Neʻepapa Ka Hana 2.0
Sixth-Grade Mathematics Resources
STEMD² Book Series

STUDENT ACTIVITIES

LET'S GO FROM MAUKA TO MAKAI

STEMD² Research & Development Group
University of Hawaiʻi at Manoa

STEMD^2 Research & Development Group
Center on Disability Studies
College of Education
University of Hawai'i at Mānoa

http://stemd2.com/

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Ne‘epapa Ka Hana Sixth-Grade Mathematics Resources

Let’s Go from Mauka to Makai

Student Activities

Project Director — Kaveh Abhari

Content Developers — Robert G. Young, Justin S. Toyofuku

Creative Designer — MyLan Tran

Publication Designer — Robert G. Young

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Unit 1: Numbers

In this unit, we'll learn how to use positive and negative integers, fractions, and decimals to describe situations through Hawai'i's vast biodiversity and unique ecosystem. There are four activities in this unit. *Module 1* involves working with integers to find species at different altitudes on the Islands of Hawai'i, *Module 2* focuses on how to use factors and multiples to support our native environment, and *Module 3* explores the rain seasons of Hawai'i with the help of rational numbers. The final activity is cumulative and incorporates concepts from each of the previous activities in this unit.

Module 1: Integers *Activity*

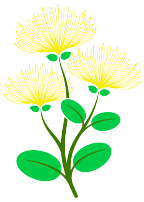
Biodiversity refers to how many different kinds of living organisms are present in an area. For example, a farm with 1000 chickens has less biodiversity than a farm with a chicken, a duck, a cow, and a pig. The Hawaiian Islands are known for having incredible biodiversity. From the bottom of the ocean to the top of the mountains, we can find a large variety of plants, animals, and other types of life.

Let's take a few days to travel the Big Island of Hawai'i. We will write down some of the life we see and the altitude (height) above sea level that we see it.

We will start the week by exploring the mountains. On the top of Mauna Kea we find a rare Wēkiu beetle at an altitude of 3725 meters. At an altitude of 1432 meters on a nearby mountain, we see the state bird of Hawai'i, the Nēnē goose. On the way down, we see an 'ōhi'a lehua plant with beautiful flowers at an altitude of 1202 meters.

Wēkiu beetle

Nēnē goose



'Ōhi'a lehua

On Friday, we sail out into the ocean. You lower a fishing line down to -642 meters and catch an opakapaka. Your friend lowers a line as deep as she can. Her line goes down 1432 meters below sea level, and she pulls up a skinny fish, with a huge mouth, called a gulper eel.

Opakapaka

Gulper eel

The following weekend, we visit a white sandy beach. While swimming offshore, we see a tiny krill at an altitude of about -1 m (or 1 meter below sea level). At sea level, we spot a Portuguese man o' war floating around. We swim around it and carefully climb 1 meter up a few slippery rocks to collect some delicious opihi.

Krill

Portuguese man o' war

Opihi

1. Use the following table to write down the names of the plants and animals that we saw and the altitude that we saw them. Be sure to use negative numbers for animals that were found below sea level.

Plant/animal name	Altitude spotted (meters)

2. Write down the name of the plants/animals in a list from **lowest altitude to highest altitude**.

   (Lowest altitude) (Highest altitude)

3. Write down the name of the plants/animals from **closest to furthest from sea level** (0 meters). If two plants/animals have the same distance from sea level, then write them next to each other.

   (Closest to sea level) (Furthest from sea level)

4. With some practice, many people are able to dive down to $\mathbf{10}$ meters below sea level or hike up to an altitude of 1500 meters without much effort. Let x be the altitudes that we can go to.

   (a) If we cannot go any lower than 10 meters below sea level, then what are the altitudes that we **can** go to? (Circle one): $x \geq 10$ $x \leq 10$ $x \geq -10$ $x \leq -10$

   (b) If we cannot go any higher than an altitude of 1500 meters, then what are the altitudes that we **can** go to? (Circle one): $x \geq 1500$ $x \leq 1500$ $x \geq -1500$ $x \leq -1500$

   (c) List the animals that could have been spotted just by diving or hiking.

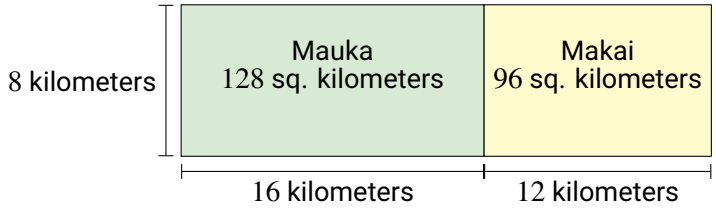
5. Which of these plants and animals have you seen in real life? Where did you see them?

6. What is the most interesting plant or animal that you have seen in Hawai'i? What was so interesting about it?

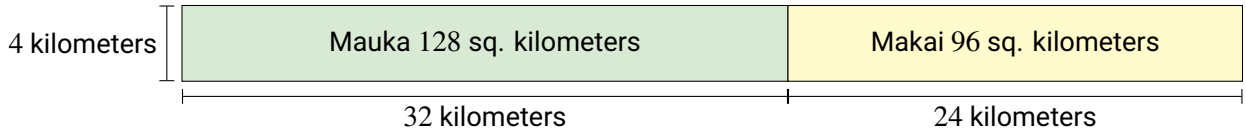
Module 2: Factors and Multiples *Activity*

To improve the condition of our environment, the government has decided to protect a large slice of land called an ahupua‘a. All ahupua‘a are made up of two parts, the mauka and the makai. The mauka part is close to the mountains and the makai part is close to the sea. We don’t know the exact measurements of the protected ahupua‘a, but we do know that the **mauka part has an area of 128 square kilometers**, and the **makai part has an area of 96 square kilometers**. We also know that the ahupua‘a and its parts are shaped like rectangles.

For example, if the protected ahupua‘a is 8 kilometers wide, then the mauka part must be 16 kilometers long and the makai part must be 12 kilometers long.



For another example, if the protected ahupua‘a is only 4 kilometers wide, then the mauka part must be 32 kilometers long and the makai part must be 24 kilometers long.



1. Suppose that the width is a **whole number**, draw at least two more possible rectangles to represent the protected area. Be sure to label the sides of your drawings just like in the example above.

2. If the width is a **whole number**, what is the largest width that the rectangle can be?

The government is asking for your help in taking care of this area by visiting it regularly. They want you to visit the mauka part **once every 8 weeks** and let them know if that area is doing well. They also want you the visit the makai part **once every 3 weeks** and let them know if it is doing well. This week, you will check on both the mauka and makai areas.

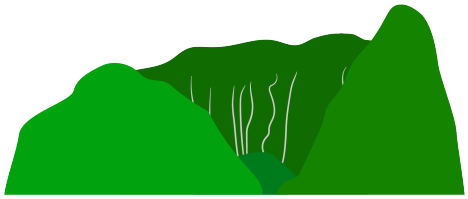
3. Sometimes you will have to visit both parts in the same week. **How often** does this happen?

4. If you needed to take care of the ahupua'a for the next 80 weeks, during which weeks would you visit both parts? **How many times** will you need to visit both parts in the same week? Be sure to count this week as the first time.

5. If you visited these protected areas, what would you look for to determine if the area is doing okay? Why would you look for these specific things?

Module 3: Rational Numbers *Activity*

Mount Waiʻaleʻale on Kauaʻi is one of the rainiest places on Earth. Normally, rainfall is measured in inches, but since it rains so much on Mount Waiʻaleʻale, we can measure it in feet.



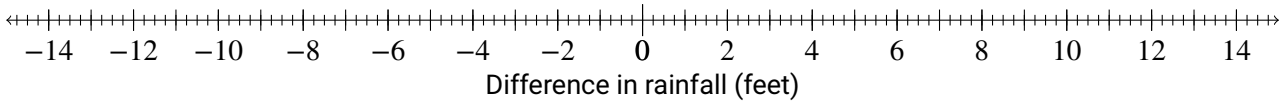
Mount Waiʻaleʻale

We want to compare the rainfall on Mt. Waiʻaleʻale with another rainy place called Mawsynram (“mah-sin-rem”) in India by calculating the difference. Let’s take the rainfall from Mt. Waiʻaleʻale and subtract the rainfall from Mawsynram. Here is the data.

	Rainfall (feet)		
Season	Mt. Waiʻaleʻale	Mawsynram	Difference
Spring	$8\frac{1}{2}$	$6\frac{1}{5}$	$2\frac{3}{10}$
Summer	7.3	21.5	-14.2
Fall	$7\frac{3}{5}$	$4\frac{2}{5}$	$3\frac{1}{5}$
Winter	7.05	0.2	6.85

1. In the table above, are there any pairs of numbers that are exactly opposite? If so, which pairs?

2. For each season, plot the “difference” column on the number line. (Do not plot any of the other numbers on the table.)



Difference in rainfall (feet)

3. When the difference in rain is 0, both Mt. Waiʻaleʻale and Mawsynram have the same amount of rainfall. What about when the difference is negative or positive?

Mt. Waiʻaleʻale / Mawsynram has more rainfall when the difference is **negative**.

(circle one)

Mt. Waiʻaleʻale / Mawsynram has more rainfall when the difference is **positive**.

(circle one)

4. Which season has the largest difference between rainfall in Mount Waiʻaleʻale and Mawsynram? How can you tell?

5. Which season has the smallest difference between rainfall in Mount Waiʻaleʻale and Mawsynram? How can you tell?

6. Let's compare the "difference" in the summer with the seasons that are not summer.

   (a) Write down the difference in rainfall in the summer.

   (b) Add up all of the differences from **spring**, **fall**, and **winter** to find the difference of the seasons that are not summer.

7. In one year, does it rain more in Mount Waiʻaleʻale or Mawsynram? How can you use part 6 to help you answer this question?

8. Of these two places, which one would you consider to have "the most unusual" weather and why?

Unit 1: *Cumulative Activity*

Ancient Hawai‘i used to be full of strong koa trees and fragrant ‘iliahi (sandalwood) trees, but centuries of deforestation have made most of these trees and the animals that depend on them disappear. Now volunteers are working to bring the trees back.

Koa sapling

‘Iliahi sapling

Kahā and Kekai are two gardeners who specialize in growing saplings (baby trees) of native plants. Kahā plans to donate 180 koa saplings, and Kekai will donate 120 ‘iliahi saplings. They will put them into packages and give them to volunteers who will plant and take care of them. Each package will contain the same mix of saplings, and no saplings will be left over once the packages are filled.

1. Kahā and Kekai are trying to decide how many koa and ‘iliahi saplings to put in each package. For example, if each package has 18 koa and 12 ‘iliahi, then they can make 10 packages.

   Work with a partner to list **other possible ways** to package the koa and ‘iliahi.

Koa per package **18** ‘Iliahi per package **12** Number of packages **10**	Koa per package ‘Iliahi per package Number of packages	Koa per package ‘Iliahi per package Number of packages
Koa per package ‘Iliahi per package Number of packages	Koa per package ‘Iliahi per package Number of packages	Koa per package ‘Iliahi per package Number of packages
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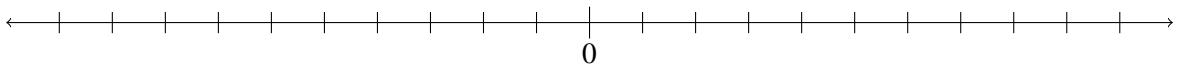
Koa per package ‘Iliahi per package Number of packages	Koa per package ‘Iliahi per package Number of packages	Koa per package ‘Iliahi per package Number of packages

2. What is the maximum number of packages Kahā and Kekai can make?

After receiving the donations, the volunteers begin to plant their saplings. Over the next few weeks, many trees will be planted but some will die. Below is a table that shows how the number of trees have changed since the saplings were planted. For example, "15" means that there are 15 more trees now than before the saplings were planted. "−5" means that there are 5 less trees now than before the saplings were planted.

Week	Change in number of trees
0	0
1	3
2	−2
3	−6
4	−5
5	1
6	6

3. For each week, plot the "change in number of trees" on the number line. Make sure to label the number line.



4. Determine whether the following statements are **true or false**.

   (a) There were more trees in week 3 than week 2. True or False

   (b) There were more trees in week 4 than week 3. True or False

   (c) There were more trees in week 3 than week 6. True or False

   (d) There were more trees in week 5 than week 4. True or False

   (e) Two of the numbers in "change in number of trees" column are opposite. True or False

5. Restoring a forest doesn't always work as planned. A new sapling has to fight for sun, water, and nutrients while facing bad weather, pollution, and pests. If you wanted to learn how to grow a plant, what kind of plant would you choose and why? Please share your thoughts with your partner or in the online comment section.