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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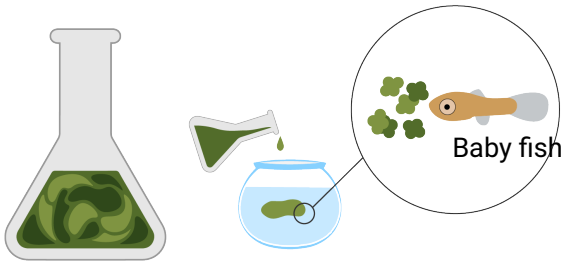
Unit 4: Equivalent Expressions

In this unit, we'll learn how to write algebraic expressions in different ways to describe situations through supporting Hawai'i's unique environment by farming. There are three activities in this unit. *Module 9* involves exploring the growth of algae through generating equivalent numerical expressions. *Module 10* focuses on generating equivalent algebraic expressions while evaluating donations to a reforestation project. The final activity is cumulative and incorporates concepts from each of the previous activities in this unit.

Module 9: Generating Equivalent Numerical Expressions *Activity*

To help the native fish populations, you have decided to raise baby fish at home. First, you need to grow some algae for the fish to eat. You have three types of algae called Type 1, Type 2, and Type 3, and each type grows differently.



Homegrown algae

1. The Type 1 algae is tripling its population every day. After two days, its starting population has multiplied by a factor of 9 or 3^2 (in exponent form). After three days, its starting population has multiplied by a factor of 27 or 3^3 (in exponent form). Please fill out the following table.

Day	Number of times the Type 1 population has multiplied by	
	Factor	In exponent form
1	3	3^1
2	9	3^2
3	27	3^3
4		
5		
6		
7		
8		
9		
10		

2. The Type 2 algae grows more unpredictably. During the first few days, the algae quintupled (multiplied its population by a factor of 5). Then, it tripled its populations for a few days. Finally, it began to double its population every day. After a total of ten (10) days of growth, the Type 2 algae has multiplied its starting population by a factor of 12960.

   (a) Find the prime factorization of 12960 in exponential form.

   (b) Using your answer from 2a, find out how many days, out of the ten days, the Type 2 algae doubled $(\times 2)$, tripled $(\times 3)$, and quintupled $(\times 5)$ its population.

   Double:_____ Triple:_____ Quintuple:_____

3. After D days, the Type 3 algae has multiplied by the following number.

$$1000 \div \left(1024 \div 2^{D} - 0.8\right)$$

   How many times did the original population of this algae multiply after ten days $(D = 10)$?

4. Rank the three types of algae from **slowest** to **fastest** growing after ten (10) days

Module 10: Generating Equivalent Algebraic Expressions *Activity*

A small high school on Hawai'i Island is raising money to buy and plant koa and 'iliahi trees.

Koa sapling 'Iliahi sapling

Below, on the left side are several **classes and a description** of how much money they have each raised. Below, on the right side are several mathematical expressions that describe the **amount of money raised**. The cost of a koa tree is k and the cost of an 'iliahi tree is h.

1. Match each class with at least one expression. A few expressions are equal so **some classes will be matched with more than one expression**.

Freshman class (grade 9):

Each student raised enough money to buy 3 koa and 2 'iliahi trees. There were 7 students.

Sophomore class (grade 10):

The students raised enough money to buy 4 koa and 6 'iliahi trees. Then a local company decided to doubled the money they raised.

Junior class (grade 11):

The students raised enough money to buy 21 koa trees, 14 'iliahi trees, and had \$21 left over.

Senior class (grade 12):

The students raised enough money to buy 21 'iliahi trees and had \$14 left over.

- $21k + 14h$
- $2\,(4k + 6h)$
- $7\,(3k + 2h)$
- $7\,(3k + 2h + 3)$
- $21k + 14h + 21$
- $12h + 8k$
- $21h + 14$
- $7\,(2 + 3h)$

2. If each koa tree cost $\$90$, and each ʻiliahi tree cost $\$110$, find the total amount of money that each class raised.

   (a) Freshman class

   (b) Sophomore class

   (c) Junior class

   (d) Senior class

Unit 4: *Cumulative Activity*

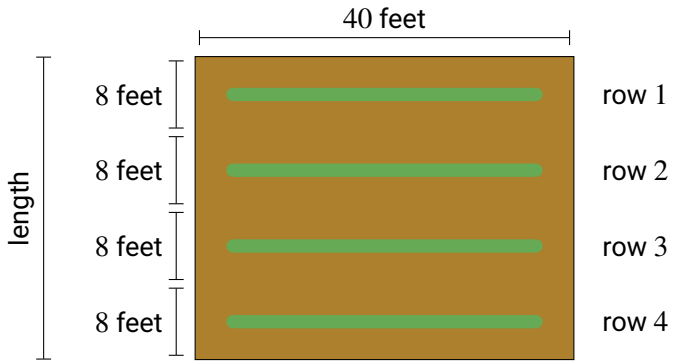
Many animals depend on plants, not just for food, but for shelter as well. For example, the Kamehameha butterfly is an animal that, as a caterpillar, lives on the māmaki plants of Hawai'i.

Kamehameha butterfly

Māmaki plant

There are signs that the Kamehameha butterfly is disappearing from many of its natural habitats. Let's grow a field of māmaki plants to help the butterfly thrive.

1. Right now we are building rows of māmaki plants in a 40 feet wide garden. The length of the garden depends on the number of rows. We need **eight feet for every row of māmaki**. For example, if our garden has 4 rows, then it needs a length of 32 feet.



   If you are building n rows, write an algebraic expression to show what the length of your garden must be.

2. Use the algebraic expression for length (in part 1) to write an expression for the area of the māmaki garden. Check with a friend to see if you have similar answers.

3. Use your expression in part 2 to determine whether the following statements are true or false.

   (a) The area is the **sum** of 320 and n. True or False

   (b) The area is the **product** of 40 and $8n$. True or False

   (c) The area is the **quotient** of 320 and n. True or False

   (d) 320 and n are **factors** in your expression in part 2. True or False

   (e) 40 and $8n$ are **terms** in your expression in part 2. True or False

   (f) n is a **coefficient** in your expression in part 2. True or False

4. You decide to plant 10 rows of māmaki in this garden. What is the total area of the garden? Check with a neighbor to see if you got the same answer.

5. Find the prime factorization of the answer in part 4.

6. Work with a partner to sketch, and label the widths and lengths, of at least 3 other rectangles that have the same area as the garden in part 4.

7. How can the prime factorization of part 5 help you in part 6?

8. Suppose that d number of Kamehameha butterflies land in the garden in part 4, and the Kamehameha butterflies spread out evenly in the area of the garden. Write an expression for the amount of area each of the d Kamehameha butterflies will have to themselves.

9. How much area would each Kamehameha butterfly have if there were...

   (a) 5 Kamehameha butterflies ($d = 5$)? (Round to the nearest tenth if needed.)

   (b) 9 Kamehameha butterflies? (Round to the nearest tenth if needed.)

10. There are 5 Kamehameha butterflies right now. Suppose that the butterfly population doubles every year. How many Kamehameha butterflies would there be in 4 years?