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

STUDENT ACTIVITIES

LET'S GO FROM MAUKA TO MAKAI

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Ne‘epapa Ka Hana Sixth-Grade Mathematics Resources

Let’s Go from Mauka to Makai

Student Activities

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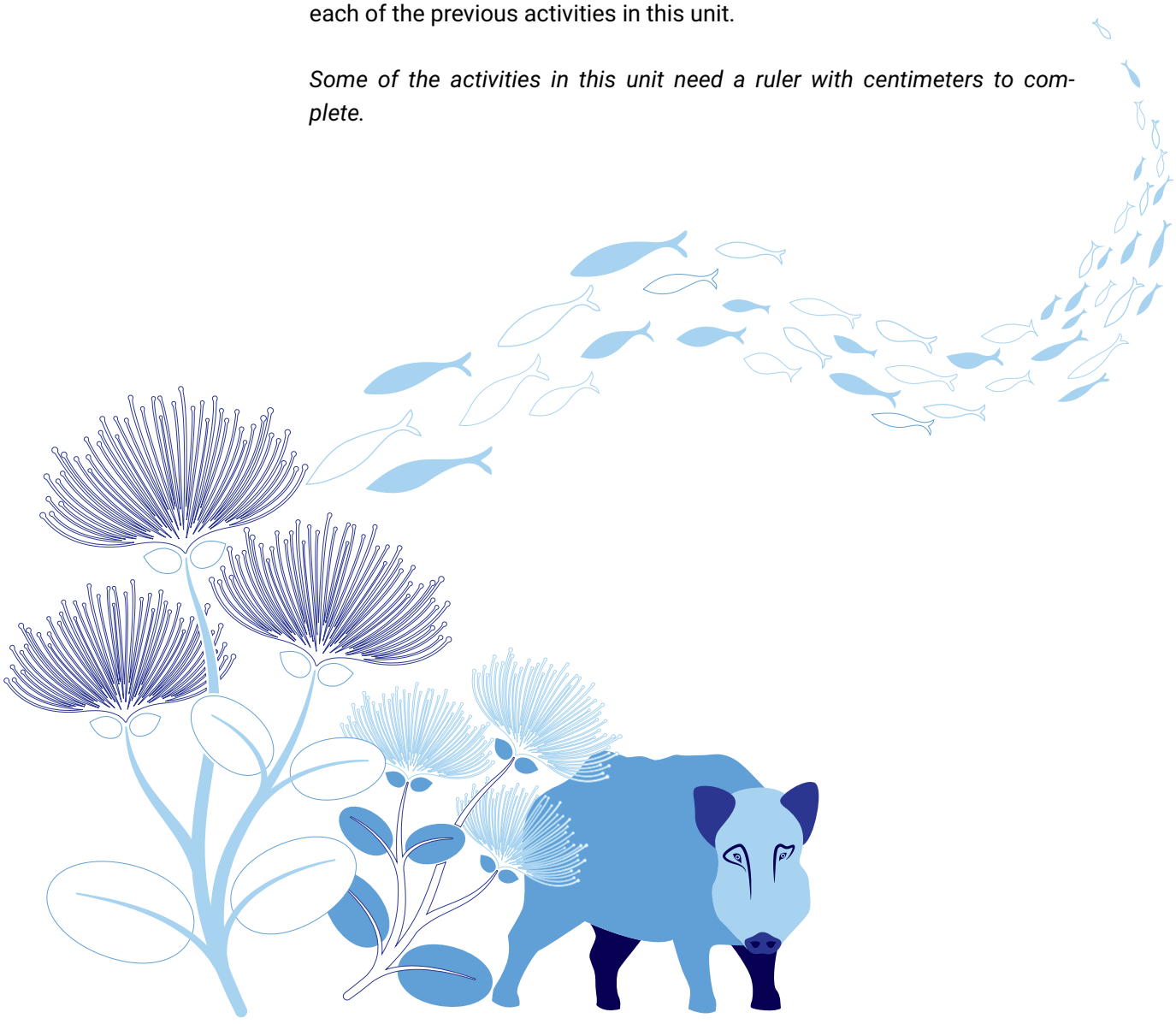
Unit 3: Proportionality: Ratio and Rates

In this unit, we'll learn how to use ratios and rates to convert measurements and describe situations through avoiding lava flows and surveying invasive and non-invasive fish populations. There are five activities in this unit. *Module 6* involves representing ratios and rates by evaluating an invasive fish population. *Module 7* has two activities where students guide the keiki to safety by applying ratios and rates to a map in order to avoid Island dangers. *Module 8* explores a variety of fish populations through the use of percents. The final activity is cumulative and incorporates concepts from each of the previous activities in this unit.

Some of the activities in this unit need a ruler with centimeters to complete.

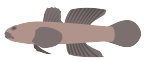


Module 6: Representing Ratios and Rates *Activity*

When fish or other living things move to new locations, the fish can completely take over its new environment and everything that lives there. When this happens, the fish is called invasive. If the fish was there originally or if it doesn't cause harm, then the fish is called non-invasive. You are at a river in Downtown Honolulu and you are counting the number of invasive and non-invasive fish. You notice that there is a new fish in the river. Let's track the impact of the new fish on the invasive and non-invasive fish populations over the next few years.

Year	Non-invasive fish	Invasive fish
1	150	6
2	138	12
3	126	18
4	114	24
5		
6		
7		
8		
9		
10		

Examples

Non-invasive fish in Hawaii	Invasive fish in Hawaii
 ʻOʻopu (freshwater goby)	 Bass
 ʻAmaʻama (striped mullet)	 Catfish
 Āholehole (spotted flagtail)	 Cichlid

1. It looks like the non-invasive fish population is dropping at a constant rate, and the invasive fish population is increasing at a constant rate. **What are the rates?** In other words, how much does the number of fish change per year? Make sure to use positive numbers to show that a number is growing and negative numbers to show that a number is shrinking.

   Non-invasive fish: _____ fish per year Invasive fish: _____ fish per year

2. Complete the previous table for the remaining six years (years 5 to 10).

3. Find the ratio of *non-invasive* to *invasive* fish on the following years. Be sure to reduce your ratios to lowest terms.

   (a) Year 3?

   (b) Year 5?

4. In what year will the ratio of *non-invasive* to *invasive* fish be 1:1?

5. How many of each type of fish do you expect to count in year 12? Explain.

   Non-invasive fish: _____ fish Invasive fish: _____ fish

6. Many plants and animals like kalo (taro), ʻulu (breadfruit), and the monarch butterfly were brought to Hawaiʻi from other places, but they are **not** considered "invasive." Why do you think that is? Can you name other plants or animals that are not from Hawaiʻi and aren't invasive either? Feel free to use the internet or work with a partner if your teacher allows.

Module 7: Applying Ratios and Rates *Activity 1*

For this activity you will need a ruler with centimeters.

A lava flow is coming! You have to help the keiki navigate this ahupua‘a to get home safely.

1. Using **straight lines**, draw a path from the **keiki** to the **home**. You may use the bridge or the sandbar to get across the river, but stay out of the water and off of the lava flow. Make sure that there are no breaks in the lines that you draw.

2. Use your ruler to measure the total length of your lines in centimeters. Round your final total to the nearest centimeter.

   Total length: _____ cm

3. For this map scale, 40 feet in real life is represented by 5 centimeters on the map. How many feet in real life does each centimeter on the map represent?

4. Complete the following table.

Centimeters on the map	1	2		4	5	10		20
Feet in real life			24		40	80	88	

5. How many feet was the length of your path?

Module 7: Applying Ratios and Rates *Activity 2*

This is a follow up of the last activity. Please complete Activity 1 before trying this one! For this activity you will need a ruler with centimeters.

A lava flow is coming! You have to help the keiki navigate this ahupua'a to get home safely.

1. This time, let's work with a partner to find the **shortest** path from the keiki to the house. Using **straight lines**, draw a path from the **keiki** to the **home**. You may use the bridge or the sandbar to get across the river, but stay out of the water and off of the lava flow. Make sure that there are no breaks in the lines that you draw.

2. Find the real distance of your path. Remember, 5 centimeters of your map is 40 feet in real life. Share your solution (map and distance, in feet) and strategy with other groups!

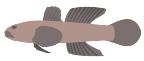
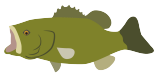
Module 8: Percents *Activity*

Volunteers are visiting several streams in Honolulu to compare how many fish in the streams are invasive. Unfortunately, each volunteer wrote their numbers in a different formats.

Here is what they found.

Stream	Proportion of invasive fish
Kapālama	19%
Makiki	$\frac{2}{7}$
Mānoa	0.21
Nu‘uanu	9%
Pālolo	$\frac{1}{5}$
Wai‘alae	0.3

Examples

Non-invasive fish in Hawaii	Invasive fish in Hawaii
 ‘O‘opu (freshwater goby)	 Bass
 ‘Ama‘ama (striped mullet)	 Catfish
 Āholehole (spotted flagtail)	 Cichlid

1. One way to get this kind of data is to catch a lot of fish and count how many of the fish are invasive. If the volunteers caught 100 fish in each stream, how many invasive fish would you find in each stream? Round to the nearest whole number if needed. Kapālama is already done for you.

Stream	Number of invasive fish out of 100
Kapālama	19
Makiki	
Mānoa	
Nu‘uanu	
Pālolo	
Wai‘alae	

2. Rank the streams from the *lowest* proportion of invasive fish to non-invasive fish to *highest*.

lowest ratio highest ratio

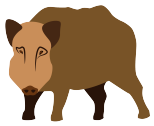
3. Discuss the following questions with a partner. Write your answers and share them with others in your class.

   (a) How do you think the invasive fish got to the rivers in the first place?

   (b) How do you think some of these invasive fish end up taking over a new environment?

Unit 3: *Cumulative Activity*

The pua‘a (pig) was introduced to the Hawaiian islands by the first Polynesian explorers. Although this animal is important to the Hawaiian culture, the pua‘a can be pretty destructive to the environment. This is mainly because they eat a lot of food and they can eat almost anything. When they are looking for food, they may dig up and chew up native plants. After they eat, they may leave poop that contain seeds of invasive plants.



Pua‘a (feral pigs)

The pua‘a can often be found eating plants, roots, mushrooms, bugs, and even small mammals. Typically, the diet of a pua‘a in your ahupua‘a consists of 17 pounds of plants (and fungi) for every 3 pounds of animal meat.

1. Represent this typical diet as a **ratio** of plants (and fungi) to animals.

2. What **percent** of this diet would be of plants? Please explain how you got this answer.

3. What **percent** of this diet would be of animals?

4. Suppose that you found a baby pua‘a in your yard. You know not to let it go because of the damage that it can do to the environment, so your family decides to keep it as a pet. If you had to prepare 500 pounds of food for this pua‘a, how many pounds of plants, and how many pounds of animal meat do you need?

5. As we saw before, the pua'a in this ahupua'a eats 17 pounds of plants for every 3 pounds of animal meat. How many pounds of plants does the pua'a eat for one (1) pound of animal meat? Round your answer to the nearest tenth.

6. If a baby pua'a is eating 10 pounds of meat, how many pounds of plant should it also eat? Round to the nearest whole number.

7. The diet of a pua'a in one ahupua'a can be different from a pua'a in a different ahupua'a. Why do you think their diets might be different?