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

STUDENT ACTIVITIES

LET'S COLLECT LAUHALA

STEMD² Research & Development Group
University of Hawaiʻi at Manoa

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

http://stemd2.com/

 Printed in the United States of America. First published (2019) by the Center on Disability Studies, University of Hawaiʻi at Mānoa, Honolulu, Hawaiʻi. This document is based upon work supported by the Native Hawaiian Education Program (NHEP) of the United States Department of Education under award #S362A180011 totalling $950,000. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of NHEP, the U.S. Department of Education, or the U.S. Government. For more information about the U.S. Department of Education, please visit www.ed.gov. For further information about this document and Neʻepapa Ka Hana 2.0 project, please contact Dr. Kaveh Abhari at abhari@hawaii.edu.

ISBN: 979-86161357-2-8
Second release, 2021

Ne‘epapa Ka Hana Seventh-Grade Mathematics Resources

Let’s Collect Lauhala

Student Activities

Project Director	Kaveh Abhari Kiriko Takahashi
Content Developers	Robert G. Young Justin S. Toyofuku
Creative Designer	MyLan Tran
Publication Designer	Robert G. Young

Acknowledgments

Mahalo nui to our cultural advisor Nohealani Behler for reviewing and refining the Hawaiian stories and use of language. Special thanks to our education specialist Robyn Rice for reviewing and advising on middle school mathematics standards and practices. We would also like to thank our course coordinator Moa Viebke for significant help in editing.

Contents

Introduction to *Let's Collect Lauhala*

Let's Collect Lauhala has been created by Neʻepapa Ka Hana (NKH) for 7th grade students of Hawaiʻi. The mathematical activities featured in *Let's Collect Lauhala* have been constructed to enrich students' mathematical abilities through culturally responsive material and to increase interest and participation in the mathematical classroom.

Through the collaboration between the Neʻepapa Ka Hana (NKH) 2.0 and STEMD2, the mathematical curriculum of *Let's Collect Lauhala* has been made available for online classroom integration. The math activities are offered on a social platform which allows for online collaboration between students and teachers. The platform is free and accessible to users with internet access at www.community.stemd2.com

Neʻepapa Ka Hana (NKH) develops programs and materials that are culturally responsive to Hawaiʻi's unique diversity - using research-based practices to support ongoing STEM education efforts across the state. *Let's Collect Lauhala* is the 8th addition to NKH's middle school book series.

The *Let's Collect Lauhala* book is composed of mathematical activities that serve as a practice for state standardized assessments while enhancing inclusive instruction based on problem-based learning strategies and connectivism principles. The math activities incorporate real-world challenges that reflect Hawaiʻi's unique culture, society, and geography. The goal of these activities is for both kumu and haumāna to collaborate while thinking critically and creatively - thereby, deepening students' understanding, application, and appreciation for mathematical thinking in the context of Hawaiian and island culture.

Let's Collect Lauhala highlights the Common Core State Standards through the theme of Hawaiʻi's environment, natural resources, and sustainability. The curriculum focuses on incorporating mathematics to understand the interdependence of the people and the land.

Common Core State Standards

Common Core State Standard	***Let's Collect Lauhala* Activity**
Ratios & Proportional Relationships	
7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour.	2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 3.1, 4.8
7.RP.2 Recognize and represent proportional relationships between quantities.	2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 3.1, 3.2, 3.3, 3.4, 4.5, 4.8, 5.3, 5.4, 5.5, 5.7
7.RP.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.	2.2, 2.6
7.RP.2b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.	2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 3.1, 3.3, 4.5, 4.8
7.RP.2c Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.	2.2, 2.3, 2.6, 2.7, 3.1, 3.2, 3.3, 3.4
7.RP.2d Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.	2.2, 2.6
7.RP.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.	1.1, 2.3, 2.4, 2.7, 3.1, 3.2, 3.3, 4.4, 4.5, 4.8, 5.3, 5.4, 5.5, 5.7

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Common Core State Standard	***Let's Collect Lauhala* Activity**
The Number System	
7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.	1.1, 1.2, 1.3, 1.4, 3.2, 3.3
7.NS.1a Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.	1.3, 3.2
7.NS.1b Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.	1.3
7.NS.1c Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.	1.3, 3.2
7.NS.1d Apply properties of operations as strategies to add and subtract rational numbers.	1.1, 1.2, 1.3, 1.4, 3.2, 3.3
7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.	1.2, 1.4, 2.1, 2.3, 2.5, 2.6, 2.7, 3.1, 3.3, 4.4, 4.5, 4.7, 4.8
7.NS.2a Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.	1.4
7.NS.2b Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts.	1.4
7.NS.2c Apply properties of operations as strategies to multiply and divide rational numbers.	1.1, 1.2, 1.4, 2.1, 2.3, 2.5, 2.6, 2.7, 3.1, 3.3, 4.4, 4.5, 4.7, 4.8
7.NS.2d Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats	3.4

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Common Core State Standard	***Let's Collect Lauhala* Activity**
7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)	1.1, 1.2, 1.4, 3.1, 3.2, 3.3, 4.4, 4.6, 4.7
Equations & Expressions	
7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	3.1
7.EE.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."	1.1, 2.4, 3.3, 3.4, 4.4
7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.	1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1, 3.2, 3.3, 4.4, 4.5, 4.7, 4.8
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.	2.2, 2.3, 2.6, 2.7, 3.1, 3.2, 3.3, 4.5
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. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?	3.3

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Common Core State Standard	***Let's Collect Lauhala* Activity**
7.EE.4b 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. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.	3.1, 3.2
Geometry	
7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	2.1, 4.5, 4.8
7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	4.1, 4.2
7.G.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	2.1, 4.1
7.G.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	4.3, 4.4, 4.7
7.G.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	4.5
7.G.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7
Statistics & Probability	
7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	5.1, 5.4, 5.6, 5.7

Continued on next page

Common Core State Standard	*Let's Collect Lauhala* Activity
7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.	5.1, 5.3, 5.4, 5.6, 5.7
7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.	5.2, 5.6
7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.	5.6
7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	5.1, 5.3, 5.4, 5.5, 5.7, 5.9
7.SP.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.	5.3
7.SP.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.	5.3, 5.5, 5.9

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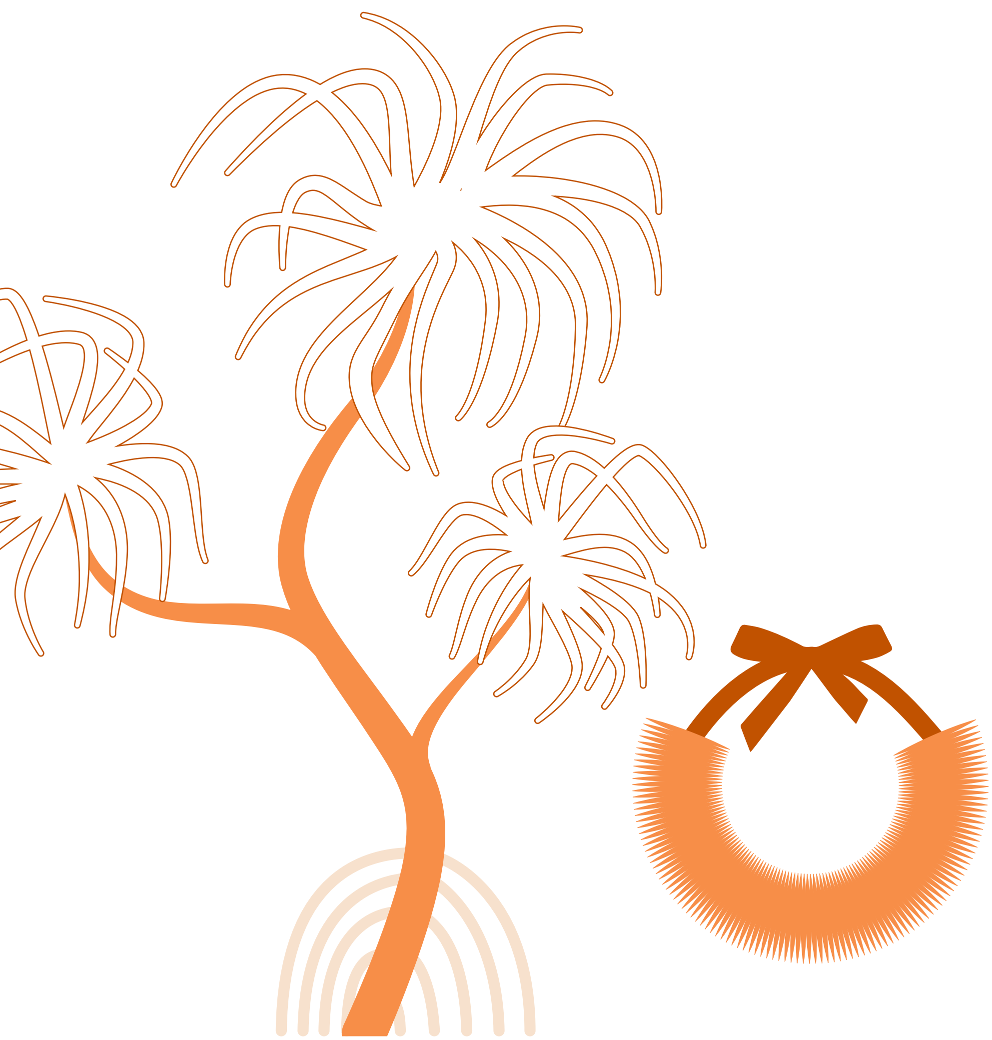
Common Core State Standard	***Let's Collect Lauhala* Activity**
7.SP.7a Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.	5.3, 5.4, 5.9
7.SP.7b Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?	5.3, 5.5
7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.	5.4, 5.8, 5.9
7.SP.8a Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.	5.8, 5.9
7.SP.8b Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.	5.4
7.SP.8c Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?	5.8

Unit 1: The Number System



SBAC alignment for *Unit 1: The Number System Activity 1*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 B** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. **4 C** State logical assumptions being used. **4 D** Interpret results in the context of a situation.
Content Domain:	The Number System
Standard(s):	**7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **7.NS.1d** Apply properties of operations as strategies to add and subtract rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) **7.EE.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."

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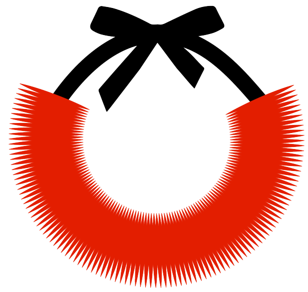
Standard(s):	**7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.
DOK:	1, 2, & 3

Unit 1: The Number System *Activity 1*

Kaiwi is a hunter and during his last hunt he caught a number of invasive ducks. Kaiwi sells the ducks' feathers for $\$20$ per bird. Many of Kaiwi's buyers use the feathers to make lei hulu (feather lei).



Lei hulu

Kaiwi also offers the following deal.

Buy 3 birds and get the 4th bird for 75% off.

1. Let's buy 4 birds using Kaiwi's deal. The sales tax in Hawaiʻi is 4%. How much money do you save by using the deal versus paying full price for the 4 birds? Show your work and justify your answer.
   (a) $\$15.00$
   (b) $\$15.60$
   (c) $\$14.40$
   (d) $\$5.20$

2. How much money will you save by buying 25 birds with the deal versus paying full price? As before, include the sales tax. Show your work and justify your answer.

3. What was the final price of 25 birds after tax using the deal?

SBAC alignment for *Unit 1: The Number System Activity 2*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation.
Content Domain:	The Number System
Standard(s):	**7.NS.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **7.NS.1d** Apply properties of operations as strategies to add and subtract rational numbers. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)

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Standard(s):	**7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.
DOK:	1 & 2

Unit 1: The Number System *Activity 2*

Keoni, Pua, and Kealoha are helping to build a replica (exact model) of a traditional hale (house) for a museum. They are providing the bark of a hau plant. This bark can be used to make rope, mats, and cloths.

- Keoni will bring 40% of the hau needed.
- Pua will bring 0.35 of the hau needed.
- Kealoha will provide the remainder of the hau.

1. Kealoha thinks that she will need to bring $1/3$ of the total hau. Is she correct? Use mathematics to justify your answer.

2. Together, Keoni, Pua, and Kealoha will provide 4000 feet of hau bark. How many feet of hau will Keoni, Pua, and Kealoha provide each?

   (a) Keoni will provide ______ feet of hau bark.

   (b) Pua will provide ______ feet of hau bark.

   (c) Kealoha will provide ______ feet of hau bark.

3. Keoni, Pua, and Kealoha also needed $52\frac{1}{2}$ long sticks of kauila wood but they've only collected 80% of that. If each person collected the same amount of wood, how much more wood does each person need to provide?

SBAC alignment for *Unit 1: The Number System Activity 3*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **3 G** At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.) **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	The Number System
Standard(s):	**7.NS.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **7.NS.1a** Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. **7.NS.1b** Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. **7.NS.1c** Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

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Standard(s):	**7.NS.1d** Apply properties of operations as strategies to add and subtract rational numbers.
DOK:	1, 2, & 3

Unit 1: The Number System *Activity 3*

You want to collect some plants to create some traditional dyes. To do this, you decide to create a map with a number line showing your house and the useful plants around it. Your house is on the side of the mountain and is represented as $x = 0$. $x > 0$ represents the locations of the plants further up the mountain and $x < 0$ represents the locations of the plants further down the mountain.

Here are the plants, the color dyes they can be used to make, and their locations.

Plant	Color	Location (x)
ʻAʻaliʻi	red-brown	5
ʻĀkala	pink	6.8
ʻAlaʻalawainui	gray	-4
Kou	yellow-brown	-6.8
Kukui	black (when roasted)	3.6

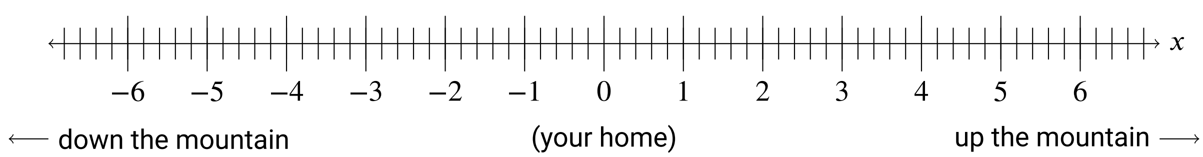
Plant	Color	Location (x)
Noni	yellow	-6
ʻŌlapa	blue	4
ʻŌlena	light yellow	-2.4
ʻUkiʻuki	blue-lavender	4.8
ʻUlei	lavender	-1

1. If you are at an ʻukiʻuki plant, what number do you need to **add** to your location x to return home?

2. If you are at a noni plant, what number do you need to **subtract** to your location x to return home

3. Are there any pairs of plants that have opposite locations? If so, list each pair.

4. Plot the locations of each plant on a number line below.



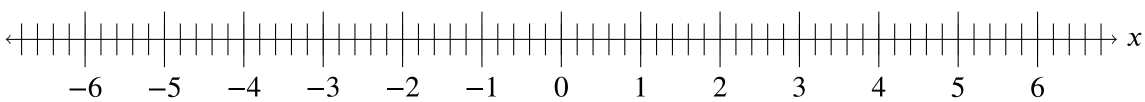
   (a) Are there any two plants that are 1 unit apart? If so, which two?

   (b) Are there any two plants that are 0.1 unit apart? If so, which two?

   (c) Right now, you're at home, and you want to collect ʻaʻaliʻi and any plants that are along the way. Which plants are along the way?

5. Suppose that you are home, and you want to collect ʻaʻaliʻi, kukui, noni, and ʻōlena and return home. In what order should you collect these plants to minimize walking back and forth as much as possible? There may be more than one possible answer.

   (Hint: Using this *optional* number line might be helpful.)



   (a) Start at home

   (b) Collect first plant: ______________________

   (c) Collect second plant: ______________________

   (d) Collect third plant: ______________________

   (e) Collect fourth plant: ______________________

   (f) Return home

6. What is the total distance traveled in part 5? Explain how you found your answer.

SBAC alignment for *Unit 1: The Number System Activity 4*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation.
Content Domain:	The Number System
Standard(s):	**7.NS.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **7.NS.1d** Apply properties of operations as strategies to add and subtract rational numbers. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2a** Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. **7.NS.2b** Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers.

Continued on next page

Standard(s):	**7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)
DOK:	1 & 2

Unit 1: The Number System *Activity 4*

In Hawaiian mythology, an ʻaumakua is a family god that often takes the form of an animal. A Hawaiiana (study of Hawaiʻi) class is preparing to make wooden sculptures of some common ʻaumakua forms. Before they make their sculptures, the class tries to learn more about these animals and where they are in the wild.

Here is a list of common animal forms of ʻaumakua and the altitudes (feet above sea level) where they are often found.

ʻAumakua form	English name	Altitude (feet)
ʻalae	mudhen bird	410
ʻenuhe	sphinx moth caterpillar	3000
honu	green sea turtle	-20
kōlea	plover bird	9000
loli	sea cucumber	-10
manō	shark	-100
moʻo	lizard	1500
ʻōpelu	mackerel scad fish	-500
pueo	owl	4000
puhi	eel	-750

1. How far apart are the ʻaumakua that have the highest and lowest altitudes?

2. How far apart are the following ʻaumakua?
   (a) Manō and puhi
   (b) Pueo and ʻalae
   (c) Honu and moʻo

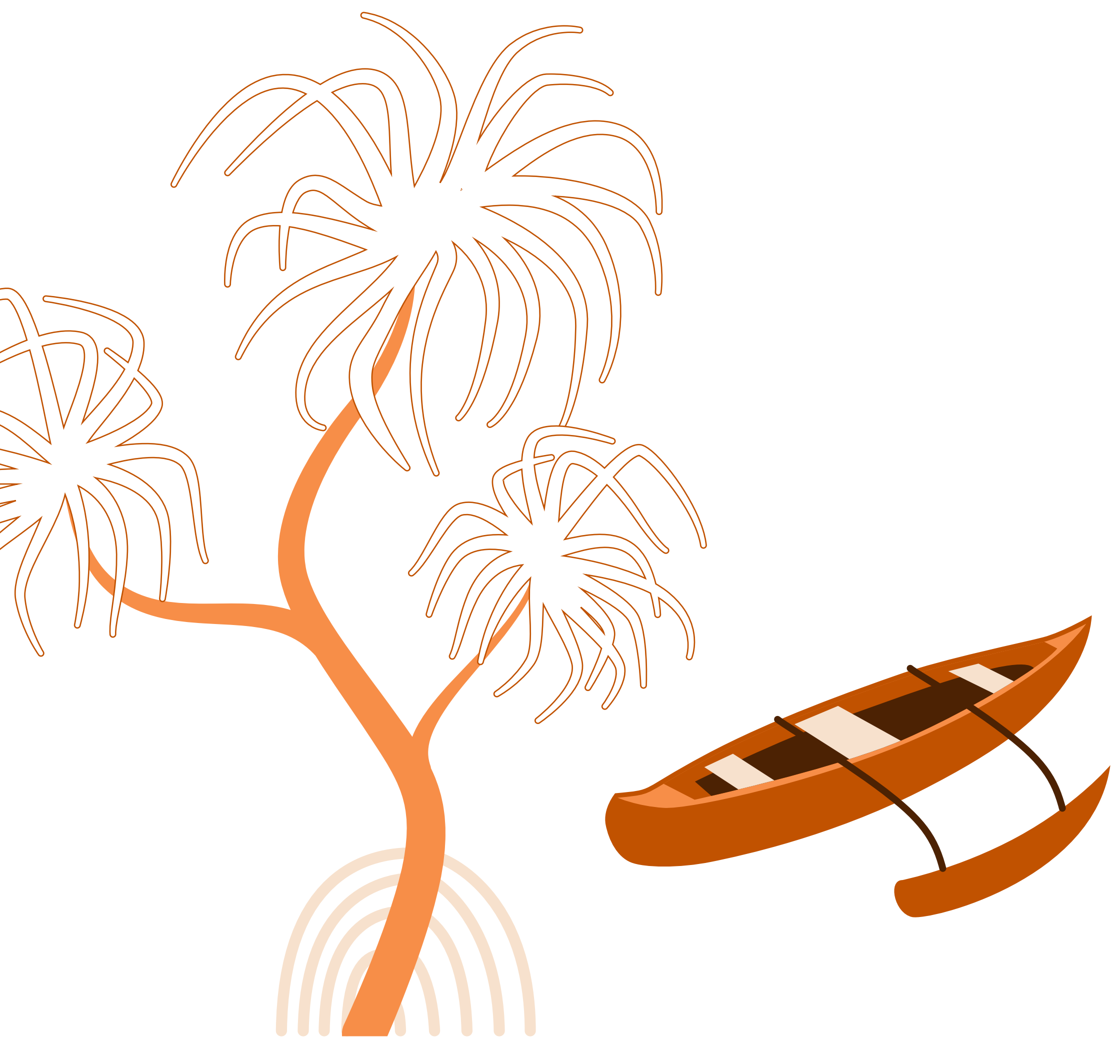
3. Divide the altitude of the loli by the altitude of the manō. What did you get and what does this number tell us about the how deep these animals live compared to each other?

4. Divide the altitude of the manō by the altitude of the loli. How does this number compare to the number in the previous question? What does this new number tell us about how deep these animals live compared to each other?

5. Divide the altitude of the moʻo by the altitude of the ʻōpelu. What did you get and what does this number tell us about the how deep these animals live compared to each other?

6. Multiply the altitude of the puhi by -4. Which ʻaumakua form did this new altitude correspond to? What does this tell us about the altitudes of the puhi and the second ʻaumakua form?

Unit 2: Ratios and Proportional Relationships



SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 1*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 B** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

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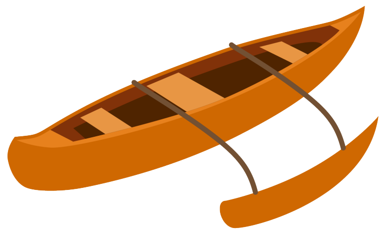
Standard(s):	**7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.G.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. **7.G.3** Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
DOK:	2 & 3

Unit 2: Ratios and Proportional Relationships *Activity 1*

A straight edge is needed for this activity.

Some canoe builders are drawing a large wa'a (canoe) that they saw at the Bishop Museum.



Wa'a

- The first builder drew the wa'a on a sheet of paper that is 10 inches wide and 4 inches tall. To fit the drawing on the paper, the builder had to use the scale of 1 inch $= 8/5$ yards.
- The second builder drew the wa'a on a sheet of paper that is 5 inches wide and 2 inches tall.

1. Which ratio represents the scale of the second drawing? Show your work and justify your answer.
   (a) $8/5$ inches to $1/2$ yard
   (b) $1/2$ inch to $8/5$ yards
   (c) $1/2$ inch to $4/5$ yard
   (d) 1 inch to $4/5$ yard

- A third builder is drawing the waʻa using a scale factor of 3 inches $= 8/5$ yards.

2. The third builder wants to use his drawing to make a replica of the waʻa from the Bishop Museum. The main part of the waʻa, without the ama (outrigger), can be carved out of a block of wood that is $3\frac{3}{5}$ yards long, $4/5$ yards tall, and $3/5$ yards wide. Sketch the top, side, and front view of the rectangular prism with these dimensions using the third builder's scale factor.

Top View:

1 inch

Side View:

1 inch

Front View:

1 inch

SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 2*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2a** Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.RP.2d** Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. **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.
DOK:	1 & 2

Unit 2: Ratios and Proportional Relationships *Activity 2*

Kekoa has been tracking the growth of an ‘ohe (bamboo) plant in his backyard and he has made a graph representing the height, y in centimeters, and the weeks x he has been tracking the ’ohe. The graph is a straight line through the origin and the point $(1, 9.5)$.

1. Which of the following statement(s) **must** be true?
   (a) It takes the ‘ohe 9.5 weeks to grow 1 centimeter.
   (b) The relationship between x and y is **not** a proportional relationship.
   (c) The ‘ohe grows 9.5 centimeters per week.
   (d) The graph crosses the point that is 1 unit above and 9.5 units to the right of the origin.
2. Write the equation showing the relationship between x and y.
3. How many weeks will it take for the ‘ohe to reach 104.5 centimeters?
4. How tall will the ‘ohe be after 5 weeks?

SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 3*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Continued on next page

Standard(s):	**7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **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.
DOK:	1 & 2

Unit 2: Ratios and Proportional Relationships *Activity 3*

In Hawaiʻi, many wooden sculptures and tools were made to be waterproof by rubbing it with kukui nut oil. Kekoa is planning to make some kukui oil to protect some wooden bowls he carved.

1. Kekoa has made kukui oil in the past and kept a record of how many nuts were used. Assuming that there is a proportional relationship, fill in the missing data.

Kukui nuts	Oil (milliliters)
3	5.4
5	9
9	16.2
15	
24	
	54
	75.6

2. How many milliliters of oil can Kekoa get from one kukui nut? Round to the nearest tenth if needed.

3. Write an equation that can be used to answer the question "How many kukui nuts does Kekoa need to produce 108 milliliters of oil?"

4. Solve the equation and show your work.

5. Kekoa uses 1 milliliter of oil to cover 40 square inches of wood. What is the **minimum** number of kukui nuts needed to produce enough oil to cover the following objects? Your answers should be whole numbers.

   (a) A wooden bowl with a surface area of 432 square inches.

   (b) A wooden canoe paddle with a surface area of 360 square inches.

   (c) A wooden sculpture with a surface area of 612 square inches.

SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 4*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.EE.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05." **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.
DOK:	1 & 3

Unit 2: Ratios and Proportional Relationships *Activity 4*

You and your friends have collected a lot of lauhala leaves and want to weave a lauhala mat.

1. Suppose that you've collected 64 pounds of lauhala leaves. After removing the useless parts and drying out the leaves, 40% of the weight remained. You then used 80% of that to make a mat. How many pounds of leaves remained after making a mat?

2. Suppose that you needed 40 pounds of lauhala leaves to make some more mats. First, you collect the 40 pounds of lauhala and then you decide to collect 20% extra lauhala to account for damaged and unusable leaves. Later, you and your friends go through the pile of lauhala and remove 20% of the total leaves. Do you still have enough lauhala to make your mat? Explain and show your calculations.

SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 5*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.
DOK:	1 & 2

Unit 2: Ratios and Proportional Relationships *Activity 5*

You're trying to make ʻaha, which is a traditional type of rope made from coconut fibers. You need different types of ʻaha to make a net; thin ʻaha on the inside of the net can help to catch fish while thick ʻaha on the outside of the net can hold everything together.

1. You use $3\frac{3}{4}$ coconuts to make 6 feet of **thin** ʻaha. Select all combinations that support the claim that the relationship between the number of coconuts and the length of the ʻaha is proportional.

   (a) 3.34 coconuts : 6 feet of ʻaha

   (b) 6 coconuts : 3.75 feet of ʻaha

   (c) 15 coconuts : 24 feet of ʻaha

   (d) 5 coconuts : 8 feet of ʻaha

2. How many feet of **thin** ʻaha can you make with *one* coconut? Give your answer as a simplified fraction.

3. If you want to make 176 feet of **thin** ʻaha for your net, how many coconuts do you need? Show your work.

4. You use 6 coconuts to make 3.2 feet of **thick** ʻaha. Select all combinations that support the claim that the relationship between the number of coconuts and the length of the ʻaha is proportional.

   (a) 6 coconuts : $3\frac{1}{5}$ feet of ʻaha

   (b) 15 coconuts : 8 feet of ʻaha

   (c) 6.4 coconuts : 12 feet of ʻaha

   (d) 6 coconuts : $3\frac{2}{3}$ feet of ʻaha

5. How many feet of **thick** ʻaha can you make with *one* coconut? Give your answer as a simplified fraction.

6. If you want to make 40 feet of **thick** ʻaha for your net, how many coconuts do you need? Show your work.

SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 6*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **3 B** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2a** Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

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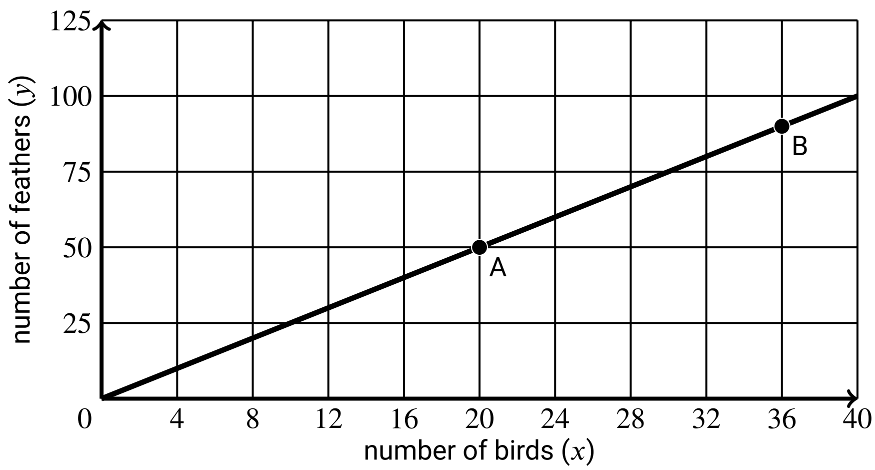
Standard(s):	**7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.RP.2d** Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **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.
DOK:	1, 2, & 3

Unit 2: Ratios and Proportional Relationships *Activity 6*

Ancient Hawaiians made beautiful feathered helmets, cloaks, and other treasures for the aliʻi (chiefs). The birds that produced bright red and yellow feathers were considered to be sacred, so bird catchers would carefully pick just a few feathers and make sure that the birds are released unharmed. Unfortunately, almost all of the treasured birds were now rare or extinct due to introduced diseases, loss of habitat, and other factors.

An ʻōʻō bird with yellow feathers

Suppose that we went back in time where the birds were common, and a bird catcher recorded the typical number of feathers they collected from the birds they caught. Use the graph of this data and some chosen points to answer the following questions.



1. Does the line in the graph show a *proportional relationship*? Explain how you know.

2. Explain what the point A tell us about the situation described in the graph.

3. Write the equation that shows the relationship between the variables x and y.

4. Use the equation in part 3 and find the number of feathers represented by point B. Show your work.

5. If the ancient bird catcher needed 165 feathers, how many birds do they need to catch?

6. What is y when $x = 1$? Do not round.

7. What does the answer to part 6 tell us about the situation described in the graph?

SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 7*

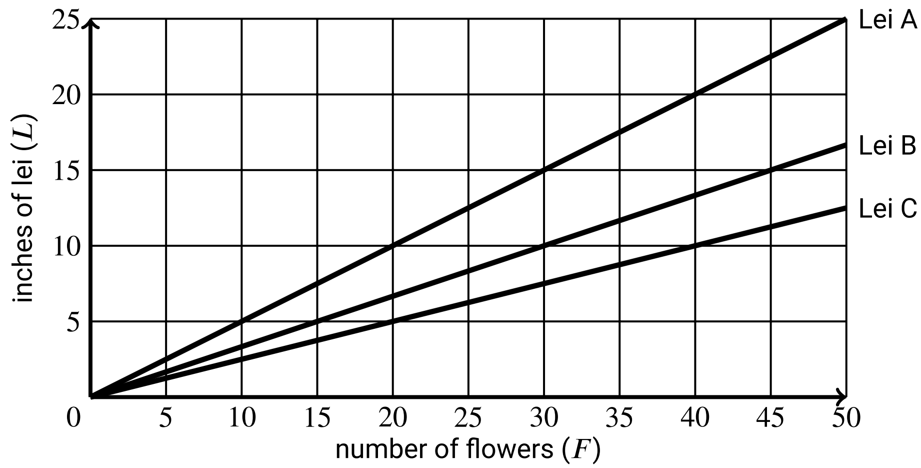
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.

Continued on next page

Standard(s):	**7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **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.
DOK:	1, 2, & 3

Unit 2: Ratios and Proportional Relationships *Activity 7*

There are many different ways to make a lei. You can use different kinds of flowers and you can string them in different patterns. Some lei use a lot of flowers and take a lot of time to make. Other lei types are very simple and only use a few flowers. Below is a graph showing the number of flowers needed to make lei of different types.



1. If each lei was the same length, which lei type would require the most flowers and which would require the least? Explain how do you know.

   Most flowers: Lei ______ Least flowers: Lei ______

   Explain.

2. Suppose that you have 45 flowers and need to make 18 inches of lei. Which lei type(s) do you have enough flowers to make? Explain.

3. Suppose that you made 10 inches of lei, but you needed more than 35 flowers to do make this. Which lei type(s) did you make? Explain.

4. For each lei type, find the constants of proportionality as a simplified fraction. Then write the equation for each line in the form $L = rF$.
   (a) Lei A:
   (b) Lei B:
   (c) Lei C:
5. Answer the following questions and show your work.
   (a) If you used 63 flowers to make Lei A, how long will it be? Round to the nearest tenth of an inch if needed.
   (b) Your friend said that you need 72 flowers to make 32 inches of Lei B. Is this correct? Explain why or why not.
   (c) How many flowers will you need to make 26 inches of Lei C?

Unit 3: Expressions and Equations

SBAC alignment for *Unit 3: Expressions and Equations Activity 1*

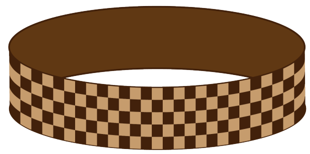
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 C** Use properties of operations to generate equivalent expressions. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Expressions and Equations
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) **7.EE.1** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Continued on next page

Standard(s):	**7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **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.4b** 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. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.
DOK:	2

Unit 3: Expressions and Equations *Activity 1*

Aunty Lani uses lauhala (leaves of the hala tree) to weave bracelets. The amount of lauhala she uses is proportional to the number of bracelets she weaves.



Lauhala bracelet

1. Aunty Lani uses $22\frac{1}{2}$ lauhala leaves to make 10 bracelets.

   Which equation represents the relationship between h, the number of lauhala leaves she uses, and b, the number of bracelets she makes?

   (a) $h = \frac{4}{9}b$
   (b) $h = 2\frac{1}{2}b$
   (c) $h = 2\frac{1}{4}b$
   (d) $h = 10b$

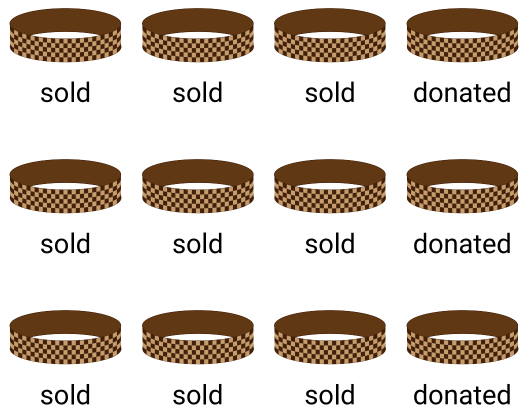
2. Aunty Lani collects enough lauhala to make b number of bracelets and then she collects an additional $8\frac{1}{2}$ leaves for her sister's lauhala project. Aunty Lani then stores all of the lauhala in a container that can hold up to 40 lauhala.

   (a) Write an inequality with the variable b to show how many leaves Aunty Lani can store in the container.

   (b) Solve the previous inequality.

3. Aunty Lani also made a lot of bracelets for a fundraiser. For every 4 bracelets she made, 1 was donated to the event. The rest were sold.

   For example, if she donated 3 bracelets, then she had to make 12.



   (a) Modify the equation in part 1 to represent the relationship between h, the amount of lauhala leaves used for all bracelets *made*, and d, the number of *donated* bracelets.

   (b) In all, Aunty Lani donated 8 bracelets. How many lauhala leaves did she use to make all of the bracelets for the fundraiser?

SBAC alignment for *Unit 3: Expressions and Equations Activity 2*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Expressions and Equations
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **7.NS.1a** Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.

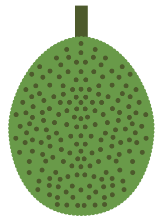
Continued on next page

Standard(s):	**7.NS.1c** Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. **7.NS.1d** Apply properties of operations as strategies to add and subtract rational numbers. **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **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.4b** 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. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.
DOK:	1 & 2

Unit 3: Expressions and Equations *Activity 2*

Kawika is an expert in making rope from coconut fibers. He wants to trade some of his rope to get some ʻulu (breadfruit) and some maiʻa (banana). His neighbor is willing to trade these fruits with Kawika at the following rates.

- One (1) ʻulu for 1.04 meters of rope.
- One (1) pound of maiʻa for 0.72 meters of rope.

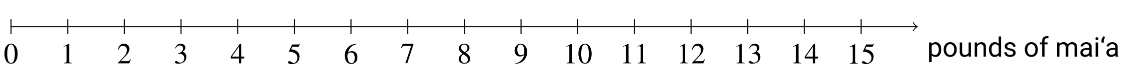


ʻUlu

Maiʻa

1. Kawika can trade **up to** 10 meters of rope with his neighbor. Kawika decides to trade some rope to get two (2) ʻulu and will trade some of the remaining rope to get some maiʻa. Write and solve an inequality that represents the **pounds** of maiʻa, m, that Kawika can get after he traded for the ʻulu.

2. On the number line below, draw a graph that represents the number of pounds of maiʻa that Kawika can buy.



3. Kawika wants to trade for more items. He is considering giving a certain amount of rope in exchange for u amount of ʻulu and m amount of maiʻa. Here's a reminder of the trading rates.

   - 1 ʻulu for 1.04 meters of rope.
   - 1 pound of maiʻa for 0.72 meters of rope.

   (a) **Write an expression** to show the total amount of rope (in meters) Kawika that owes for u number of ʻulu and m pounds of maiʻa.

   (b) Kawika gives 7 meters of rope to receive 3 ʻulu and 5 maiʻa.

      i. Did he give too much, not enough, or the correct amount of rope?

      ii. How much *more* rope does he need to give in order to have given the correct amount of rope? This answer does not need to be a positive number.

      Kawika needs to give an additional ___________ meter(s) of rope.

   (c) Kawika gives 3.75 meters of rope to receive 1 ʻulu and 4 maiʻa.

      i. Did he give too much, not enough, or the correct amount of rope?

      ii. How much *more* rope does he need to give in order to have given the correct amount of rope? This answer does not need to be a positive number.

      Kawika needs to give an additional ___________ meter(s) of rope.

   (d) Kawika gives 2.8 meters of rope to receive 2 ʻulu and 1 maiʻa.

      i. Did he give too much, not enough, or the correct amount of rope?

      ii. How much *more* rope does he need to give in order to have given the correct amount of rope? This answer does not need to be a positive number.

      Kawika needs to give an additional ___________ meter(s) of rope.

SBAC alignment for *Unit 3: Expressions and Equations Activity 3*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Expressions and Equations
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **7.NS.1d** Apply properties of operations as strategies to add and subtract rational numbers. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

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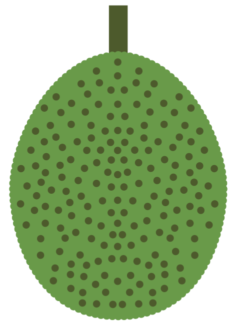
Standard(s):	**7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) **7.EE.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05." **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **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.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. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?
DOK:	1 & 2

Unit 3: Expressions and Equations *Activity 3*

In traditional Hawaiian life, it is very common to trade or donate extra supplies to your neighbors. Suppose that your village produces a lot of ‘uala (sweet potato), and a neighboring village produces a lot of ‘ulu (breadfruit). The two villages regularly trade pounds of ‘uala for numbers of ‘ulu at a constant rate.


‘Uala


‘Ulu

This year, the ‘uala in your village grew rapidly so your village decided to give 20% more ‘uala than normal.

1. Let x be the weight, in pounds, of ‘uala that is normally traded for one (1) ‘ulu fruit. Write an expression that can be used to find the number of pounds of ‘uala that would be traded for an ‘ulu now.

A friend from the neighboring village came by and gave you an ‘ulu. You gave him 3.72 pounds of ‘uala, because that is the new rate for an ‘ulu.

2. Write and solve an equation to determine how many pounds of ‘uala, your friend would have gotten last year for the ‘ulu.

We saw that 3.72 pounds of ʻuala currently trades for 1 ʻulu.

3. Which of the following ratios represent this rate exactly? Choose all that apply.
   (a) 100 pounds of ʻuala : 372 ʻulu
   (b) 93 pounds of ʻuala : 25 ʻulu
   (c) 18 pounds of ʻuala : 5 ʻulu
   (d) 4 pounds of ʻuala : 1 ʻulu

4. Let x be the pounds of ʻuala traded for y number of ʻulu. Write an equation to show the relationship between x and y using the ratio from part 3. Use the form $rx = y$ where r is a simplified fraction.

5. Suppose that after trading x amount of ʻuala, your friend will give you an extra $1\frac{2}{3}$ of an ʻulu as a gift. Modify your equation in part 4 to include this gift.

6. Use the equation from part 5 to find how much ʻulu you get for 31 pounds of uʻala (including the gift).

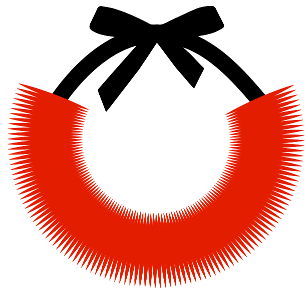
SBAC alignment for *Unit 3: Expressions and Equations Activity 4*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 C** Use properties of operations to generate equivalent expressions. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Expressions and Equations
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2c** Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.NS.2d** Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats **7.EE.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."
DOK:	1

Unit 3: Expressions and Equations *Activity 4*

Do not use a calculator for this activity.

A group of friends are collecting feathers to make lei hulu (feather lei).



Lei hulu

Let x be the amount of feathers they need.

1. One person collects 0.2 of the feathers they need. Write this as an algebraic expression.

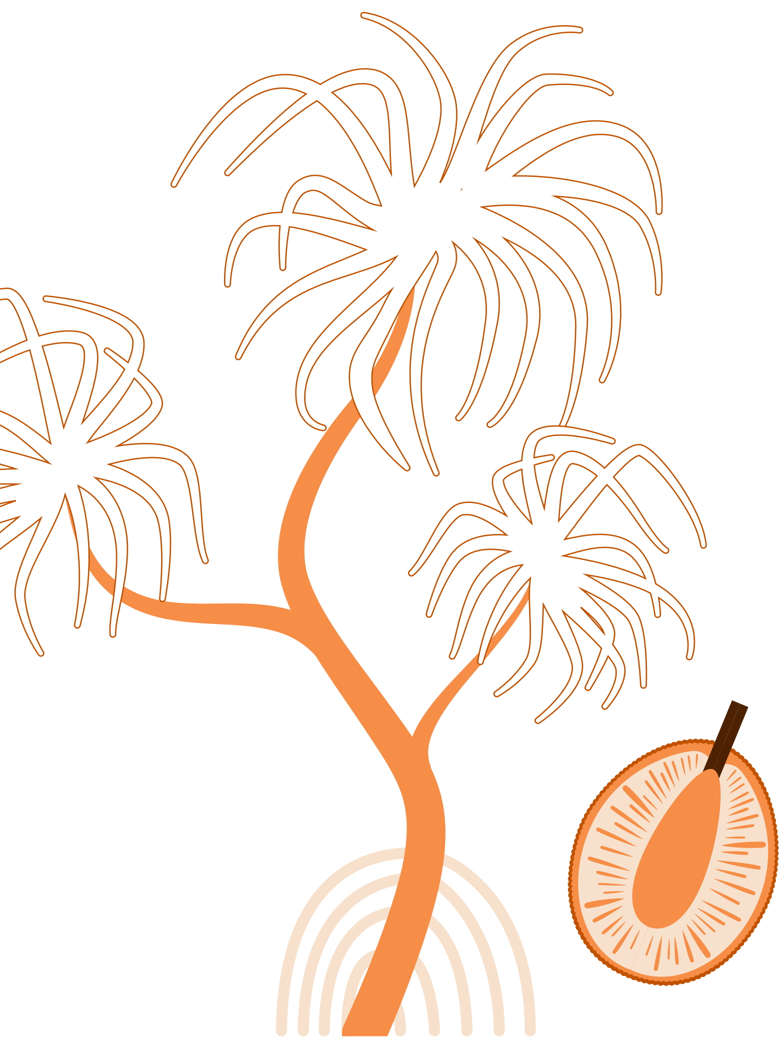
2. Another person collects $1/3$ of the feathers they need. Write this as an algebraic expression.

3. A final person collects 40% of the feathers they need. Write this as an algebraic expression.

4. Write a simplified expression for the total amount of feathers collected. Do not round.

5. What percent of the feathers needed did they collect? Show your work and do not round.

Unit 4: Geometry



SBAC alignment for *Unit 4: Geometry Activity 1*

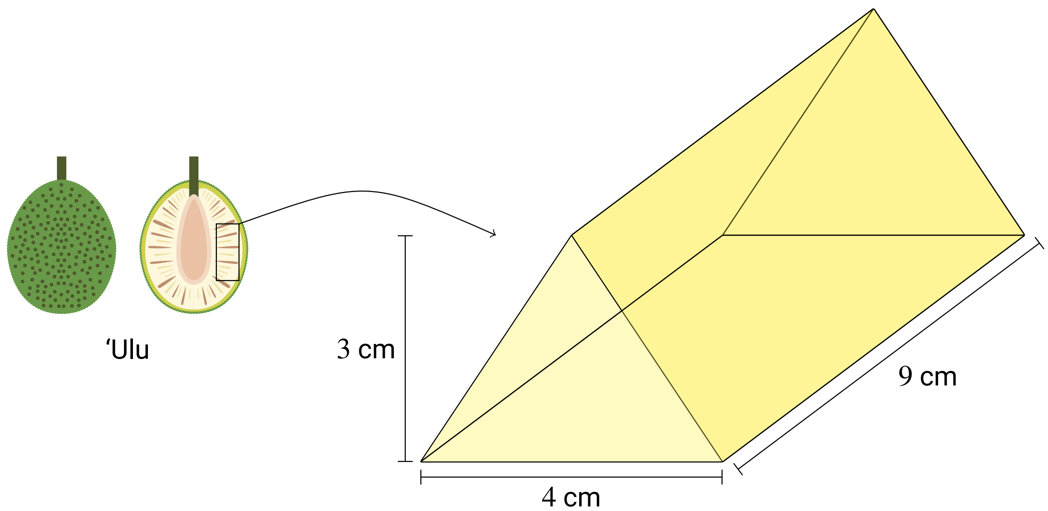
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.
Assessment Target(s):	**1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 B** Select and use appropriate tools strategically. **2 C** Interpret results in the context of a situation. **3 A** Test propositions or conjectures with specific examples.
Content Domain:	Geometry
Standard(s):	**7.G.2** Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. **7.G.3** Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
DOK:	1 & 2

Unit 4: Geometry *Activity 1*

A ruler with centimeters and a protractor is needed for this activity.

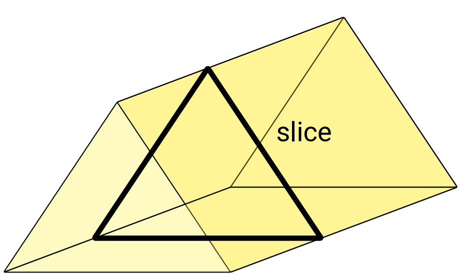
The ‘ulu (breadfruit) is an important plant for the people of Polynesia. Its milky sap is used to seal up any gaps in a canoe to make it waterproof, and the fruit of the ‘ulu has saved many people from starvation.

1. This piece of ‘ulu was cut into this triangular prism before cooking. The triangular face of the prism has a base of 4 centimeters (cm) and a height of 3 cm. The length of the prism is 9 cm.

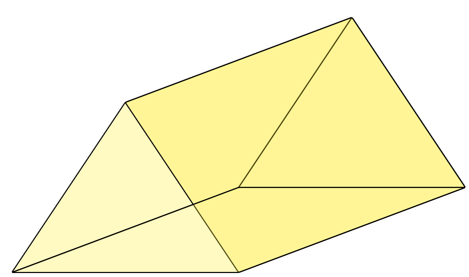


   What is the volume, in cm^3, of this triangular prism?

2. The ‘ulu can be sliced to make a triangle as in the example to the left. On the ‘ulu on the right, draw a **rectangular** slice.



Example of a trangular slice



Draw a rectangular slice

3. Sometimes, we cut the ʻulu into thin chips. Read the following descriptions of ʻulu chips and try to draw it.

   - If only one shape can be made to fit the description, then draw it.
   - If more than one shape can fit the description, then draw two.
   - If no shape can be made to fit the description, then say so.

   (a) Triangle with sides 3 cm, 1 cm, and 1 cm.

   (b) Triangle with angles $40°$, $60°$, and $80°$.

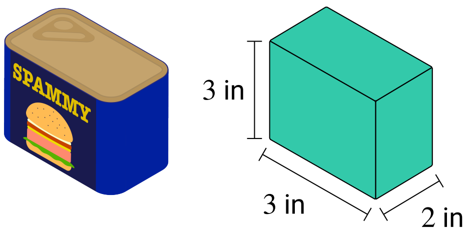
   (c) Triangle with sides 3 cm and 4 cm and the angle $60°$ in between the two given sides.

SBAC alignment for *Unit 4: Geometry Activity 2*

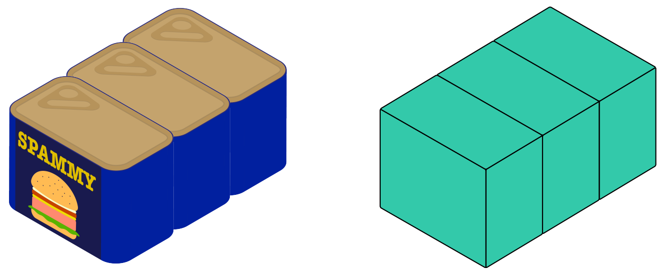
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Content Domain:	Geometry
Standard(s):	**7.G.2** Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
DOK:	1 & 2

Unit 4: Geometry *Activity 2*

Your cousin left Hawaiʻi to go to college. She is homesick so you decide to send her a care package. You line up a row of her favorite lunch meat to form a rectangular prism. Each can is 3 inches (in.) long, 2 in. wide, and 3 in. tall, and the cans are lined up so that their largest faces touch. Then you wrap the prism of cans in lauhala leaves before sending it to her in the mail. You have enough lauhala to cover a rectangular prism with a surface area between 181 and 191 square inches.



Can of meat



Rectangular prism of cans

1. What is the maximum number of cans you can use to create a rectangular prism that you can wrap with the lauhala? Draw the new prism and label its length, width, and height in inches.

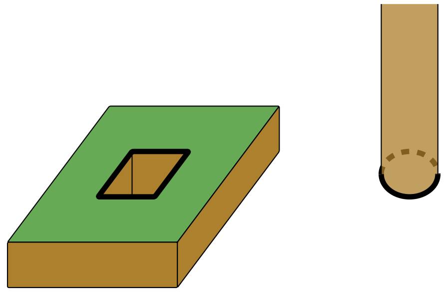
2. Find the surface area of the prism that you drew.

SBAC alignment for *Unit 4: Geometry Activity 3*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C I**nterpret results in the context of a situation. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D I**nterpret results in the context of a situation.
Content Domain:	Geometry
Standard(s):	**7.G.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
DOK:	1 & 2

Unit 4: Geometry *Activity 3*

While building a hale (house), the main posts are buried deep into the ground to make the hale stable. We dug a square hole in the ground and we are going to stick a cylindrical pole into this hole. The opening of the hole is a perfect square and the cross section of the pole is a perfect circle.



The hole has a perimeter of 40 inches, and the diameter of the pole is exactly the width of the hole.

1. How much longer is the perimeter of the hole compared to the circumference of the pole? Show your work and use $\pi = 3.14$.
2. How much larger is the area of the hole's opening compared to the cross-sectional area of the pole? Show your work and use $\pi = 3.14$.
3. What measurement is more useful for understanding how well the pole fits in the hole, area or circumference? Explain your answer.

SBAC alignment for *Unit 4: Geometry Activity 4*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Content Domain:	Geometry
Standard(s):	**7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) **7.EE.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that “increase by 5%” is the same as “multiply by 1.05.”

Continued on next page

Standard(s):	**7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **7.G.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
DOK:	1 & 2

Unit 4: Geometry *Activity 4*

A calculator is needed for this activity.

A master kalai wa'a (canoe maker) is taking care of a tree that he wants to carve into a wa'a (canoe).

1. The kalai wa'a uses a string and measures the circumference of the tree to be 78.5 inches. The cross section of this tree is a perfect circle. What is the **area** of the cross section? Show all work necessary. Use $\pi = 3.14$ and do not round the final answer.

2. If the kalai wa'a needs a tree with a cross sectional area that is 44% larger, what should the **radius** of this tree be? Show all work necessary. Use $\pi = 3.14$ and do not round the final answer.

SBAC alignment for *Unit 4: Geometry Activity 5*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 B** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.
Content Domain:	Geometry
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

Continued on next page

Standard(s):	**7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **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.G.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. **7.G.5** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
DOK:	1 & 2

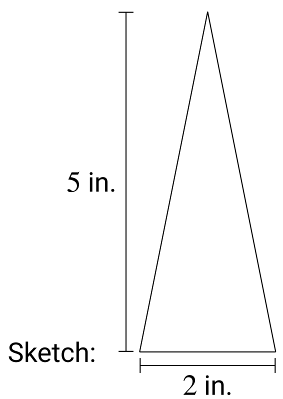
Unit 4: Geometry *Activity 5*

A calculator is recommended for this activity.

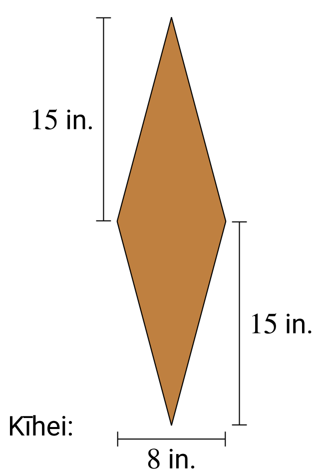
Below is an image of a woman wearing a kīhei (cloak or shawl) around her body. Your class is coming up with some simpler kīhei designs.

First, they have to sketch their designs on a piece of paper. Then, when they're happy with their designs, they will create the actual design on the kīhei to scale. 1 inch on the sketch maps to $6\frac{1}{4}$ inches on the actual kīhei.

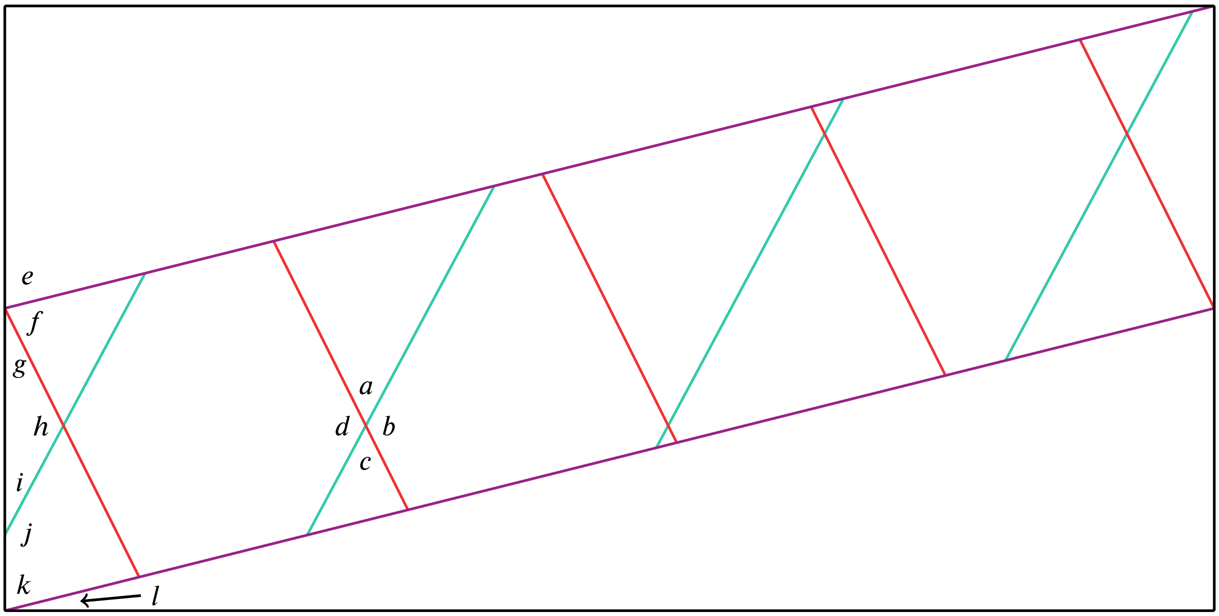
1. The following is a *sketch*. What is the area of this shape when it is actually on the *kīhei*? Round to the nearest tenth of a square inch.



2. The following is an image on a *kīhei*. What is the area of this shape on the original *sketch*? Round to the nearest tenth of a square inch.



3. Here's a sketch for a future Kīhei design. The outside shape is a rectangle and the inside pattern is made up of parallel lines. Lines with the same color are parallel to each other and the letters a to l represent measures of angles.



(a) Are there any pairs of vertical angles? If so, which pair(s)?

(b) Are there any pairs of adjacent angles that are also complementary? If so, which pair(s)?

(c) Are there any pairs of adjacent angles that are also supplementary? If so, which pair(s)?

(d) Are there any pairs of adjacent angles that are *not* supplementary? If so, which pair(s)?

(e) Write an equation that shows the relationship between angles g, h, and i.

(f) Write an equation that shows the relationship between angles k and l.

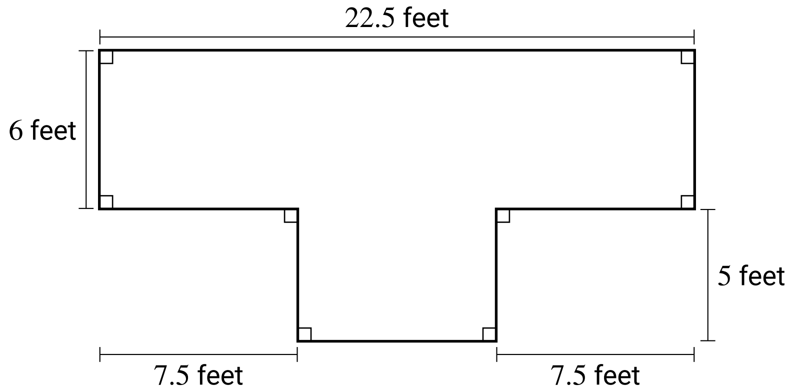
(g) If the measure of angle b is twice the measure of angle a, find the measure of angle c.

SBAC alignment for *Unit 4: Geometry Activity 6*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Content Domain:	Geometry
Standard(s):	**7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
DOK:	1 & 2

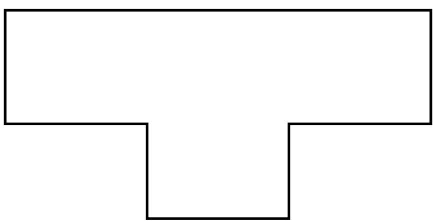
Unit 4: Geometry *Activity 6*

You and your hula classmates lay out some lauhala mats to create a stage to practice hula.

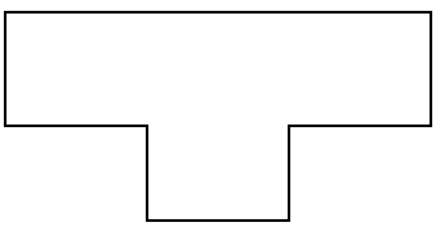


1. The shape of the stage was created using rectangular lauhala mats. Draw straight, perpendicular lines to deconstruct the shape into a number of smaller, non-overlapping rectangles as indicated below.

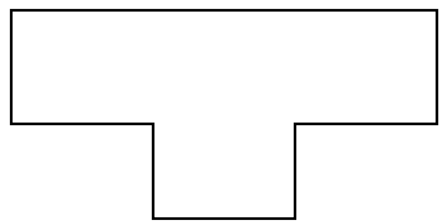
   (a) 4 rectangles:

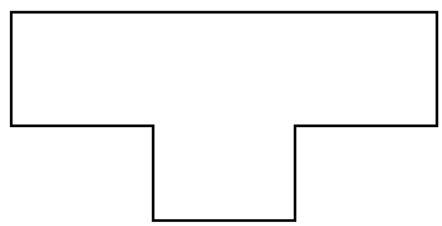
   (b) 3 rectangles:

   (c) 6 rectangles:

   (d) 7 rectangles:

2. What is the total area of the stage?

SBAC alignment for *Unit 4: Geometry Activity 7*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **2 D** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 C** State logical assumptions being used. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Geometry
Standard(s):	**7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)

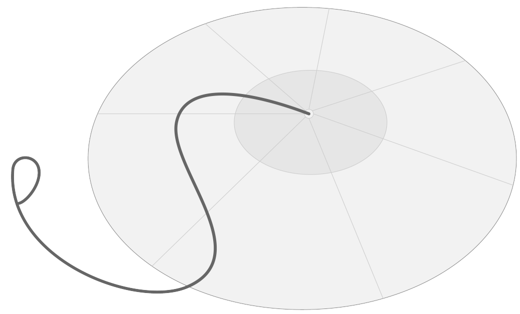
Continued on next page

Standard(s):	**7.EE.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 as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **7.G.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
DOK:	1, 2, & 3

Unit 4: Geometry *Activity 7*

A calculator is recommended for this activity.

The throw net has been used by locals to catch fish in Hawaiʻi for generations. It is usually the shape of a big circle with weights along its edge. It takes a lot of skill to properly fold and cast (throw into the water) a net. When done correctly, the many weights will be under control and the net will automatically open up into a big circle in the air without getting tangled.



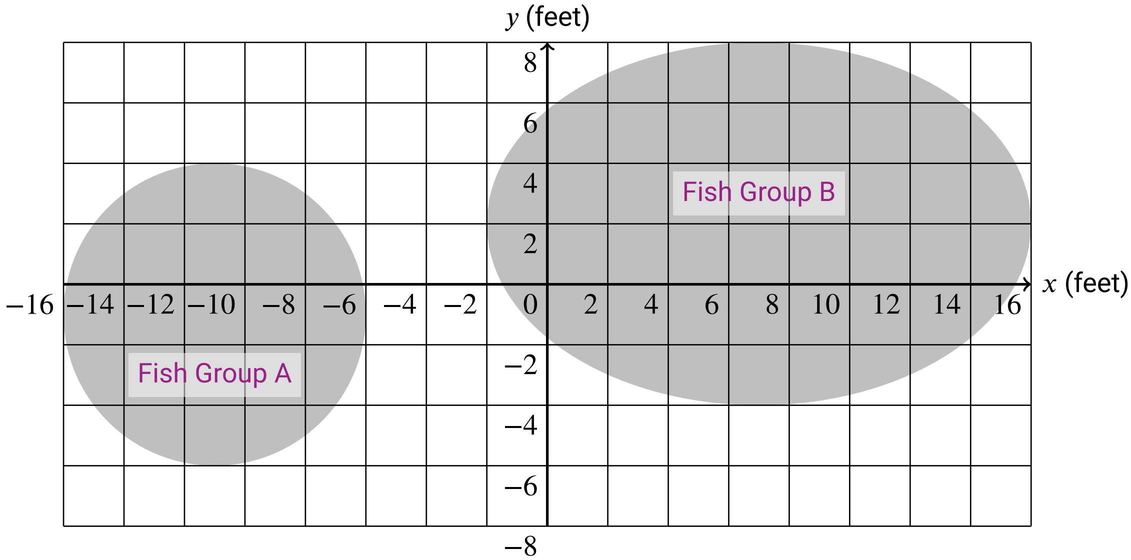
Modern throw net

1. You want to make a net that opens up to a circumference of 56.52 feet. What is its radius and area? Use 3.14 for π.

   (a) Radius:

   (b) Area:

2. You're looking down into the water and see two dark areas where fish are grouped together.



You can use the following throw nets to catch the fish. The nets will open up as a perfect circle when cast into the water. Use $\pi = 3.14$ where it is needed.

- Net 1 has a radius of 8.5 feet.
- Net 2 has a diameter of 15 feet.
- Net 3 has a circumference of 62.8 feet.
- Net 4 has a area of 113.04 feet^2.

(a) Which is the **smallest** net that can cover Fish Group A? Explain your answer.

(b) Which is the **smallest** net that can cover Fish Group B? Explain your answer.

SBAC alignment for *Unit 4: Geometry Activity 8*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 B** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 E** Draw, construct, and describe geometrical figures and describe the relationship between them. **1 F** Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation. **4 F** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).
Content Domain:	Geometry
Standard(s):	**7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

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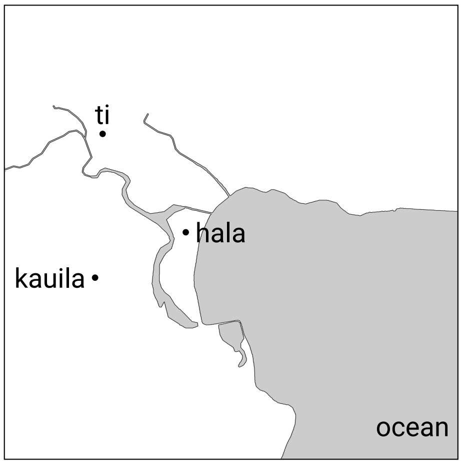
Standard(s):	**7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. **7.G.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
DOK:	1, 2, & 3

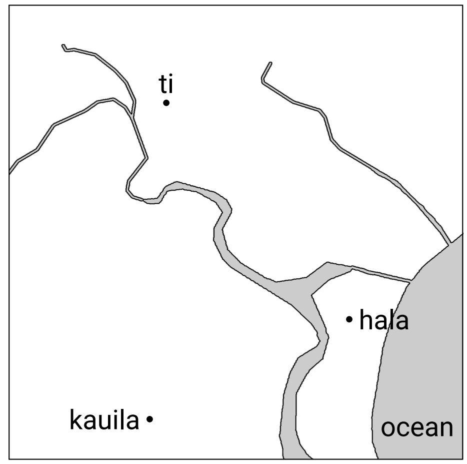
Unit 4: Geometry *Activity 8*

A calculator is recommended for this activity.

You need to collect some traditional Hawaiian plants for an upcoming Makahiki (Hawaiian New Year) Festival. A map of your town can show where the ti, hala, and kauila plants are. Below are two maps that show the same area at two different scales.



Map A



Map B

Use the following facts about the maps.

- 2 centimeters on Map A represents 3500 feet in real life.
- On Map A, the distance between the ti plant and the hala plant is 1.70 centimeters.
- On Map A, the distance between the hala plant and the kauila plant is 1.35 centimeters.
- On Map B, the distance between the ti plant and the hala plant is 3.74 centimeters.
- On Map B, the distance between the ti plant and the kaulia plant is 4.18 centimeters.

1. Complete the following table that shows the distances between the plants on both maps. Round to the nearest hundredth of a centimeter if needed.

Distance on Map (cm)

	Map A	Map B
Ti and hala	1.70	
Ti and kauila		
Hala and kauila		

2. 1 centimeter on Map B represents how many feet in real life? Round to the nearest tenth of a foot.

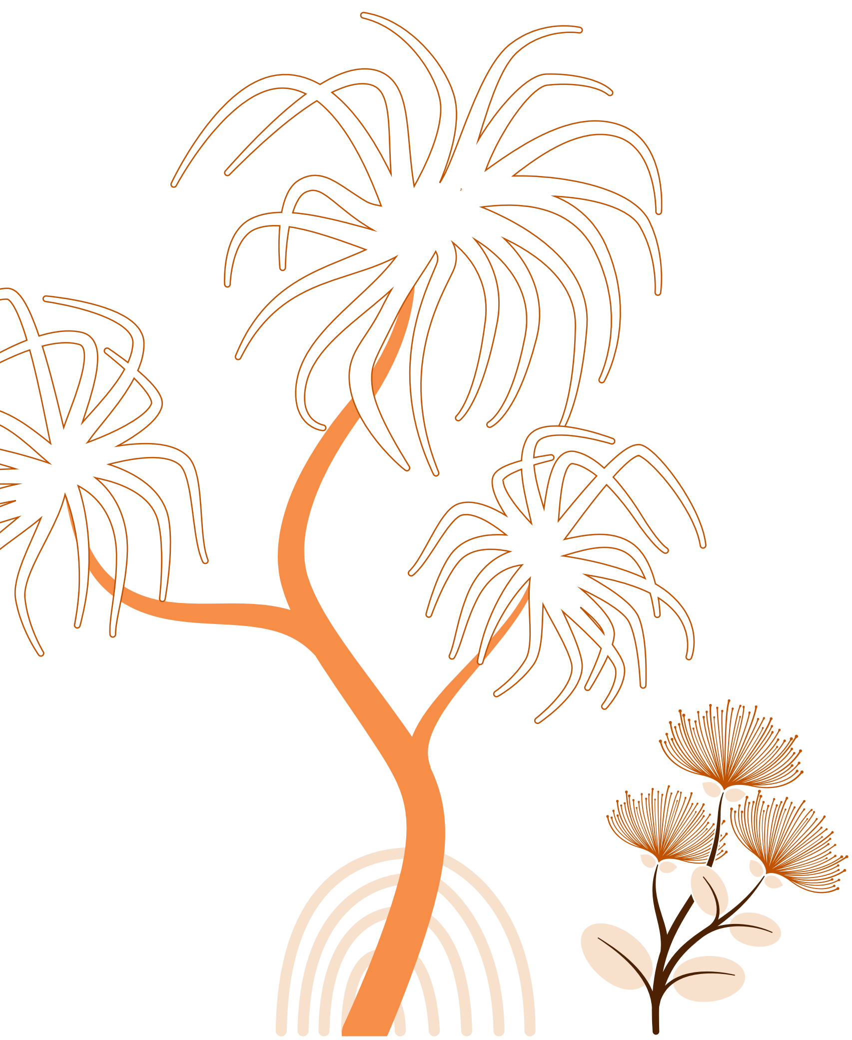
3. Find the real-life distances between each plant. Round to the nearest foot. Show your work.

   (a) Ti and hala

   (b) Ti and kauila

   (c) Hala and kauila

Unit 5: Statistics and Probability



SBAC alignment for *Unit 5: Statistics and Probability Activity 1*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.
Assessment Target(s):	**1 G** Use random sampling to draw inferences about a population. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **3 B** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. **3 C** State logical assumptions being used. **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions.
Content Domain:	Statistics and Probability
Standard(s):	**7.SP.1** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. **7.SP.2** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. **7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
DOK:	1 & 2

Unit 5: Statistics and Probability *Activity 1*

Kumu Lehua wants to teach a lei-making class after school. Before the start of her class, she asks a random sample of 40 students in her school to identify the type of material they would like to use to make the lei. There are 300 students at her school. Kumu Lehua's data is shown in the table below.

Student Lei Preferences	
Lei Material	Number of Students
Hulu (feathers)	5
Pūpū (shells)	4
Kukui nuts	3
ʻAkia berries	2
Ti leaves	10
Pūkiawe leaves	3
Palaʻā ferns	0
Maile vines	4
ʻIlima flowers	4
Pikake flowers	5

Which **one** of these four statements is **best** supported by the data? Explain.

(a) Exactly 25% of the students at Kumu Lehua's school want to make lei with ti leaves.

(b) There are no students at Kumu Lehua's school that want to make a lei with palaʻā ferns.

(c) There are probably more students at Kumu Lehua's school that want to make lei with ti leaves than with hulu (feathers).

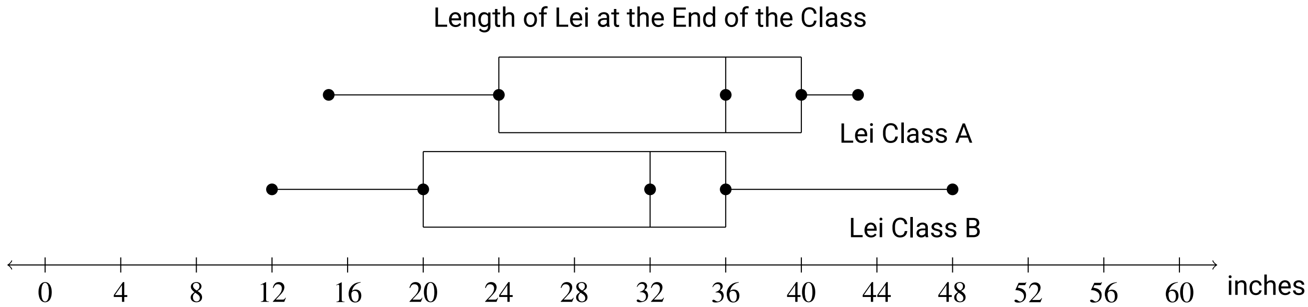
(d) There are probably more students at Kumu Lehua's school that want to make lei with hulu (feathers) than with pūpū (shells).

SBAC alignment for *Unit 5: Statistics and Probability Activity 2*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 H** Draw informal comparative inferences about two populations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **3 B** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. **3 C** State logical assumptions being used. **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. **4 C** State logical assumptions being used.
Content Domain:	Statistics and Probability
Standard(s):	**7.SP.3** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.
DOK:	1 & 2

Unit 5: Statistics and Probability *Activity 2*

There are two lei-making classes at a local middle school. In each class, there are students who are experienced lei makers and students who are beginners. The length of each student's lei at the end of the class is summarized by the box plots below.



The kumu of the lei-making classes concluded that there was more variability in the length of the lei made by Class A than Class B. Which statement is true about the kumu's conclusion?

(a) It is valid because the median for Class A is is greater than the median for Class B.

(b) It is valid because the interquartile range for Class A is greater than the interquartile range for Class B.

(c) It is invalid because the maximum value for Class A is less than the maximum value for Class B.

(d) It is invalid because the range for Class A is less than the range for Class B.

SBAC alignment for *Unit 5: Statistics and Probability Activity 3*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 I** Investigate chance processes and develop, use, and evaluate probability models. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 B** Select and use appropriate tools strategically. **2 C** Interpret results in the context of a situation. **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **3 G** At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.) **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 B** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. **4 C** State logical assumptions being used. **4 D** Interpret results in the context of a situation.
Content Domain:	Statistics and Probability
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

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Standard(s):	**7.SP.2** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. **7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. **7.SP.6** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. **7.SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. **7.SP.7a** Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. **7.SP.7b** Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?
DOK:	1, 2, & 3

Unit 5: Statistics and Probability *Activity 3*

Either a paper clip or an internet browser is needed for this activity.

For a lei-making class, each student will be given a box of supplies for making a lei. The boxes will be given out at random, and they contain different supplies. Here are the possible contents of lei supply boxes:

- Red hulu (feathers)
- Yellow hulu (feathers)
- Red leho (sea snail shells)
- White leho (sea snail shells)
- Red pua (flowers)
- White pua (flowers)
- Yellow pua (flowers)
- Brown kukui nuts

The students are wondering which box they'll get.

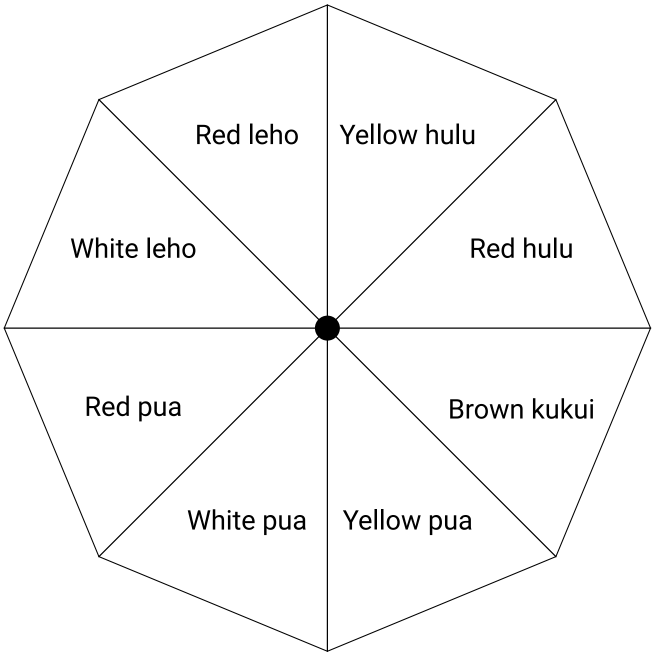
1. What is the probability of getting box for making lei from plant parts? Give your answer as a simplified fraction.

2. Which is more likely? Getting a box with red items or a box with animal parts? Explain.

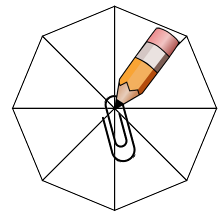
3. One student, Ka'ula, claims that he is **likely but not certain** to get something that is red. Is he correct? Explain.

4. Another student, Kalei, describes the lei supplies that she is **likely but not certain** to get. What could her description(s) be? (There may be more than one possible answer.)

To receive a box, the students will have to spin the spinner on the board below.



To use the spinner, hold a paperclip to the center of the spinner with a pencil and flick the paperclip to make it spin.



You can also go to `https://tools-unite.com/tools/random-picker-wheel` to make your own online spinner.

5. If you spin the spinner 16 times, how many times do you expect the spinner to land on red?

6. Spin the spinner 16 times and count the number of times it ended up on a red item.

   Number of red: ______

7. Did your actual spin in part 6 exactly match your prediction in part 5? Do you expect it to **always** match the prediction? Why or why not?

SBAC alignment for *Unit 5: Statistics and Probability Activity 4*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 G** Use random sampling to draw inferences about a population. **1 I** Investigate chance processes and develop, use, and evaluate probability models. **3 B** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. **3 C** State logical assumptions being used. **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation.
Content Domain:	Statistics and Probability
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.SP.1** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. **7.SP.2** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. **7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

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Standard(s):	**7.SP.7a** Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. **7.SP.8** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **7.SP.8b** Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
DOK:	1, 2, & 3

Unit 5: Statistics and Probability *Activity 4*

A Hawaiian school wants to plant a garden and use the plants for next year's Makahiki (Hawaiian New Year) Festival.

1. To plan what types of plants to grow, the principal of the school decides to survey some students. Rather than asking the opinion of every student at the school, she selects a sample of the students to represent the school. For each of the following samples, determine whether they are or aren't representative of the school.

   - If they are representative of the population, then say so.
   - If they are not, then give an example or an explanation of why not.

   (a) Students selected by the teachers.

   (b) Students randomly selected from a list of all students at the school.

   (c) Students sitting at randomly selected tables in the library.

   (d) Students selected from a hallway between classes.

   (e) Students who have an average grade of B or higher in all classes.

2. Are there any circumstances where it is better to survey all students? If so, when? If not, why not?

3. Here are the results of the survey. There are different ways that the principal can use this information to plan the garden.

Plant	Uses	Number of votes
Ti	Lei, wrapping things	7
Māmaki	Tea	4
Hau (hibiscus)	Rope	3
Uhi (yam)	Food	5
Kauila	Tools and weapons	1

   (a) One way that the principal could use this information is by creating a garden with 80 plants that match the proportion shown in the survey results. To follow this strategy, how many of each plant should she get?

Plant	Amount
Ti	
Māmaki	
Hau	
Uhi	
Kauila	

   (b) Another way that the principal can use this information is by randomly choosing a few plants to grow based on the survey results. The principal had each vote written on separate pieces of paper and placed into a bag and randomly chose a few votes to make her decision.

      i. What are the probabilities that the following plants are chosen first? Give your answer as a simplified fraction.

Plant	Probability
Ti	
Māmaki	
Hau	
Uhi	
Kauila	

ii. The principal chose hau first and then removed all the hau votes from the bag to choose a **second** plant. How many total votes remain?

iii. What are the probabilities that the following plants are chosen as the **second** plant? Give your answer as a simplified fraction.

Plant	Probability
Ti	
Māmaki	
Uhi	
Kauila	

iv. The principal chose ti next and then removed all the ti votes from the bag to choose a **final** plant. How many total votes remain?

v. What are the probabilities that the following plants are chosen as the **final** plant? Give your answer as a simplified fraction.

Plant	Probability
Māmaki	
Uhi	
Kauila	

SBAC alignment for *Unit 5: Statistics and Probability Activity 5*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 I** Investigate chance processes and develop, use, and evaluate probability models. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 B** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. **4 D** Interpret results in the context of a situation. **4 E** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
Content Domain:	Statistics and Probability
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. **7.SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. **7.SP.7b** Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?
DOK:	1, 2, & 3

Unit 5: Statistics and Probability *Activity 5*

For your school's graduation ceremony, you made 5 ti leaf lei, 9 plumeria flower lei, and 2 pīkake flower lei and put them in a big bag.

1. Suppose that you were to select a random lei in your bag to give to a graduating student. Calculate the probabilities of the following events as a simplified fraction. Then state whether the event is *certain*, *likely*, *neither unlikely nor likely*, *unlikely*, or *impossible* to happen.

   (a) A pīkake flower lei will be selected.

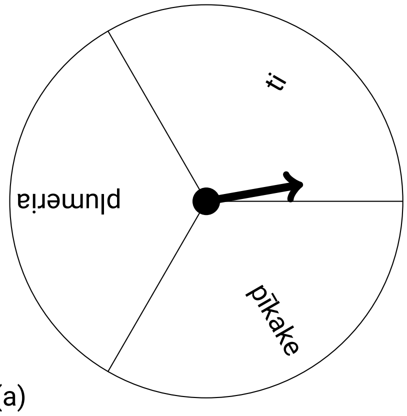
   (b) A kukui nut lei will be selected.

   (c) A plumeria flower will be selected.

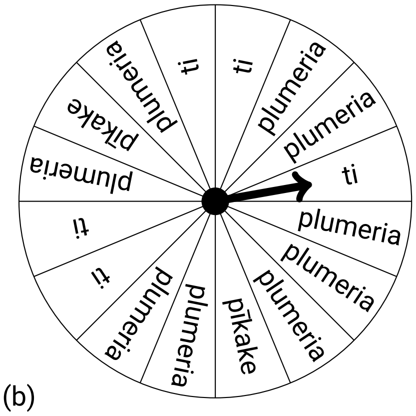
   (d) A ti leaf lei will be selected.

   (e) A lei made out of flowers will be selected.

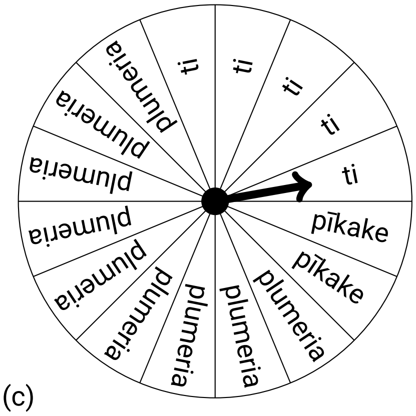
Here are some spinners that you might want to use to randomly choose a lei to give out.



(a)



(b)



(c)

2. Which of the three spinners **do not** accurately model the act of randomly choosing a lei from your bag? State all that apply and explain why not.

SBAC alignment for *Unit 5: Statistics and Probability Activity 6*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 H** Draw informal comparative inferences about two populations. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 C** Interpret results in the context of a situation. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 C** State logical assumptions being used. **4 D** Interpret results in the context of a situation.
Content Domain:	Statistics and Probability
Standard(s):	**7.SP.1** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. **7.SP.2** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. **7.SP.3** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.

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Standard(s):	**7.SP.4** Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.
DOK:	1, 2, & 3

Unit 5: Statistics and Probability *Activity 6*

Let's compare the lauhala (leaves of the hala tree) in your yard with other lauhala in your neighborhood.

Here are the lengths, in feet, of 10 random lauhala from your yard.

3.5	5	5	6	4.5
5.5	3	5	5.5	4.5

1. Find the mean length of your lauhala. Round your answer to the nearest hundredth.

2. Find the mean absolute deviation (MAD) for the lengths of your lauhala. Round your answer to the nearest hundredth.

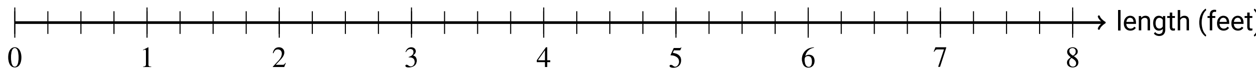
3. Your uncle's hala tree had a mean lauhala length of 3.7 feet. This mean is how many multiples of MAD different from your mean? Round your answer to the nearest tenth.

4. Your aunt's hala tree had a mean lauhala length of 5.1 feet. This mean is how many multiples of MAD different from your mean? Round your answer to the nearest tenth.

Here are the lengths of your lauhala again.

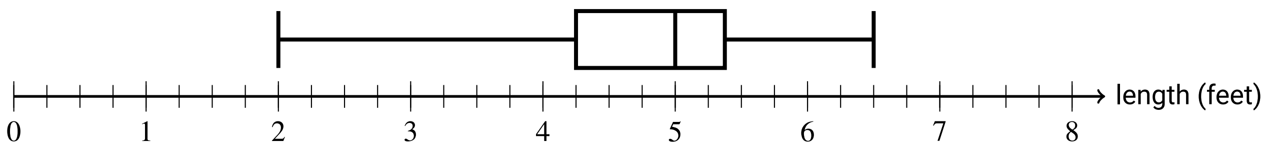
3.5	5	5	6	4.5
5.5	3	5	5.5	4.5

5. Create a box and whisker diagram with the data.



6. There are three other hala trees in your neighborhood, and you have recorded the lengths of some random lauhala from them. Compare *center* and *spread* of following box and whisker diagrams with diagram of *your tree* by stating whether it is "less than," "greater than," or "similar to" your hala tree.

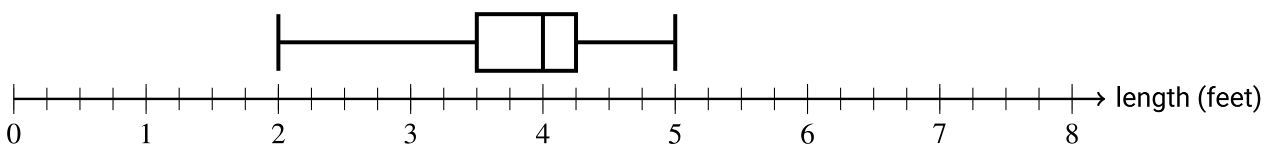
   (a) Hala A

   The center of Hala A is ________________ your hala tree.

   The spread of Hala A is ________________ your hala tree.

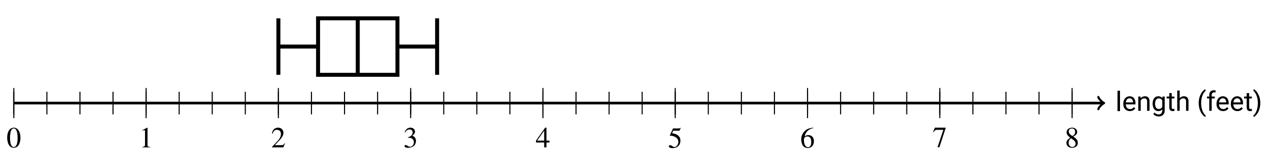
   (b) Hala B

   The center of Hala B is ________________ your hala tree.

   The spread of Hala B is ________________ your hala tree.

   (c) Hala C

   The center of Hala C is ________________ your hala tree.

   The spread of Hala C is ________________ your hala tree.

7. Answer the following questions about your hala tree and Hala A, B, and C.

   (a) You have a lauhala that is 6.5 feet long. Can you tell whether it come from your hala or Hala A? If so, which one? Explain.

   (b) You found a lauhala that is 2 feet long. Can you tell whether it come from Hala B or Hala C? If so, which one? Explain.

   (c) Name a possible leaf size from Hala B that is less than all of the leaves on your hala.

   (d) What is the smallest leaf on your hala that is greater than all the leaves on Hala C?

   (e) Which hala tree gives the most predictable leaf sizes? Explain.

   (f) Which of the hala tree(s) do you expect *half of their leaves* to be 4 feet or shorter?

SBAC alignment for *Unit 5: Statistics and Probability Activity 7*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 A** Analyze proportional relationships and use them to solve real-world and mathematical problems. **1 D** Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **1 G** Use random sampling to draw inferences about a population. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. **2 B** Select and use appropriate tools strategically. **2 C** Interpret results in the context of a situation. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 B** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. **4 C** State logical assumptions being used. **4 D** Interpret results in the context of a situation.
Content Domain:	Statistics and Probability
Standard(s):	**7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.3** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. **7.SP.1** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

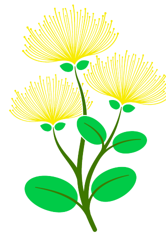
Continued on next page

Standard(s):	**7.SP.2** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. **7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
DOK:	1, 2, & 3

Unit 5: Statistics and Probability *Activity 7*

A six-sided die is needed for this activity.

The ʻōhia lehua tree is a cherished plant in Hawaiʻi. Its wood can be used to create weapons, musical instruments, and statues. Its leaves can be used to be make medicine, and its flowers are an important part of hula decorations. Unfortunately, populations of ʻōhia lehua are disappearing due to a disease called Rapid Ohia Death. A small volunteer group is studying ʻōhia lehua and are hoping to increase their numbers.



1. Suppose that the volunteers went into a forest and measured the heights of 20 random ʻōhia lehua that they found scattered throughout the forest. Here are the heights in feet.

9	10	11	13	8
13	15	7	11	15
10	9	9	16	9
18	12	14	18	7

(a) What is the probability a randomly chosen ʻōhia lehua in the forest is 9 feet tall? Give your answer as a simplified fraction.

(b) If there were 160 ʻōhia lehua in the entire forest, how many 18-feet tall trees do you expect to find?

(c) If there were 160 ʻōhia lehua in the entire forest, how many trees do you expect to find that are over 13 feet tall?

2. The volunteers decided to grow 36 ʻōhia lehua at the same time. Those that thrive will eventually be replanted in the forest. The ʻōhia lehua are grown in six rows. Below is a diagram showing the heights of all 36 trees in feet.

Row 1	5.4	3.1	4.2	3.8	4.3	3.5
Row 2	4.5	3.3	3.7	4.9	4.3	2.7
Row 3	5.5	3.4	3.3	2.6	3.9	3.9
Row 4	3.7	3.2	2.3	7.0	5.5	3.6
Row 5	3.9	4.4	4.0	3.4	4.9	2.9
Row 6	6.0	2.2	3.7	4.9	4.1	2.5

(a) Roll a six-sided die and use the result to choose a row to sample. Row ___________

(b) Use the trees in the row you selected to estimate the mean height of all the trees. Round to the nearest hundredth.

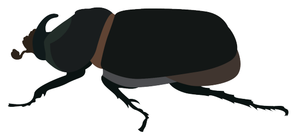
(c) Is the estimate from your row a good estimate for the mean height of all 36 trees? How do you know without calculating the mean of all 36 trees?

SBAC alignment for *Unit 5: Statistics and Probability Activity 8*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 3: Communicating Reasoning** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 I** Investigate chance processes and develop, use, and evaluate probability models. **3 E** Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. **3 F** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. **4 E** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
Content Domain:	Statistics and Probability
Standard(s):	**7.SP.8** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **7.SP.8a** Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. **7.SP.8c** Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?
DOK:	3

Unit 5: Statistics and Probability *Activity 8*

The coconut is a very important plant in Hawaiʻi. The inside of the coconut fruit is a great source of food and water. The outside of the fruit is used to make rope. The leaves can be woven to create clothing, furniture, and shelter. Its wood can also be used for creating buildings and musical instruments. Unfortunately, the coconut trees in Hawaiʻi are threatened by an invasive insect called the coconut rhinoceros beetle (CRB).



Coconut rhinoceros beetle

Let's look at how simulations can be used to answer complicated questions about CRB.

1. You are trying to answer this question:

   You're at a park where 1 in 6 coconut trees are infected with CRB. You need to find two coconut trees that are infected. On average, how many trees do we need to check until we find two infected trees?

   Consider the following simulations using six-sided dice. If it **can** be used to find the answer to the question, say so. If it **cannot**, explain what the simulation will find instead.

   (a) Repeatedly roll one die and count how many rolls it takes to get the number 1 to show up two times. For example, this would take five rolls: $3, 4, 1, 4, 1$. Repeat this experiment many times and find the mean number of rolls.

   (b) Roll six dice at the same time and count how many dice showed the number 1. Repeat the experiment many times and find the fraction of rolls that had at least two dice that showed that number 1.

   (c) Roll two dice at the same time and check whether both dice showed the number 1. Repeat the experiment many times and find the fraction of rolls that had both dice showing the number 1.

2. You are trying to answer this question:

   You're at a park where 1 in 6 coconut trees are infected with CRB. You are looking for an infected tree, and you see four trees that you want to check first. What is the probability that at least 1 out of a group of 4 trees will be infected?

   Consider the following simulations using six-sided dice. If it **can** be used to find the answer to the question, say so. If it **cannot**, explain what the simulation will find instead.

   (a) Repeatedly roll one dice and count how many rolls it takes to get the number 1 to show up four times. For example, this would take five rolls: $1, 3, 1, 1, 1$. Repeat this experiment many times and find the mean number of rolls.

   (b) Roll six dice at the same time and count how many dice showed the number 1. Repeat the experiment many times and find the fraction of rolls that had at least four dice that showed that number 1.

   (c) Roll four dice at the same time and check whether at least one die showed the number 1. Repeat the experiment many times and find the fraction of rolls that had at least one die showing the number 1.

   (d) Repeatedly roll one dice and count how many rolls it takes to get the number 1 to show up. For example, this would take five rolls: $2, 3, 3, 5, 1$. Repeat this experiment many times and find the fraction of tries that needed four or less rolls to get a 1 on the dice.

SBAC alignment for *Unit 5: Statistics and Probability Activity 9*

Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 4: Modeling and Data Analysis** Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Assessment Target(s):	**1 I** Investigate chance processes and develop, use, and evaluate probability models. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 D** Interpret results in the context of a situation.
Content Domain:	Statistics and Probability
Standard(s):	**7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. **7.SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. **7.SP.7a** Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. **7.SP.8** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **7.SP.8a** Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
DOK:	1 & 2

Unit 5: Statistics and Probability *Activity 9*

We've collected some materials for some traditional games in an upcoming Makahiki (Hawaiian New Year) Festival at your school. Here is the list of games with a description of how to play the game, the skills needed, the materials used, and the location of where the game will take place.

Game	Description	Skills	Materials	Location
Hāpai Pōhaku	Lift a series of large stones	Balance and strength	Stones	Garden
He'e Hōlua	Race a sled down a hill	Accuracy and balance	Rope and wood	Garden
Hukihuki	Tug of war	Strength and endurance	Rope	Middle of track field
Kūkini	Foot race	Endurance	None	Middle of track field
ʻŌʻō Ihe	Throw a wooden spear into a banana trunk.	Accuracy and strength	Wood	Garden
ʻUlu Maika	Roll a stone disk through a narrow gap between two stakes in the ground.	Accuracy	Stones and wood	Garden

The students in your school are randomly assigned to compete in the games. Answer the following questions as a simplified fraction.

1. What is the probability of being randomly assigned to the Kūkini game?
2. What is the probability of being randomly assigned to a game that uses strength?
3. What is the probability of being randomly assigned to a game that uses stones?
4. What is the probability of being randomly assigned to a game that takes place in the garden?
5. What is the probability of being randomly assigned to a game that uses balance and takes place in the middle of the track field?