



# Removing Invasives

*A unit about .....*

## UNIT OVERVIEW

This unit integrates math, science, and language arts standards and is designed for collaboration with a marine science community partner. Students will continue to develop fluency in solving and interpreting linear equations and inequalities through the use of tables and graphs. They will encounter issues dealing with invasive species, fishing restrictions, and overpopulation throughout the unit. The unit culminates in a task where students advocate for the value of a volunteer.

## BACKGROUND

*Removing Invasives* is an integrated STEMS<sup>2</sup> unit of study that is designed to function in collaboration with a community-based partner. The organization featured in this plan is Kumuola Marine Science Education Center located on Hawai'i island. Kumuola regularly hosts student groups from kindergarten all the way up to graduate-level students. The staff does a great job of co-designing experiences and tasks that are age- and ability-appropriate for any group. The activities contained in this unit mirror the experiences found at the marine science center and can be modified to be responsive to whatever community partner is used.

In this unit, students expand their skill set of solving and interpreting linear equations and inequalities through the use of tables and graphs. Students write, analyze, and solve two-step equations using positive and negative numbers on four-quadrant graphs. Students identify independent and dependent variables and interpret negative solutions to problem situations. Students participate in a community service activity and collect data to generate a productivity equation.

Students compare graphs of linear equations in different forms. Students analyze the equations and explain how the quantities in each equation can be identified on the graphs of the equations. Students learn about the rules and regulations for the 'ama'ama and its introduced competitor, the kanda, and consider the implications of overpopulation.

Students practice solving problems by writing equations and inequalities for problem situations, analyzing tables and graphs to solve the equation or inequality, and interpreting the quantities in each problem situation. Students practice choosing the most effective representation of a relationship to advocate for an issue. In the last lesson, students are challenged to use mathematical representations to illustrate how much a volunteer is worth.

This unit incorporates the concept of Sense of Place by being grounded in an opening learning journey to a loko i'a. Through this experience, students will engage in Nā Hopena A'o and STEMS<sup>2</sup> Pedagogy in addition to Common Core State Standards for Mathematics as well as other content

standards. Throughout the unit, students will revisit their huaka'i through instructional videos, news articles, informational texts, and mathematical scenarios.

Students should already be familiar with using multiple representations to model and solve problem situations, specifically one-step equations. They should be able to identify independent and dependent quantities. Students should be comfortable with solving for a variable by reading a graph. This unit begins by having students continue to identify independent and dependent quantities, create a table of values, graph the relationship, and write an equation. This unit focuses on problem-solving scenarios while including two-step equations and the entire set of rational numbers.

Students will demonstrate understanding of the standards in this unit if they can:

- Use variables to represent numbers in real-world or mathematical problems.
- Write and fluently solve word problems leading to equations in the form  $px + q = r$  and  $p(x + q) = r$ .
- Write and fluently solve word problems leading to inequalities in the form  $px + q > r$  or  $px + q < r$ .
- Use properties of operations to write equations in different forms to reveal information about the problem situation.
- Make connections between verbal descriptions, tables, graphs, and equations of problem situations.
- Use a graph to solve a two-step equation or inequality with rational coefficients.
- Identify and bring awareness to issues relevant to sense of place.
- Confidently select mathematical representations as evidence to support a claim.

## STAGE 1

### Unit Title: Removing Invasives

Essential Question: What is the value of a volunteer?

Enduring Understanding(s):

- Students understand that math is persuasive.
- Students understand that young people can do hard things.
- Students understand that their efforts can make a difference in their community.
- Students understand that collaboration is valuable.

# Standards, Benchmarks, and Values

## ADDRESSED

### CCSS MATH

- 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- 7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- 7.EE.4.A Solve word problems leading to equations of the form  $px + q = r$  and  $p(x + q) = r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
- 7.EE.4.B Solve word problems leading to inequalities of the form  $px + q > r$  or  $px + q < r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.
- PRACTICE.MP1 Make sense of problems and persevere in solving them.
- PRACTICE.MP2 Reason abstractly and quantitatively.
- PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.
- PRACTICE.MP4 Model with mathematics.
- PRACTICE.MP5 Use appropriate tools strategically.
- PRACTICE.MP6 Attend to precision.

### CCSS ELA

- RI.7.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.

- W.7.1 Write arguments to support claims with clear reasons and relevant evidence.
- W.7.1.B Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
- W.7.6 Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.
- SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- SL.7.1.A Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

## NGSS

- MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

## C3

- D3.3.6-8 Identify evidence that draws information from multiple sources to support claims, noting evidentiary limitations.
- D3.4.6-8 Develop claims and counterclaims while pointing out the strengths and limitations of both.

## HĀ

- BELONGING.F Communicate with clarity and confidence
- BELONGING.G Understand how actions affect others
- BELONGING.H Actively participate in school and communities
- RESPONSIBILITY.G Reflect on the quality and relevancy of the learning
- EXCELLENCE.B Know and apply unique gifts and abilities to a purpose
- EXCELLENCE.F Utilize creativity and imagination to problem-solve and innovate
- ALOHA.D Communicate effectively to diverse audiences
- ALOHA.E Respond mindfully to what is needed
- ALOHA.G Share the responsibility for collective work
- HAWAI'I.B Use Hawaiian words appropriate to their task
- HAWAI'I.C Learn the names, stories, special characteristics and the importance of places in Hawai'i
- HAWAI'I.D Learn and apply Hawaiian traditional world view and knowledge in contemporary settings
- HAWAI'I.K Share the histories, stories, cultures and languages of Hawai'i.

## STEMS<sup>2</sup>

- A'O Teaching and learning is a reciprocal relationship in which one is both a learner and a teacher at all times.
- MAKAWALU Literally meaning “eight eyes”, represents the need to see real world problems and solutions through multiple lenses and many angles at the same time.
- MO'OLELO Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. From the phrase mo'o 'ōlelo, a succession of talk; all stories were oral, not written (Ulukau Hawaiian Electronic Library, n.d.).
- SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.

- ADVOCACY The act or process of supporting a cause or proposal. Specific to STEMS<sup>2</sup> advocacy is related to educational transformation and addressing issues of access and equity.

## ASSESSED

### CCSS MATH

- 7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- 7.EE.4.B Solve word problems leading to inequalities of the form  $px + q > r$  or  $px + q < r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.
- PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.
- PRACTICE.MP4 Model with mathematics.

### CCSS ELA

- W.7.1 Write arguments to support claims with clear reasons and relevant evidence.
- W.7.1.B Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

### NGSS

- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

## C3

- D3.3.6-8 Identify evidence that draws information from multiple sources to support claims, noting evidentiary limitations.

## HĀ

- BELONGING.G Understand how actions affect others
- EXCELLENCE.F Utilize creativity and imagination to problem-solve and innovate
- ALOHA.D Communicate effectively to diverse audiences
- HAWAI'I.K Share the histories, stories, cultures and languages of Hawai'i.

## STEMS<sup>2</sup>

- SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.
- ADVOCACY The act or process of supporting a cause or proposal. Specific to STEMS<sup>2</sup> advocacy is related to educational transformation and addressing issues of access and equity.

## Critical Skills and Concepts

- Use variables to represent numbers in real-world or mathematical problems.
- Write and fluently solve word problems leading to equations in the form  $px + q = r$  and  $p(x + q) = r$ .
- Write and fluently solve word problems leading to inequalities in the form  $px + q > r$  or  $px + q < r$ .
- Use properties of operations to write equations in different forms to reveal information about the problem situation.
- Make connections between verbal descriptions, tables, graphs, and equations of problem situations.
- Use a graph to solve a two-step equation or inequality with rational coefficients.

- Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- Write arguments to support claims with clear reasons and relevant evidence.
- Support claim(s) with logical reasoning and relevant evidence, using an appropriate mathematical representation and demonstrating an understanding of the issue.
- Students are required to analyze problem situations in terms of tables, graphs, and equations and to make connections across the representations, which are exercises in searching for structure and patterns in equations and inequalities in different forms.
- Students focus their attention on the use of mathematics to solve problems that arise in everyday life and to use tools such as graphs, tables, and equations to analyze and draw conclusions about the problem situations.
- Students are expected to interpret the meanings of values in equations and interpret results in the context of the situation.
- When given scenarios, tables, graphs, and equations, students are expected to reason about the relationships among them and the affordances and limitations of each.
- Students notice similarities and differences among graphs and generalize about the relationships between the quantities.

## STAGE 2:

Students have practiced solving problems by writing equations and inequalities for problem situations, analyzing tables and graphs to solve the equation or inequality, and interpreting the quantities in each problem situation. Students have practiced choosing the most effective representation of a relationship to support a claim.

## Authentic Performance Tasks

Students will demonstrate understanding of the standards in *Removing Invasives* if they can:

- Make connections between verbal descriptions, tables, graphs, and equations of problem situations.
- Use a graph to solve a two-step equation or inequality with rational coefficients.
- Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- Write arguments to support claims with clear reasons and relevant evidence.
- Support claim(s) with logical reasoning and relevant evidence, using an appropriate mathematical representation and demonstrating an understanding of the issue.

In the last lesson, students are challenged to use mathematical representations to illustrate how much a volunteer is worth. Students create content to advocate for the loko i'a by making a claim and supporting it with the appropriate mathematical representations. Students present their work and reflect on their learning using a co-created rubric.

## Authentic Audience

Student-created content from this task is intended to be shared with classmates for feedback before being shared with a larger audience. Ideas on how and where to share can range from a classroom newsletter, school social media, or community message boards. For this particular activity, all content is being designed to be shared with Kumuola Marine Science Education Center.

## Other Evidence

There are Synthesis and Cool Down activities at the end of each lesson that can be used as formative assessments. These also function as ways to check for understanding and capture big idea learning.

### STAGE 3:

## Sequence of Lessons

LESSON	TITLE	STANDARDS	HIGHLIGHTS
1	How Many Gallons?  Representing a Scenario with an Equation	ELA SL.7.1  NGSS LS2-1  STEMS <sup>2</sup> A'O STEMS <sup>2</sup> ADVOCACY STEMS <sup>2</sup> MAKAWALU STEMS <sup>2</sup> MO'OLELO STEMS <sup>2</sup> SENSE OF PLACE	Students engage in aloha 'āina activity to reclaim an area in the loko i'a. They develop a system to collect data to measure their work. They learn about the poaching and trespassing that is happening in the space and participate in advocacy activities to address the issues.
2	Potties & Buckets  Representing Equations with Tables and Graphs	MATH 7.EE.4A  STEMS <sup>2</sup> A'O STEMS <sup>2</sup> MO'OLELO STEMS <sup>2</sup> SENSE OF PLACE	Students analyze linear equations using tables and graphs. They write and solve equations, create tables of values, and create graphs of the situations. They use the graphs to answer questions about the situations. Students determine if the linear situations represent proportional relationships.
3	'Ama'ama Restrictions  Building Inequalities and Equations to Solve Problems	MATH 7.EE.B.3 MATH 7.EE.4  NGSS LS2-1  STEMS <sup>2</sup> A'O STEMS <sup>2</sup> ADVOCACY STEMS <sup>2</sup> MAKAWALU STEMS <sup>2</sup> MO'OLELO STEMS <sup>2</sup> SENSE OF PLACE	Students work with a negative rate of change. They use negative values to create a table and graph. Then students write and analyze equations and inequalities with negative rates of change.
4	Tanks. Ur Welcome.	7.EE.4	Students solve equations using tables of

	Using Multiple Representations to Solve Problems	NGSS LS2-1  STEMS <sup>2</sup> A'O STEMS <sup>2</sup> ADVOCACY STEMS <sup>2</sup> MAKAWALU STEMS <sup>2</sup> SENSE OF PLACE	values, graphs, and equations. In each activity, a different representation is presented, and students use that representation to solve problems.
5	Stop the Scroll  Exploring Advocacy Through Math	MATH MP3 MATH MP4 MATH MP5  ELA SL.7.1 ELA SL.7.1.A  STEMS <sup>2</sup> A'O STEMS <sup>2</sup> ADVOCACY STEMS <sup>2</sup> MAKAWALU STEMS <sup>2</sup> MO'OLELO STEMS <sup>2</sup> SENSE OF PLACE	Students explore different examples of advocacy and hear from a guest speaker who works with advocacy groups. They see how math is used to promote an idea, persuade an audience, and inspire action.
6	In-Kind  Using Multiple Representations to Support a Claim	MATH 7.EE.4 MATH MP3 MATH MP4  ELA RI.7.8 ELA W.7.1 ELA W.7.6 ELA SL.7.4 ELA SL.7.5  NGSS LS2-4  STEMS <sup>2</sup> A'O STEMS <sup>2</sup> ADVOCACY STEMS <sup>2</sup> MAKAWALU STEMS <sup>2</sup> MO'OLELO STEMS <sup>2</sup> SENSE OF PLACE	Students create content to advocate for the loko i'a by making a claim and supporting it with the appropriate mathematical representations. Students present their work and reflect on their learning.

## Nā Hua'ōlelo Hawai'i

- 'ama'ama
  - ho'olei 'upena
  - i'a
  - kai
  - kaiuli
  - kuapā
  - loko
  - loko i'a
- mākāhā
  - muliwai
  - pākini
  - pua 'ama'ama
  - 'upena
  - Uouoa
  - wai
  - waikai

# 1 How Many Gallons?

## *Representing a Scenario with an Equation*

Students engage in aloha ‘āina activity to reclaim an area in the loko i‘a. They develop a system to collect data to measure their work. They learn about the poaching and trespassing that is happening in the space and participate in advocacy activities to address the issues.

### STANDARDS

- ELA SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- NGSS LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- STEMS<sup>2</sup> A'O Teaching and learning is a reciprocal relationship in which one is both a learner and a teacher at all times.
- STEMS<sup>2</sup> MAKAWALU Literally meaning “eight eyes”, represents the need to see real-world problems and solutions through multiple lenses and many angles at the same time.
- STEMS<sup>2</sup> MO'OLELO Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. From the phrase mo'o 'ōlelo, a succession of talk; all stories were oral, not written (Ulukau Hawaiian Electronic Library, n.d.).
- STEMS<sup>2</sup> SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.
- STEMS<sup>2</sup> ADVOCACY The act or process of supporting a cause or proposal. Specific to STEMS<sup>2</sup> advocacy is related to educational transformation and addressing issues of access and equity.

### LEARNING GOALS

- Increase awareness of other perspectives.
- Collaboratively design for someone else in mind.
- Build pilina with place and people.

### KEY TERMS

-



## QUESTION

- How can we utilize signage to protect the loko i'a?

## LESSON STRUCTURE & PACING: 1 DAY

### DAY 1

#### WARM UP: Opening Circle

Students prepare for the day with an opening circle. Students are asked to share who they are bringing with them on the huaka'i. Students pule together.

#### ACTIVITY 1: Huli ka Lima i Lalo

Students work collaboratively using a halihali line to remove sediment from an area of the loko i'a. Students collect data to measure productivity. Students make connections between their work and the reclamation of 'āina.

#### ACTIVITY 2: Makana

Students present makana and share their mana'o behind their gift. Students pule together.

#### ACTIVITY 3: Signage

Students ideate possible uses of signage to advocate for the loko i'a through the context of trespassing and poaching. Students consider different perspectives of the issue through discussion. Students revise their ideas.

#### COOL DOWN: Reflection

Students take time to connect their experiences so far to the E Ola! outcomes of 'Ike Kūpuna, Aloha 'Āina, Kūpono, and Mālama and Kuleana.

## 2 Potties and Buckets

### *Representing Equations with Tables and Graphs*

Students analyze linear equations using tables and graphs. They write and solve equations, create tables of values, and create graphs of the situations. They use the graphs to answer questions about the situations. Students determine if the linear situations represent proportional relationships. Students review the life cycle of the 'ama'ama and its importance to the loko i'a.

#### STANDARDS

- MATH 7.EE.4A Solve word problems leading to equations of the form  $px + q = r$  and  $p(x + q) = r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
- STEMS<sup>2</sup> A'O Teaching and learning is a reciprocal relationship in which one is both a learner and a teacher at all times.
- STEMS<sup>2</sup> MO'OLELO Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. From the phrase mo'ō 'ōlelo, a succession of talk; all stories were oral, not written (Ulukau Hawaiian Electronic Library, n.d.).
- STEMS<sup>2</sup> SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.

#### LEARNING GOALS

- Write and solve two-step equations to solve real-world problems.
- Use multiple representations to reason about quantities and analyze problem situations.
- Identify independent and dependent variables.
- Interpret negative solutions to problem situations.
- Explore connections between math and advocacy.

#### QUESTION

- How can math representations help us advocate for important things?

#### LESSON STRUCTURE & PACING: 2 DAYS

##### DAY 1

WARM UP: Kaimana's Lawn Service



Students identify independent and dependent quantities within a context. Students use what they already know to write an equation to represent a scenario. Students use an equation to solve a problem.

#### ACTIVITY 1: Loko I'a Superheroes

Students review information from the previous lesson. They watch a video that highlights the importance of the 'ama'ama to the loko i'a.

#### ACTIVITY 2: Port-A-Potty Business

Students create a table of values. They use the table of values to create a graph of the problem situation. Students use the graph to answer questions. Students write an equation and determine if related scenarios are correct.

#### DAY 2

#### ACTIVITY 3: How Many Buckets?

Students analyze a scenario involving breaking a sediment removal record in the context of the previous lesson. They determine the rate at which the students must remove sediment to break the record. Students identify and define both the independent and dependent variables and write a linear equation. They use their equation to answer questions about the problem situation. Students complete a table of values and plot points on the coordinate plane, using Quadrants I and II. Then they answer questions that focus on the graph.

#### COOL DOWN

Students create a graphic organizer to explain the advantages and disadvantages of representing a situation using a sentence, a table, a graph, and an equation. Students generate ideas on ways that these mathematical representations could be used to advocate for the 'ama'ama.

#### STUDENT MATERIALS

Student materials for this lesson can be accessed at

<https://teacher.desmos.com/activitybuilder/custom/62341eeb0f43e1065eece993>

### 3 ‘Ama‘ama Restrictions

#### *Building Inequalities and Equations to Solve Problems*

Students work with a negative rate of change. They use negative values to create a table and graph. Then students write and analyze equations and inequalities with negative rates of change. Students review ‘ama‘ama fishing rules and regulations.

#### STANDARDS

- MATH 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- MATH 7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- NGSS MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- STEMS<sup>2</sup> A‘O Teaching and learning is a reciprocal relationship in which one is both a learner and a teacher at all times.
- STEMS<sup>2</sup> MAKAWALU Literally meaning “eight eyes”, represents the need to see real-world problems and solutions through multiple lenses and many angles at the same time.
- STEMS<sup>2</sup> MO‘OLELO Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. From the phrase mo‘o ‘ōlelo, a succession of talk; all stories were oral, not written (Ulukau Hawaiian Electronic Library, n.d.).
- STEMS<sup>2</sup> SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.
- STEMS<sup>2</sup> ADVOCACY The act or process of supporting a cause or proposal. Specific to STEMS<sup>2</sup> advocacy is related to educational transformation and addressing issues of access and equity.

#### LEARNING GOALS

- Write and solve two-step equations.
- Compare two linear problem situations.

- Rewrite expressions in different forms in problem contexts in order to interpret how quantities are related.
- Compare graphs of linear problem situations.
- Compare and interpret forms of linear equations.
- Consider the relationships between native and invasive species in the context of the loko i'a.

#### QUESTION

- Are there other ways we can advocate for the 'ama'ama?

#### LESSON STRUCTURE & PACING: 2 DAYS

##### DAY 1

###### WARM UP: Inequalities

Students review solving one- and two-step inequalities without context.

###### ACTIVITY 1: 'Ama'ama Restrictions

Students review a handout from the Department of Aquatic Resources. Students write a two-step inequality to represent a problem situation. They then solve the inequality, interpret the solution in terms of the problem situation, and graph the solution set on a number line.

###### ACTIVITY 2: Unit Rate of Change

A deep-sea submarine is the context for this activity. Students identify the independent and dependent quantities and their units of measure, define variables for the quantities, and write an equation to represent the depth in terms of time. They then use the equation to complete a table of values. The unit rate of change is defined and students determine the unit rate of change in the problem situation. The equation is used to compute unknown time when the depth is given and unknown depth when the time is given. Students create a graph in Quadrant IV to model the situation.

##### DAY 2

###### ACTIVITY 3: Representing Inequalities on Graphs

Students analyze a worked example showing how to represent inequalities using the graph of the equation they created in the previous activity. Students estimate solutions and then solve inequalities to determine exact answers. They compare their estimates with the exact solutions.

###### ACTIVITY 4: Graphing Equations and Inequalities

An ascending deep-sea submarine is the context for this activity. Students write an equation to represent the depth in terms of time and use the equation to complete a table of values. Students determine the unit rate of change for the problem situation. They use their equation to compute an unknown time when the depth is given and unknown depth when the time is given. Students create a graph from the table of values and use their graph to estimate answers requiring



the use of an inequality. They write and solve an inequality to confirm the accuracy of the estimated answers.

#### COOL DOWN

Students add notes to their tablet sketching examples of how to estimate an inequality using the graph of an equation. Students make connections back to the opening question and share out with the class.

#### STUDENT MATERIALS

Student materials for this lesson can be accessed at

<https://teacher.desmos.com/activitybuilder/custom/625fe8e19cd4fa0521e49ce9?collections=6278896825abbbba2663b98b0>

## 4 TANKS. UR WELCOME.

### *Using Multiple Representations to Solve Problems*

Students solve equations using tables of values, graphs, and equations. In each activity, a different representation is presented, and students use that representation to solve problems. Students learn about the introduced mullet variety and analyze how it is impacting the 'ama'ama.

#### STANDARDS

- MATH 7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- NGSS MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- STEMS<sup>2</sup> A'O Teaching and learning is a reciprocal relationship in which one is both a learner and a teacher at all times.
- STEMS<sup>2</sup> MAKAWALU Literally meaning "eight eyes", represents the need to see real-world problems and solutions through multiple lenses and many angles at the same time.
- STEMS<sup>2</sup> SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.
- STEMS<sup>2</sup> ADVOCACY The act or process of supporting a cause or proposal. Specific to STEMS<sup>2</sup> advocacy is related to educational transformation and addressing issues of access and equity.

#### LEARNING GOALS

- Use multiple representations to analyze and interpret problem situations.
- Use tables, graphs, and equations to represent and solve word problems by reasoning about quantities.
- Interpret data to provide evidence to support a claim.

#### KEY TERMS

- 'ama'ama
- muliwai
- pua 'ama'ama
- Uouoa

#### QUESTION

- How can we use a variety of representations to help us solve problems?

## LESSON STRUCTURE & PACING: 2 DAYS

### DAY 1

#### WARM UP

Article INTRODUCED INVASIVE MULLET MAY OUTPACE NATIVE 'AMA 'AMA with Video

<https://dlnr.hawaii.gov/blog/2019/02/26/nr19-040/>

How did the kanda take over the muliwai and loko i'a?

#### ACTIVITY 0

Students match equations with graphs or tables. They then create a table and graph for the unmatched equation.

#### ACTIVITY 1

The activity begins with a verbal description of emptying an oil tank. Students identify the independent and dependent quantities and their units of measure, define variables for the quantities, and write an equation to represent the gallons of oil in the tank. They use the equation to determine the amount of oil remaining in the tank given the minutes the oil has been draining, and determine the minutes the oil has been draining given the amount of oil in the tank. Students complete a table of values and graph the situation.

#### ACTIVITY 2

The activity begins with an equation that converts a temperature in degrees Celsius to a temperature in degrees Fahrenheit. Students use the equation to convert Celsius to Fahrenheit and Fahrenheit to Celsius. They use their answers to create a table of values and graph the situation.

### DAY 2

#### ACTIVITY 3

This activity begins with a partially-completed table of values. Students calculate the unit rate of change, define variables for the two quantities in the table, and write an equation. The equation is used to complete the table of values and the table is used to graph the situation.

#### ACTIVITY 4

This activity begins with a graph without any context. Students use the points on the graph to create a table of values, and from the table, calculate the unit rate of change. They then write an equation to represent the relationship and create a problem situation to fit the equation.

#### COOL DOWN

Students identify which representation of equal expressions—tables, graphs, equations, or verbal descriptions—is their favorite. Students make connections back to the opening question and share out with the class.



## STUDENT MATERIALS

Student materials for this lesson can be accessed at

<https://teacher.desmos.com/activitybuilder/custom/6264dfd4a75d8c0d03314df8?collections=6278896825abbba2663b98b0>

## 5 Stop the Scroll

### *Exploring Advocacy Through Math*

Students explore different examples of advocacy and hear from a guest speaker who works with advocacy groups. They see how math is used to promote an idea, persuade an audience, and inspire action.

#### STANDARDS

- MATH MP3 Construct viable arguments and critique the reasoning of others.
- MATH MP4 Model with mathematics.
- PRACTICE.MP5 Use appropriate tools strategically.
- ELA RI.7.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
- ELA SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- ELA SL.7.1.A Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- STEMS<sup>2</sup> A'O Teaching and learning is a reciprocal relationship in which one is both a learner and a teacher at all times.
- STEMS<sup>2</sup> MAKAWALU Literally meaning "eight eyes", represents the need to see real-world problems and solutions through multiple lenses and many angles at the same time.
- STEMS<sup>2</sup> MO'OLELO Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. From the phrase mo'o 'ōlelo, a succession of talk; all stories were oral, not written (Ulukau Hawaiian Electronic Library, n.d.).
- STEMS<sup>2</sup> SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.
- STEMS<sup>2</sup> ADVOCACY The act or process of supporting a cause or proposal. Specific to STEMS<sup>2</sup> advocacy is related to educational transformation and addressing issues of access and equity.



## LEARNING GOALS

- Understand that advocacy comes in many forms (speaking, volunteering, promoting, sharing, art, coordinating events, etc.)

## QUESTION

- How do advocates use math?

## LESSON STRUCTURE & PACING: 2 DAYS

### DAY 1

#### WARM UP

Ice-breaker game

#### GUEST SPEAKER

Who you are, where you are from, your job. Educational journey: How did you end up in this job? How do advocacy and a sense of place play into your workflow? Where do you see/use math?

#### Q & A

#### ACTIVITY

Students will be given research, facts, stats, etc. to review which will be used to practice creating content.

### DAY 2

#### WORK SESSION

Students work independently on designing an Instagram post utilizing the materials provided in the previous activity. Students should seek out feedback during their work time before publishing their finished product.

#### SHARING

Students share their content with the class and leave feedback. Students leave guided feedback by sharing two things they appreciate and one question that pushes the creator.

#### SYNTHESIS / CHECK FOR UNDERSTANDING

In tablets: How does math show up in advocacy? What other jobs/careers would math be useful for promoting, convincing, or persuading?

## 6 In-Kind

### *Using Multiple Representations to Support a Claim*

Students create content to advocate for the loko i'a by making a claim and supporting it with the appropriate mathematical representations. Students present their work and reflect on their learning using a co-created rubric.

#### STANDARDS

- MATH MP3 Construct viable arguments and critique the reasoning of others.
- MATH MP4 Model with mathematics.
- PRACTICE.MP5 Use appropriate tools strategically.
- ELA RI.7.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
- ELA SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- ELA SL.7.1.A Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- STEMS<sup>2</sup> A'O Teaching and learning is a reciprocal relationship in which one is both a learner and a teacher at all times.
- STEMS<sup>2</sup> MAKAWALU Literally meaning "eight eyes", represents the need to see real-world problems and solutions through multiple lenses and many angles at the same time.
- STEMS<sup>2</sup> MO'OLELO Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. From the phrase mo'o 'ōlelo, a succession of talk; all stories were oral, not written (Ulukau Hawaiian Electronic Library, n.d.).
- STEMS<sup>2</sup> SENSE OF PLACE An identity construct made up of how an individual sees themselves and a space and how they perceive others see them. Our sense of place drives our actions and/or inactions.
- STEMS<sup>2</sup> ADVOCACY The act or process of supporting a cause or proposal. Specific to STEMS<sup>2</sup> advocacy is related to educational transformation and addressing issues of access and equity.



## LEARNING GOALS

- Use multiple representations to support a claim.
- Use tables, graphs, and equations to represent scenarios.
- Create content with a specific audience in mind.

## KEY TERMS

- in-kind donation

## QUESTION

Organizations represent the value of a volunteer through in-kind donations. How much is a volunteer worth?

## LESSON STRUCTURE & PACING: 2 DAYS

### DAY 1

#### WARM UP

#### EXPECTATIONS / RUBRIC CREATION

Students work on identifying criteria for the rubric. Consider pairing students up, then grouping into fours, then finally coming together as a large group to build the foundation of the rubric.

#### WORK TIME

Allow time for students to work. Check-in frequently and take opportunities to connect back to experiences from previous lessons in class and experiences at the loko i'a.

### DAY 2

#### SHARING

Students share their content creations and are given feedback aligned to the rubric. Students will have an opportunity to revise their work before sharing it with the community partner.

#### SYNTHESIS / REFLECTION

In tablets: How has your perspective on volunteers changed after this project? How has viewing your classmates' work inspired you?