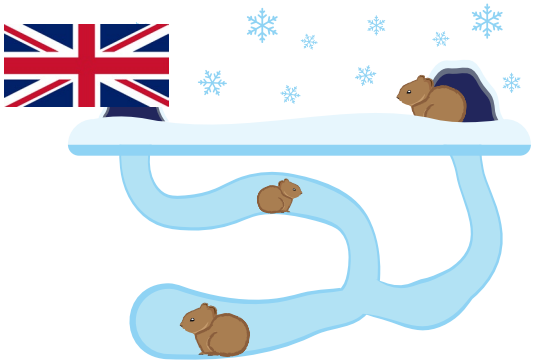

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10

Pikas are uniquely adapted to cold weather.

9

Pikas have a thicker fur coat in the winter.

12

During the summer, pikas collect and store grass and other plants in hay piles.

11

Pikas can overheat if they are in high temperatures for too long.

14

Pikas do not hibernate in the winter.

13

Pikas eat the grass they stored during the winter months.

16

Pikas live high in the mountains.

15

Pikas spend the winter building tunnels in the snow.

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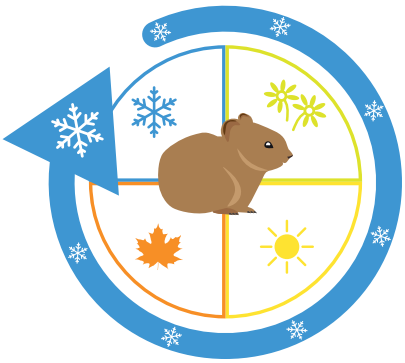

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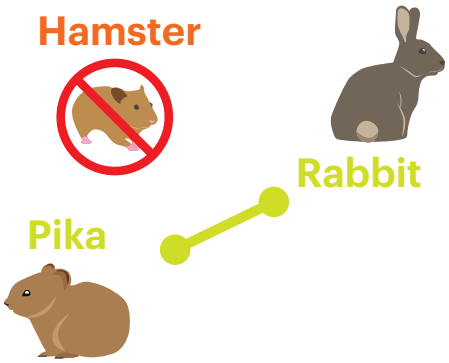

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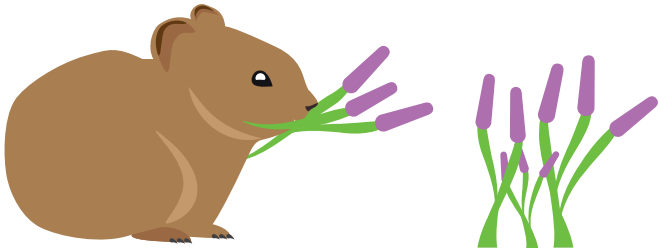

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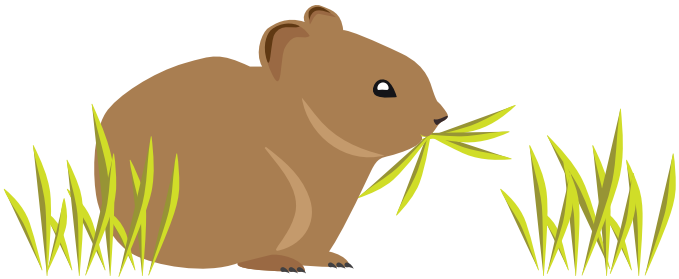

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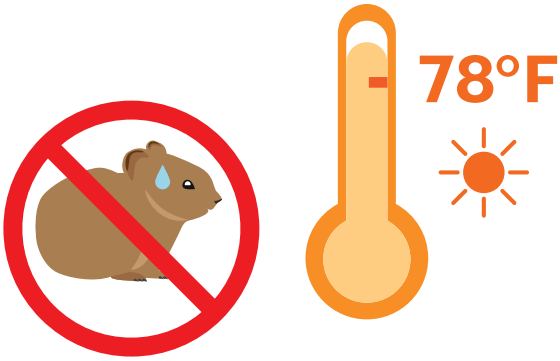

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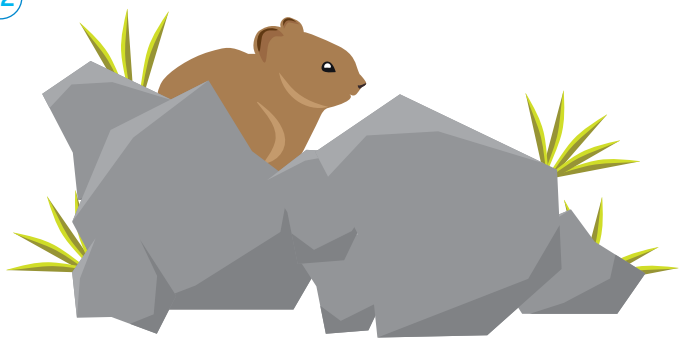

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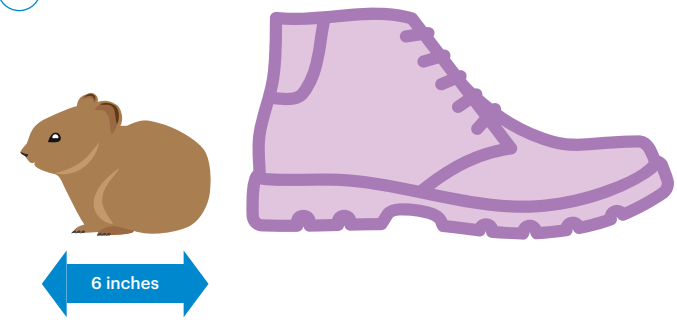

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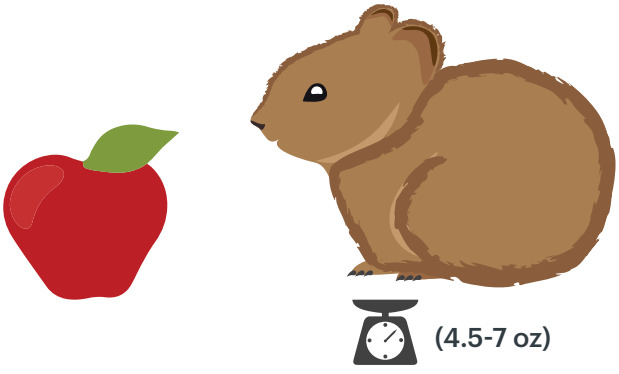

18

Pikas might look like hamsters, but they are actually closely related to rabbits and hares.

17

Where pikas live temperatures are cool all year.

20

Pikas eat grasses and weeds.

19

Pikas eat wildflowers.

22

Pikas live in rocky areas.

21

Pikas can not survive in temperatures above 78 degrees F.

24

Pikas do not weigh much.

23

Pikas are small and round.