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

TEACHER'S GUIDE

LET'S CHANT FOR RAIN



STEMD² Research & Development Group
University of Hawaiʻi at Manoa

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

http://stemd2.com/

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Ne‘epapa Ka Hana Sixth-Grade Mathematics Resources

Let’s Chant for Rain

Teacher’s Guide

Project Director — Kaveh Abhari, Kiriko Takahashi

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

Creative Designer — MyLan Tran

Publication Designer — Robert G. Young

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Introduction to *Let's Chant for Rain*

Let's Chant for Rain has been created by Ne'epapa Ka Hana (NKH) for 6th grade students of Hawai'i. The mathematical activities featured in *Let's Chant for Rain* 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 Ne'epapa Ka Hana (NKH) 2.0 and STEMD2, the mathematical curriculum of *Let's Chant for Rain* 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

Ne'epapa Ka Hana (NKH) develops programs and materials that are culturally responsive to Hawai'i's unique diversity - using research-based practices to support ongoing STEM education efforts across the state. *Let's Chant for Rain* is the 7th addition to NKH's middle school book series.

The *Let's Chant for Rain* 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 Hawai'i'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 Chant for Rain highlights the Common Core State Standards through the theme of Hawai'i's environment, weather, and climate. The curriculum focuses on incorporating mathematics to understand the human-environmental interactions that shape Hawai'i and the people who call it home.

Lesson Planning Structure

Aloha kākou, e komo mai, and welcome to our Ne'epapa Ka Hana (NKH) guide for kumu! In *Let's Chant for Rain*, we have developed a series of questions that model SBAC test questions to prepare your students for the SBAC (Smarter Balanced Assessment Consortium) testing at the end of the school year.

Formative Steps in the NKH Activity Set

In *Let's Chant for Rain*, each activity can be used separately and in various order. These activities serve as cumulative activities that should come after the various components of a given unit has been covered. To maximize the benefits of the activities, we suggest the following.

1. Allow the students to attempt the activity individually.
2. After reviewing students' initial solutions, formulate questions to challenge the students to explain their thought process and improve their responses.
3. Next, arrange students to work in small groups to synthesize their understanding of the activity. Four students per group is recommended, as students could also work in pairs within the group.
4. In the same small groups, students need to explain to each other how they come to the initial response and comment on initial responses by comparing them with their own work.
5. The group continues working together to finalize a solution for the given activity set to present to the class.
6. In a whole-class discussion-preferably moderated by themselves-students compare and evaluate the strategies they have seen and used.
7. In the end, you may need to summarize the students' discussions and explain one or two possible approaches.
8. Before moving to the next lesson, ask students to individually reflect for 10 minutes on their work and on what they have learned. You may ask your students to write what they learn in a few sentences.

Along with the book, we also offer online activities available on our community platform at https://community.stemd2.com. We encourage teachers to implement the community platform to provide students an online collaboration forum where they can work with other students on the math activities.

To facilitate the group and class discussion, you may need mini whiteboards with markers and erasers to quickly and visibly check individual understanding. This instructional strategy also enhances attention and participation. Using a projector and screen to share students' sample responses are highly recommended as well. A few activities in Let's Chant for Rain require materials such as a calculator and a straight edge or ruler.

Lesson Structure

Give each student a copy of the appropriate **NKH SBAC-aligned activity** or access to the activities on the NKH community platform.

Examples of instructional prompts for individual students who are attempting any given activity include the following:

- Read the questions and try to answer them as carefully as you can.
- Show all your work, so that I can understand your reasoning.
- In addition to trying to solve the problem, I want you to check if you can present your work in a clear and organized fashion.

Students should work individually and without your assistance. Note that you may have to rearrange your students seating arrangements.

Assessing Students' Responses and Giving Feedback

After collecting the students' attempts at a NKH SBAC-aligned activity, please take the time to create a few notes about what these samples of students' work reveal about their current levels of understanding and their unique approaches to problem-solving.

Scoring is not recommended during this phase.

It is also important to note that as a kumu, your feedback should summarize students' difficulties as a series of questions either by:

- Writing one or two questions on each students' work;
- Giving each student a printed version of you list of questions and highlight the questions that are more relevant to each individual student; or
- Selecting a few questions that will be of help to the majority of students and sharing them collectively with the whole class (either projected or written on the board) when returning students' initial attempts at the beginning of the NKH activity.

When providing feedback to your haumāna, please refer to your own professional judgment and the respective needs of your unique instructional setting. That being said, certain common issues do arise across different classrooms and we recommend the following instructional prompts:

Common Issues	**Feedback Examples**
Student has difficulty getting started	• What do you know? • What do you need to find out?
Student omits some given information when solving the problem	Write the given information in your own words.
Student overlooks or misinterprets some constraints	• Can you organize... in a systematic way? • What would make sense to try? Why? • How can you organize your work?
Student makes incorrect assumptions	Will it always be the way you described?

Continued on next page

Common Issues	Feedback Examples
Work is poorly presented	• Could someone unfamiliar with the task easily understand your work? • Have you explained how you arrived at your answer?
Student provides little or no justification	• How did you get your answer? • How could you convince me that...?
Completes the task early	• What would happen if...? • Double check your work • Can you spot any mistakes?

When you are delivering the full NKH Activity Set as a lesson, please make sure that you have allotted approximately 50 minutes for proper lesson delivery and activity execution.

That being said, reviewing a students' first attempt at a NKH Activity should take approximately 5-10 minutes. This review is done individually and generally provided to the entire class, as a collective whole, by either projecting on a screen or writing on the board.

Collaborative Small-Group Work

Once divided into groups, students should take 10-15 minutes to share and reflect upon their individual attempts at the prior, independent NKH Activity.

During this time, you may provide a few additional guiding prompts for your student groups:

- You each have your own individual solution to the task. Now, I want you to share your work with your partner(s). Take turns to explain how you did the task and how you think it could be improved.
- If explanations are unclear, ask questions until everyone in the group understands the individual solutions.

This leads to the next 15-20 minutes where students work together towards a common solution. If you are using the NKH community platform, your joint solution can be posted onto the Forum. Of course, the use of your own professional judgment and any other format achieving this goal will suffice.

During this section, you should take note of the different approaches between groups, the change of direction, dialogue between groups, etc. This effort will help you guide the class discussion wrap-up.

You will support and foster problem-solving skills by asking questions that help your haumāna clarify their thinking, while encouraging students to develop self-regulation as well as error detection skills.

Sharing, discussing, analyzing different approaches (10-20 minutes)

In this section, a whole-class discussion may follow the previous section. Voluntary or randomly select groups to share their strategies that were developed towards a joint solution. It may be important to ask how the students' group solution different from their individual solutions. If your students do not explicitly state their conclusions, you might ask how they checked their work. A conversation could be initiated via the online Forum as well.

Wrap-up (5-10 minutes)

As we wrap-up the final sections, a class discussion might conclude the NKH Activity Set by comparing the advantages and disadvantages of the approaches in the activity. Such discussion may center around shared difficulties or possible shortcuts that students could have developed either together or independently. It is important to recognize students' feelings and attitudes both during and after these activities.

Please note that the timing for these sections and activities range from 40-70 minutes but may vary from classroom to classroom depending on the nature of your needs within your particular instructional setting.

Additional Notes

The given lesson duration are only approximate. Please feel free to spend more or less time on these activities if it suits your classroom better.

Please send us any comments, issues, technical or otherwise, you might have with the content, the format, or the approach.

Common Core State Standards

Common Core State Standard	*Let's Chant for Rain* Activity
Ratios & Proportional Relationships	
6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
6.RP.2 Understand the concept of a unit rate a/b associated with a ratio a:b with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Note: Expectations for unit rates in this grade are limited to non-complex fractions.)	2.3, 2.5, 3.2, 3.4
6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.	2.1, 2.3, 2.5, 2.6, 2.7, 3.2, 3.4, 4.6
6.RP.3a Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	2.4, 2.6
6.RP.3b Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*	2.1, 2.3, 2.5, 2.6, 3.2, 3.4
6.RP.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.	2.2, 2.7
6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	2.3, 2.6

Continued on next page

Common Core State Standard	*Let's Chant for Rain* Activity
The Number System	
6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.). How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*	1.3, 1.4, 2.6, 3.2
6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.	1.5, 1.6, 2.2
6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	1.5, 2.2
6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).*	1.4
6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	1.1, 1.6
6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	1.1, 1.2, 1.3, 4.1, 4.2, 4.3, 4.6
6.NS.6a Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.	1.1

Continued on next page

Common Core State Standard	***Let's Chant for Rain* Activity**
6.NS.6b Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.	1.2, 4.1, 4.2, 4.3
6.NS.6c Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	1.1, 1.2, 4.1, 4.2, 4.3, 4.6
6.NS.7 Understand ordering and absolute value of rational numbers.	1.1, 1.2, 1.6
6.NS.7a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret −3 > −7 as a statement that −3 is located to the right of −7 on a number line oriented from left to right.*	1.1
6.NS.7b Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write −3° C > −7° C to express the fact that −3° C is warmer than −7° C.*	1.1, 1.2
6.NS.7c Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of −30 dollars, write |−30| = 30 to describe the size of the debt in dollars.*	1.1, 1.2, 1.6
6.NS.7d Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than −30 dollars represents a debt greater than $30.*	1.1, 1.2, 1.6
6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	1.2, 4.1, 4.2, 4.3, 4.6
Equations & Expressions	
6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.	3.7, 4.4
6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.	3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.8, 4.9

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Common Core State Standard	***Let's Chant for Rain* Activity**
6.EE.2a Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*	3.2, 3.3, 3.4, 3.5, 4.9
6.EE.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*	1.4
6.EE.2c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length s = 1/2.*	3.4, 3.6, 3.7, 4.4, 4.6, 4.8, 4.9
6.EE.3 Apply the properties of operations as strategies to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply properties of operations to y + y + y to produce the equivalent expression 3y.*	3.6, 4.9
6.EE.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*	3.6
6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	3.1, 3.2, 3.3, 3.5, 4.8
6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	3.2, 3.3, 3.5, 3.6, 4.8, 4.9
6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.	3.2, 3.5, 3.6

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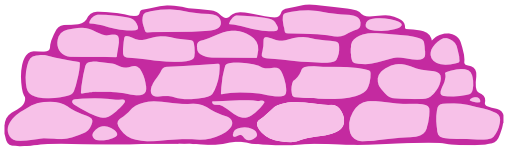
Common Core State Standard	*Let's Chant for Rain* Activity
6.EE.8 Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	3.1, 3.5, 4.8
6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*	3.3, 3.6, 4.9
Geometry	
6.G.1 Find area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	4.2, 4.6, 4.8
6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	4.4, 4.5
6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	1.2, 4.1, 4.2, 4.3, 4.6
6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	4.7, 4.8, 4.9

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Common Core State Standard	***Let's Chant for Rain* Activity**
Statistics & Probability	
6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*	5.3
6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	5.2
6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values using a single number, while a measure of variation describes how its values vary using a single number.	5.1
6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	5.1
6.SP.5 Summarize numerical data sets in relation to their context, such as by:	5.1, 5.2, 5.3, 5.4, 5.5
6.SP.5a Reporting the number of observations.	5.4, 5.5
6.SP.5b Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.	5.3
6.SP.5c Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	5.1, 5.2, 5.4, 5.5
6.SP.5d Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	5.2

Unit 1: The Number System



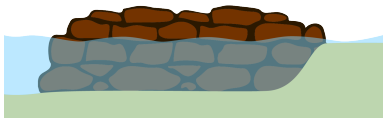


SBAC alignment for *Unit 1: The Number System Activity 1*

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.
Assessment Target(s):	**1 D** Apply and extend previous understandings of numbers to the system of rational numbers. **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:	The Number System
Standard(s):	**6.NS.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. **6.NS.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **6.NS.6a** Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. **6.NS.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.7** Understand ordering and absolute value of rational numbers. **6.NS.7a** Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* **6.NS.7b** Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3° C > –7° C to express the fact that –3° C is warmer than –7° C.* **6.NS.7c** Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* **6.NS.7d** Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than $30.*
DOK:	1 & 2

Unit 1: The Number System *Activity 1*

After a storm, two scientists go to a beach to check if there is any major damage. One scientist dives in the water to investigate and the other climbs up the ocean cliff.



- The ocean surface is considered to be at an altitude of zero (0) feet.
- The ocean floor at the diving spot is at an altitude of -20 feet.
- The diving scientist is in the water at an altitude of -5 feet.
- The climbing scientist is above the ocean surface at an altitude of 15 feet.

For the following statements, select True or False and justify your answer by showing your work.

1. The distance from the climber to the diver is greater than the distance from the ocean surface to the ocean floor.

☐ True ☑ False

Climber to diver		Ocean surface to ocean floor
$\lvert(-5)-(15)\rvert$		$\lvert(-20)-(0)\rvert$
$\lvert-20\rvert$		$\lvert-20\rvert$
20	$=$	20

2. The distance from the climber to the ocean surface is the same as the distance from the diver to the ocean floor.

☑ True ☐ False

Climber to ocean surface		Diver to ocean floor
$\lvert(0)-(15)\rvert$		$\lvert(-20)-(-5)\rvert$
$\lvert-15\rvert$		$\lvert-15\rvert$
15	$=$	15

3. When the diver swims to an altitude of -10 feet, the diver will be the same distance below the ocean surface as the climber is above the ocean surface.

☐ True ☑ False

Diver at -10 feet to ocean surface		Climber to ocean surface
$\lvert(0)-(-10)\rvert$		$\lvert(0)-(15)\rvert$
$\lvert 10\rvert$		$\lvert -15\rvert$
10	$<$	15

4. When the diver swims to an altitude of -10 feet, the diver's distance to the ocean floor will be equal to the diver's distance to the ocean surface.

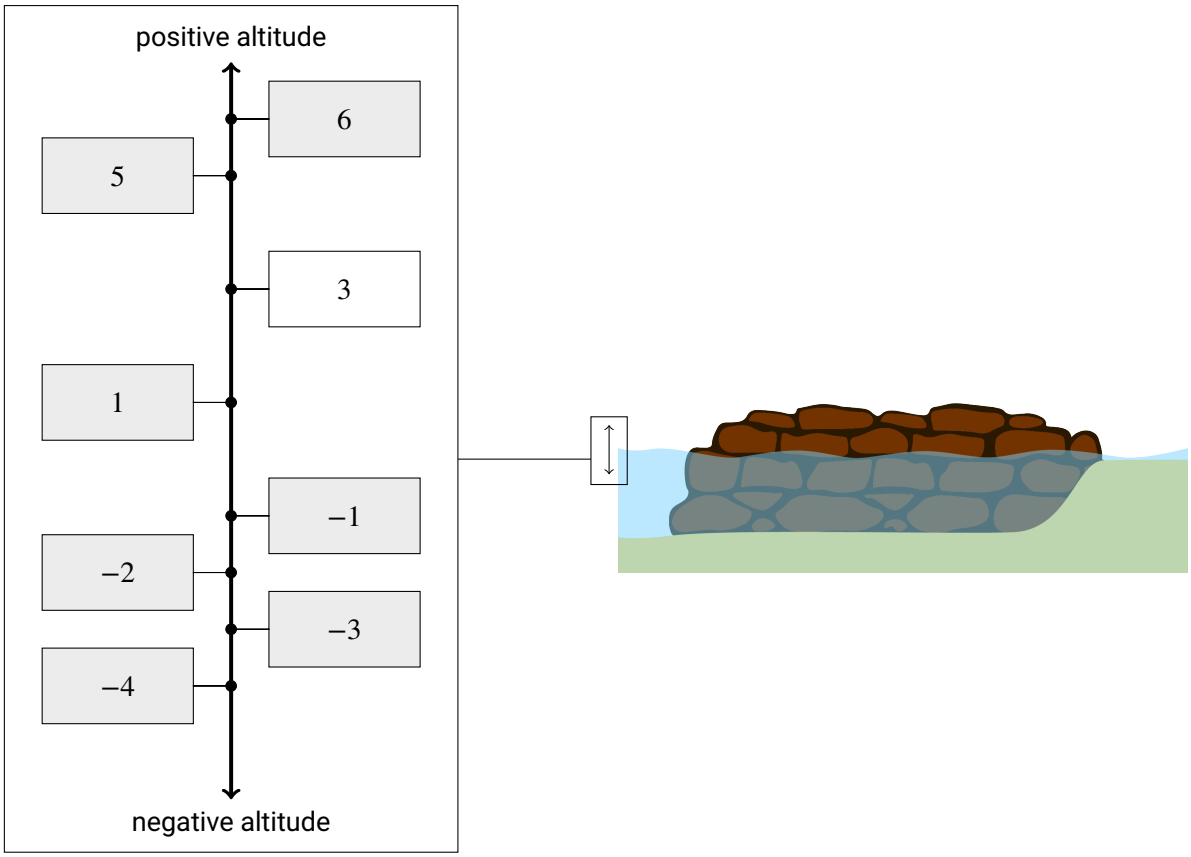
☑ True ☐ False

Diver at -10 feet to ocean surface		Diver to ocean surface
$\lvert(-20)-(-10)\rvert$		$\lvert(0)-(-10)\rvert$
$\lvert -10\rvert$		$\lvert 10\rvert$
10	$=$	10

5. Later, the scientists investigate the beach at eight more altitudes (in feet):

$3 \qquad -2 \qquad -3 \qquad 5 \qquad -4 \qquad 6 \qquad 1 \qquad -1$

(a) The eight altitudes are plotted on the following vertical number line. The positive direction on the line is up and the negative is down, but the actual numbers are missing. Fill in the missing numbers in the boxes below.



(b) Which of the eight numbers were opposite numbers?

-3, 3, -1, and 1 were two pairs of opposite numbers

(c) Determine if each of the following statements about those opposite numbers are true or false.

Their sums are always positive.	☐ True	☑ False
Their sums always equal zero.	☑ True	☐ False
Their sums are always negative.	☐ True	☑ False
When the scientists are at the opposite altitudes, they are both the same distance away from the ocean surface.	☑ True	☐ False
When the scientists are at the opposite altitudes, they are both the same distance away from the ocean floor.	☐ True	☑ False

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 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** Apply and extend previous understandings of numbers to the system of rational numbers. **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):	**6.NS.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **6.NS.6b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. **6.NS.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.7** Understand ordering and absolute value of rational numbers. **6.NS.7b** Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write −3° C > −7° C to express the fact that −3° C is warmer than −7° C.* **6.NS.7c** Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of −30 dollars, write |−30| = 30 to describe the size of the debt in dollars.* **6.NS.7d** Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than −30 dollars represents a debt greater than $30.*

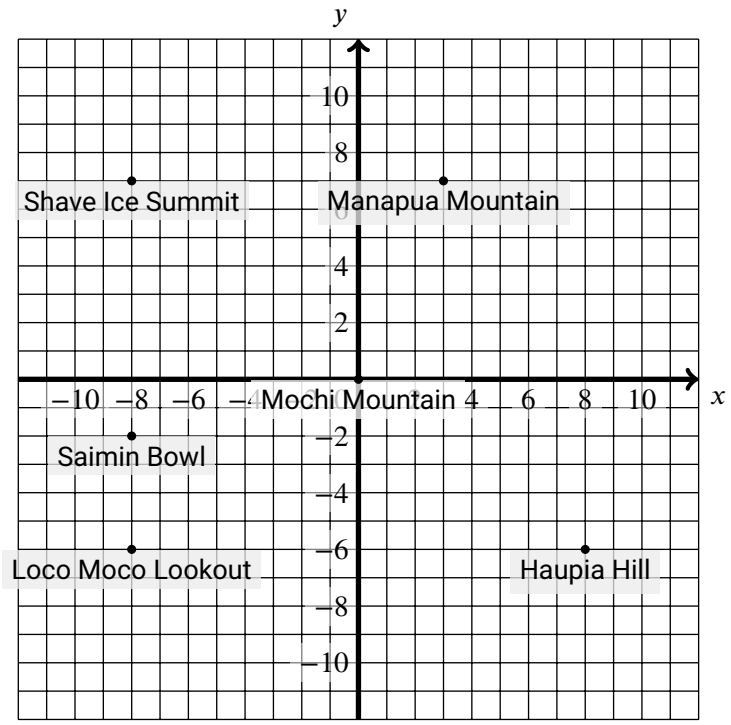
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Standard(s):	**6.NS.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. **6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	1, 2, & 3

Unit 1: The Number System *Activity 2*

When people think about volcanoes, they often think only about fire and rocks. However, volcanoes come in many different shapes, sizes, and colors. There are volcanoes that are covered in snow, hidden in forests, and even under water.

Below is an area with a lot of volcanic activity, drawn on a coordinate plane.



1. A snowy volcano, Mochi Mountain, is at the origin, $(0, 0)$. Plot and label the locations of five other volcanic places listed below.
   - Shave Ice Summit $(-8, 7)$
   - Manapua Mountain $(3, 7)$
   - Haupia Hill $(8, -6)$
   - Saimin Bowl $(-8, -2)$
   - Loco Moco Lookout $(-8, -6)$
2. A Visitor's Center will be placed on the map with the same y-coordinate as the Manapua Mountain. If the Visitor's Center is the same distance from Manapua Mountain as the Loco Moco Lookout is from the Saimin Bowl, then what is the x coordinate of the Visitor's Center? Explain your answer.
   Hint: There are two possible answers. Find just one of these answers.

   Loco Moco Lookout and Saimin Bown have the same x-coordinate so the distance between these two locations is $|(-6) - (-2)| = |-4| = 4$. The Visitor's Center has the same y-coordinate as Manapua Mountain so its y-coordinate is 7. Visitor's Center has the same distance from Manapua Mountain as Loco Moco Lookout has from Saimin Bowl so the x-coordinate of the Visitor's Center is 4 units from 3, $3 - 4 = -1$ or $3 + 4 = 7$. Thus the possible locations of the Visitor's Center are $(-1, 7)$ and $(7, 7)$.

3. For the following statements, select True or False, based on the given information. Justify your answers by showing your work.

   (a) Loco Moco Lookout is further from Shave Ice Summit than it is from Haupia Hill.

   ☐ True ☑ False

Loco Moco to Shaved Ice (x-coordinate constant)		Loco Moco to Haupia (y-coordinate constant)
$\lvert(7)-(-6)\rvert$		$\lvert(8)-(-8)\rvert$
$\lvert 13\rvert$		$\lvert 16\rvert$
13	$<$	16

   (b) The distance from Shave Ice Summit to Manapua Mountain is equal to $|-8|+|3|$.

   ☑ True ☐ False

Shave Ice to Manapua (y-coordinate constant)		$\lvert-8\rvert+\lvert3\rvert$
$\lvert(3)-(-8)\rvert$		$8+3$
$\lvert 11\rvert$		
11	$=$	11

   (c) The distance from Shave Ice Summit to Saimin Bowl is equal to $|7|+|-2|$.

   ☑ True ☐ False

Shave Ice to Saimin (x-coordinate constant)		$\lvert7\rvert+\lvert-2\rvert$
$\lvert(-2)-(7)\rvert$		$7+2$
$\lvert-9\rvert$		
9	$=$	9

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 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 multiplication and division to divide fractions by fractions. **1 D** Apply and extend previous understandings of numbers to the system of rational numbers. **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:	The Number System
Standard(s):	**6.NS.1** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.). How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* **6.NS.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
DOK:	1 & 2

Unit 1: The Number System *Activity 3*

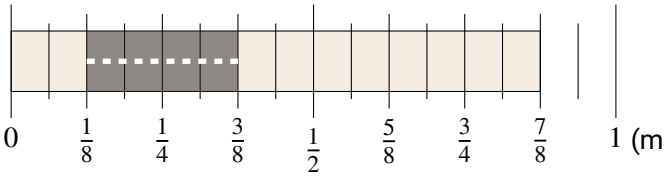
Kawai grew up on a $\frac{7}{8}$-mile long road along the west coast of O'ahu. This road has been slowing eroding into the ocean and over time, $\frac{1}{2}$-mile has been lost.

1. Which of the following are possible drawings of the road today? Choose all possible answers.

$\frac{7}{8} - \frac{1}{2} = \frac{3}{8}$

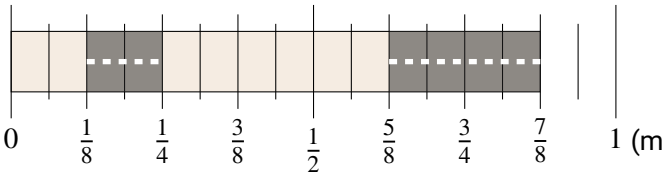
After erosion, $\frac{3}{8}$ mile of road is left. In the following drawings, options (b) and (c) show this length.

(a)



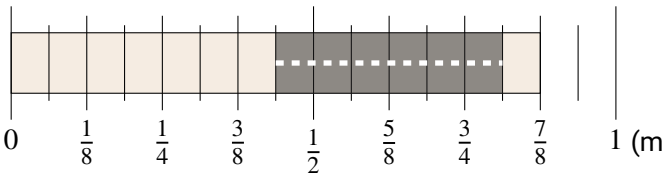
This shows $\frac{1}{4}$ mile of road.

(b)



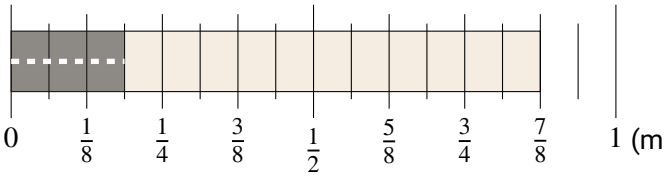
This shows $\frac{3}{8}$ mile of road.

(c)



This shows $\frac{3}{8}$ mile of road.

(d)



This shows $\frac{3}{16}$ mile of road.

2. What **fraction** of the original length of the road has been eroded away?

$\frac{1}{2} \div \frac{7}{8} = \frac{1}{2} \times \frac{8}{7} = \frac{4}{7}$

$\frac{4}{7}$ of the road has been eroded away

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 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 multiplication and division to divide fractions by fractions. **1 C** Compute fluently with multi-digit numbers and find common factors and multiples. **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 E** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
Content Domain:	The Number System
Standard(s):	**6.NS.1** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.). How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* **6.NS.4** Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* **6.EE.2b** Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*
DOK:	1, 2, & 3

Unit 1: The Number System *Activity 4*

To prepare for an upcoming hurricane, your family decides to protect your windows with some sheets of wood.



1. There's a stack of $7\frac{1}{2}$ wooden sheets in your yard. If each window needs to be covered with a $\frac{3}{4}$ sheet of wood, how many windows can you cover?

   $7\frac{1}{2} = \frac{15}{2}$
   $\frac{15}{2} \div \frac{3}{4} = \frac{15}{2} \times \frac{4}{3} = 10$

   With $7\frac{1}{2}$ sheets of wood, you should be able to cover 10 windows.

2. Your house has a total of 14 windows. Do you have enough sheets of wood to cover all your windows?

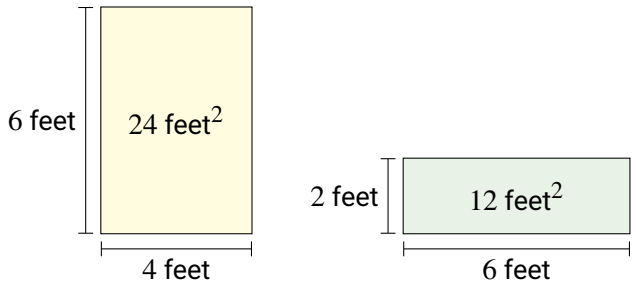
   - If so, how many wooden sheets are left over?
   - If not, how many wooden sheets do you need to get?

   Do not round. Give your answer as a mixed fraction if needed.

   You have enough to cover 10 of your 14 windows so you need to cover 4 more.

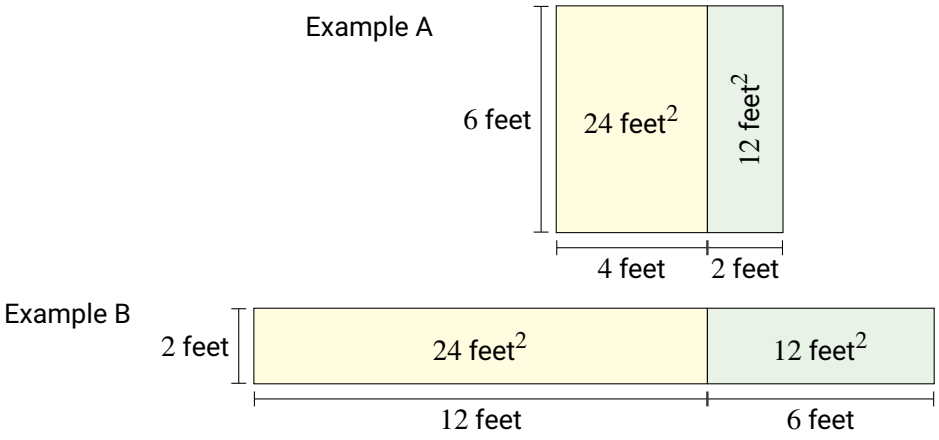
   $4 \times \frac{3}{4} = 3$
   $\frac{3}{4}$ of a sheet covers 1 window so you need 3 whole sheets to cover 4 windows.

3. You want to cover two more windows. One is 6 feet tall and 4 feet wide, with an area of 24 square feet. The other is 2 feet tall and 6 feet wide with an area of 12 square feet.



Your neighbor says they have an extra board that they can give you. They say that their board is in the **shape of a rectangle** and has **just enough area** that you can cut the board and cover your two windows. We do not know the height and width of the board, but we know that they are **whole numbers**.

If the board is 6 feet tall, like in Example A, a simple cut can be made to create the two boards that you need. However if the board has a different height, like in Example B, then you might need to make more than a simple cut to use the board.



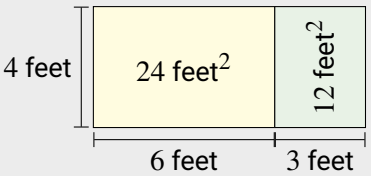
Sketch and label one other possible board.

Knowing the common factors of 24 and 12 can help find the height. Here are the factors with the common factors circled.
Factors of 24: ① ② ③ ④ ⑥ 8 ⑫ 24
Factors of 12: ① ② ③ ④ ⑥ ⑫
Heights of 6 and 2 are already used in the examples so that leaves us with 1, 3, 4, and 12.

Here are the possible combinations:

Height (feet)	Width of 24 ft^2 board	Width of 12 ft^2 board
1	24	12
3	8	4
4	6	3
12	2	1

Example:



4. The two windows that you need to cover have a total surface area of 36 square feet. One way to check if the board you sketched in part 3 is the correct size, is by writing a expression to show the total area of the board and checking if it evaluates to 36 square feet.

   The area of the board in Example A can be expressed as $6(4 + 2)$.
   The area of the board in Example B can be expressed as $2(12 + 6)$.

   Write the expression for the area of the board you sketched in part 3.

   $\square\,(\,\square + \square\,)$ Example: $4\,(\,6 + 3\,)$

5. What are the **factors** in the expression you wrote in part 4?

   The factors are 4 and $(6 + 3)$. Students can also say that 4 and 9 are factors.

6. What are the **terms** in the expression you wrote in part 4?

   The terms are 6 and 3. Students can also say that 24 and 12 are terms.

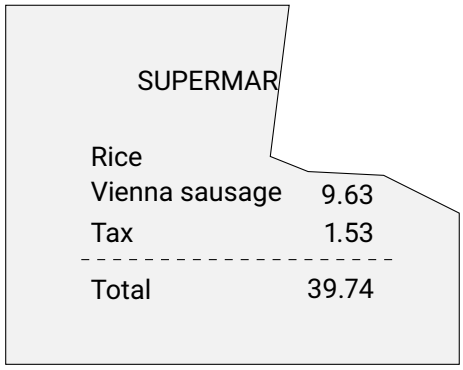
SBAC alignment for *Unit 1: The Number System Activity 5*

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 C** Compute fluently with multi-digit numbers and find common factors and multiples. **1 D** Apply and extend previous understandings of numbers to the system of rational numbers. **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:	The Number System
Standard(s):	**6.NS.2** Fluently divide multi-digit numbers using the standard algorithm. **6.NS.3** Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
DOK:	1

Unit 1: The Number System *Activity 5*

Do not use a calculator for this activity.

A hurricane is on its way, and an elderly neighbor asks you to help him buy some rice and Vienna sausages. He says he'll pay you back if you give him the receipt. Unfortunately, the receipt got torn.



1. Write and solve a numerical expression to find the cost of the rice. Show your work and do not use a calculator.

$39.74 - 9.63 - 1.53$ or $39.74 - (9.63 + 1.53)$ or similar would give us the cost of the rice.

$$\begin{array}{r} {\scriptstyle 1} \\ 9.63 \\ +\ 1.53 \\ \hline 11.16 \end{array} \qquad \begin{array}{r} {\scriptstyle 6\,1} \\ 39.74 \\ -\ 11.16 \\ \hline 28.58 \end{array}$$

2. In times of emergency, important supplies may start to run out and their prices may go up. Before the hurricane, the rice cost half as much as it does now. What was the original cost of the rice? Show your work and do not use a calculator.

$$\begin{array}{r} 14.29 \\ 2\overline{)\,28.58} \\ -2 \\ \hline 08 \\ -8 \\ \hline 05 \\ -4 \\ \hline 18 \\ -18 \\ \hline 0 \end{array}$$

$28.58 \div 2 = 14.29$

The original price of the rice was $\$14.29$.

SBAC alignment for *Unit 1: The Number System 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.
Assessment Target(s):	**1 C** Compute fluently with multi-digit numbers and find common factors and multiples. **1 D** Apply and extend previous understandings of numbers to the system of rational numbers. **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:	The Number System
Standard(s):	**6.NS.2** Fluently divide multi-digit numbers using the standard algorithm. **6.NS.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. **6.NS.7** Understand ordering and absolute value of rational numbers. **6.NS.7c** Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* **6.NS.7d** Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than $30.*
DOK:	1 & 2

Unit 1: The Number System *Activity 6*

Do not use a calculator for this activity.

The state recommends that each family stores one gallon of water per person per day and have enough water for seven days. For a family of 3, that means 21 gallons of water is recommended.

1. A small grocery store has 300 gallons of drinking water to sell. If each family buys 21 gallons, how many families can this store sell to? Find your answer *without* using a calculator show your work.

$$\begin{array}{r} 14.2 \\ 21\overline{)\,300.0} \\ -21 \\ \hline 090 \\ -84 \\ \hline 060 \\ -42 \\ \hline 18 \end{array}$$

The store can sell to about 14 families if they buy 21 gallons each.

2. A family of three decides to keep track of the amount of water that they are recommended to have in storage and the amount of water that they actually have. The water that the family has goes up and down as the family buys and uses water. To keep track of how well they're conserving water, the family is also calculating the difference between the recommended and actual amounts of water.

   Fill out the missing data in the table.

Day	Recommended amount of water stored (gallons)	Actual amount of water stored (gallons)	Difference (gallons)
1	21	23	2
2	18	17	-1
3	15	15	0
4	12	10	-2
5	9	5	-4
6	6	7	1
7	3	8	5

3. On which day was the actual amount of water stored furthest from the recommended amount?

   The absolute value of the difference was greatest on day 7. On this day, the water that the family has stored was most different from what's recommended.

4. On which day was the actual amount of water stored closest to the recommended amount?

   The absolute value of the difference was zero on day 3. On this day, the water that the family has stored matched the recommendation exactly.

5. How many days did the family have more than enough water to meet the state recommendations?

   On three days, the difference was positive so the family had more than enough water.

6. How many days did the family have less than enough water to meet the recommendations?

   On three days, the difference was negative so the family had less than enough water.

Unit 2: Ratios and Proportional Relationships

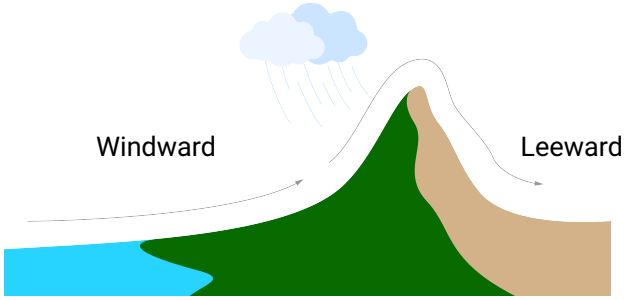


SBAC alignment for *Unit 2: Ratios and Proportional Relationships Activity 1*

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.
Assessment Target(s):	**1 A** Understand ratio concepts and use ratio reasoning to solve problems. **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):	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.RP.3b** Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
DOK:	1 & 2

Unit 2: Ratios and Proportional Relationships *Activity 1*

Different sides of a mountain experience different amounts of rain. The windward side of a mountain faces towards the wind and the leeward side faces away from the wind.



Suppose that the leeward side of a mountain receives 3 inches of rain, and the windward side of the same mountain receives 8 inches of rain.

1. Identify the equivalent ratio(s) of leeward rain to windward rain. Select all that apply.

   We can reduce the ratios to see if they are equivalent.

   (a) $20{:}25$

   This reduces to $4{:}5$.

   (b) $30{:}800$

   This reduces to $3{:}80$.

   (c) $16{:}6$

   This reduces to $8{:}3$.

   (d) $36{:}96$

   This reduces to $3{:}8$.

   Among our options, only (d) gives the desired ratio of $3{:}8$.

2. If the amount of rain remains a constant proportion, and the leeward side of this mountain received 24 inches of rain, how much would the windward side receive?

   $$24 \text{ in. leeward} \times \frac{8 \text{ in. windward}}{3 \text{ in. leeward}} = 8 \times 8 \text{ in. windward} = 64 \text{ in. windward}$$

   The windward side would receive 64 inches of rain.

3. If the amount of rain remains a constant proportion, and the windward side of this mountain received 24 inches of rain, how much would the leeward side receive? Give your answer as a mixed number if needed.

24 in. windward $\times \frac{3 \text{ in. leeward}}{8 \text{ in. windward}} = 3 \times 3$ in. leeward $= 9$ in. leeward

The leeward side would receive 9 inches of rain.

4. If the amount of rain remains a constant proportion, and the leeward side of this mountain received 4 inches of rain, how much would the windward side receive? Give your answer as a mixed number if needed.

4 in. leeward $\times \frac{8 \text{ in. windward}}{3 \text{ in. leeward}} = \frac{32}{3}$ in. windward $= 10\frac{2}{3}$ in. windward

The windward side would receive $10\frac{2}{3}$ inches of rain.

5. If the windward side of this mountain received 4 inches of rain, how much did the leeward side receive? Give your answer as a mixed number if needed.

4 in. windward $\times \frac{3 \text{ in. leeward}}{8 \text{ in. windward}} = \frac{12}{8}$ in. leeward $= 1\frac{1}{2}$ in. leeward

The leeward side would receive $1\frac{1}{2}$ inches of rain.

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. **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** Understand ratio concepts and use ratio reasoning to solve problems. **1 C** Compute fluently with multi-digit numbers and find common factors and multiples. **1 D** Apply and extend previous understandings of numbers to the system of rational numbers. **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:	Ratios and Proportional Relationships
Standard(s):	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* **6.RP.3c** Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. **6.NS.2** Fluently divide multi-digit numbers using the standard algorithm. **6.NS.3** Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
DOK:	1 & 2

Unit 2: Ratios and Proportional Relationships *Activity 2*

Do not use a calculator for this activity.

In February, Lihue (on Kaua'i) experienced an average of 7 hours of sunshine for every 17 hours without sunshine.

1. Write a ratio that compares the number of hours of sunshine to the number of hours without sunshine.

   $7:17$

2. Describe what the ratio $24:7$ means in terms of the hours of sunshine in Lihue.

   In a typical day, out of the 24 hours of a day, 7 of those hours will be in sunshine. Note that the answer "there are 24 hours a day, 7 days a week" is *not* an appropriate answer because it is outside of the context of this activity.

3. For what percent of a February day does Lihue experience sunshine? Show your work, do not use a calculator, and round your answer to the nearest percent.

$$
\begin{array}{r}
0.291 \\
24\overline{)\,7} \\
-48 \\
\hline
22 \\
-216 \\
\hline
004 \\
-24 \\
\hline
16
\end{array}
$$

$7 \div 24 \approx 0.291$

In Lihue, there is sunshine for 29% of a typical day in February.

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.
Assessment Target(s):	**1 A** Understand ratio concepts and use ratio reasoning to solve problems. **1 C** Compute fluently with multi-digit numbers and find common factors and multiples. **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):	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* **6.RP.2** Understand the concept of a unit rate a/b associated with a ratio a:b with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Note: Expectations for unit rates in this grade are limited to non-complex fractions.) **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.RP.3b** Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* **6.RP.3d** Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
DOK:	1

Unit 2: Ratios and Proportional Relationships *Activity 3*

1. Over the last 4 hours, it has rained 30.6 millimeters on O‘ahu. What is the unit rate of rainfall per hour?

   $\boxed{7.65}$ millimeters of rain per hour

   $(30.6 \text{ millimeters}) \div (4 \text{ hours}) = 7.65 \frac{\text{millimeters}}{\text{hour}}$

2. If it keeps raining like this, how many millimeters of rain will fall in 7 hours?

   $\boxed{53.55}$ millimeters of rain

   $(7 \text{ hours}) \times \left(7.65 \frac{\text{millimeters}}{\text{hour}}\right) = 53.55 \text{ millimeters}$

3. Convert your answer in part 2 from millimeters to inches and round to the nearest tenth. 1 inch = 25.4 millimeters.

   $\boxed{2.1}$ inches of rain

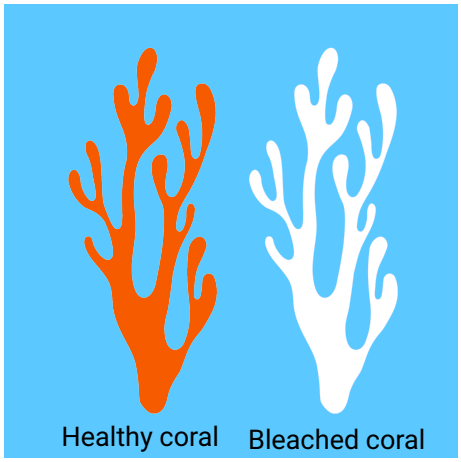
   $(53.55 \text{ millimeters}) \times \left(\frac{1 \text{ inch}}{25.4 \text{ millimeters}}\right) \approx 2.1 \text{ inches}$

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. **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** Understand ratio concepts and use ratio reasoning to solve problems. **1 G** Represent and analyze quantitative relationships between dependent and independent variables. **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 A** Test propositions or conjectures with specific examples. **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. **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):	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* **6.RP.3a** Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
DOK:	1, 2, & 3

Unit 2: Ratios and Proportional Relationships *Activity 4*

Corals are really important animals, but they are very sensitive to temperature changes in the ocean. When the ocean gets too hot, the corals get sick and turn completely white. This is called coral bleaching. If the temperature stays hot for only a short amount of time before returning back down to normal, then the corals will regain their bright beautiful colors and health. However, if the temperature stays warm for too long, the corals will die.



You and your friends go diving on a bright sunny day. You notice that it's been really warm lately, so you check on the health of a nearby coral reef. You find that for every 5 square meters of healthy coral, there are 8 square meters of bleached coral.

1. Identify the equivalent ratio(s) of healthy coral to bleached coral. Select all that apply.

   We can reduce the ratios to see if they are equivalent.

   (a) $20{:}23$

   This cannot be reduced.

   (b) $40{:}25$

   This reduces to $8{:}5$.

   (c) $50{:}800$

   This reduces to $5{:}80$ or $1{:}16$.

   (d) $60{:}96$

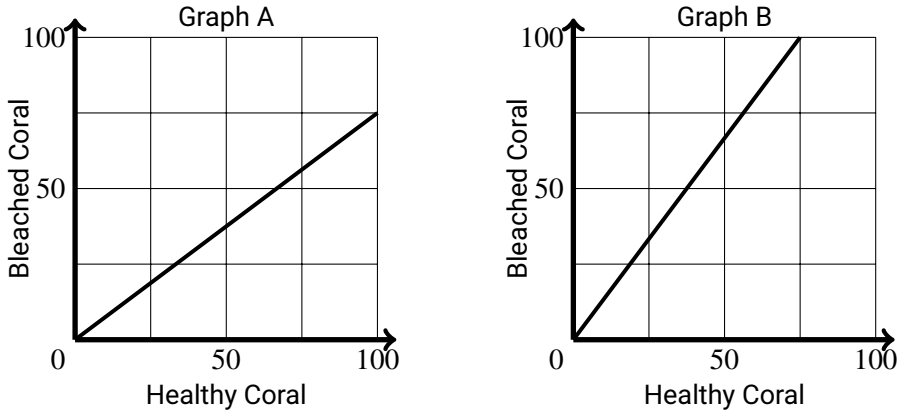
   This reduces to $5{:}8$.

   Among our options, only (d) gives the desired ratio of $5{:}8$.

2. You and your friends went to a different beach and spent a few hours measuring the amount of healthy and bleached coral. You saw that there was a proportional relationship between healthy and bleached coral and listed some of their measurements in the following table. Fill out the missing data.

Healthy coral (m^2)	Bleached coral (m^2)
18	24
27	36
42	56
63	84
75	100

3. Which of the following graphs represents the relationship shown in part 2?



The correct graph is Graph B.

4. Explain what was wrong with the graph that you **didn't** choose in part 3.

According to the labels of the axes, the horizontal axis of the graph should correlate with the first column of the table and the vertical axis should correlate with second column. So, the line should intersect the point $(75, 100)$. Instead, it intersects $(100, 75)$ which shows us that the horizontal and vertical coordinates are switched.

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. **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** Understand ratio concepts and use ratio reasoning to solve problems. **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 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):	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* **6.RP.2** Understand the concept of a unit rate a/b associated with a ratio a:b with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Note: Expectations for unit rates in this grade are limited to non-complex fractions.) **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.RP.3b** Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
DOK:	1

Unit 2: Ratios and Proportional Relationships *Activity 5*

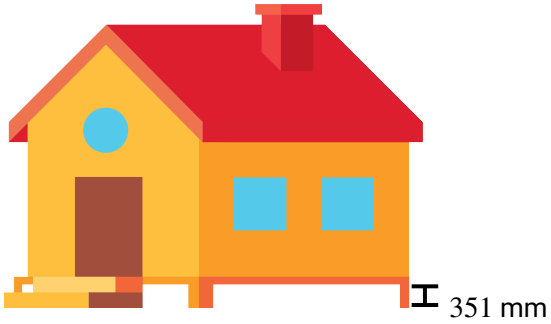
During a rainstorm on Kaua'i, 108 millimeters of rain fell in 4 hours.

1. How many millimeters of rain fell during each hour of the rainstorm?

108 millimeters of rain $\div 4$ hours $= 27 \frac{\text{millimeters of rain}}{\text{hour}}$

27 millimeters of rain fall in each hour of the storm.

2. Like many houses in Hawai'i, your house is built above the ground to protect against flooding. Your house is 351 millimeters above the ground.



Suppose that the rainstorm had continued to rain like this and suppose that the rain did not drain away from your house. How man hours will it take for the rain to reach the bottom of your house?

$351\text{mm} \times \frac{1 \text{ hour}}{27 \text{ mm}} = 13$ hours

In 13 hours, the water will rise up the house.

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 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** Understand ratio concepts and use ratio reasoning to solve problems. **1 G** Represent and analyze quantitative relationships between dependent and independent variables. **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:	Ratios and Proportional Relationships
Standard(s):	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.RP.3a** Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. **6.RP.3b** Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* **6.RP.3d** Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. **6.NS.1** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.). How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*
DOK:	1, 2, & 3

Unit 2: Ratios and Proportional Relationships *Activity 6*

It is starting to rain heavily so you set up a rain gauge to keep track of the rainfall.

1. Some of the data that you've collected is in the following table. Suppose that the rain fell at a constant rate throughout the entire storm. Fill in the missing values.

Time (minutes)	Rainfall (millimeters of rain)
15	10
36	24
54	36
72	48
81	54

To fill in the missing data, it is helpful to reduce the ratio of Time to Rainfall. This comes out to 3 minutes to 2 millimeters of rain.

2. If it keeps raining like this, how much rain (in millimeters) will fall after 5 **hours**?

$5 \text{ hours} \times \frac{60 \text{ minutes}}{1 \text{ hour}} \times \frac{2 \text{ millimeters of rain}}{3 \text{ minutes}} = 200 \text{ millimeters of rain}$

After 5 hours, 200 millimeters will fall.

3. If it keeps raining like this, how many minutes must pass for a total of 100 millimeters of rain to fall?

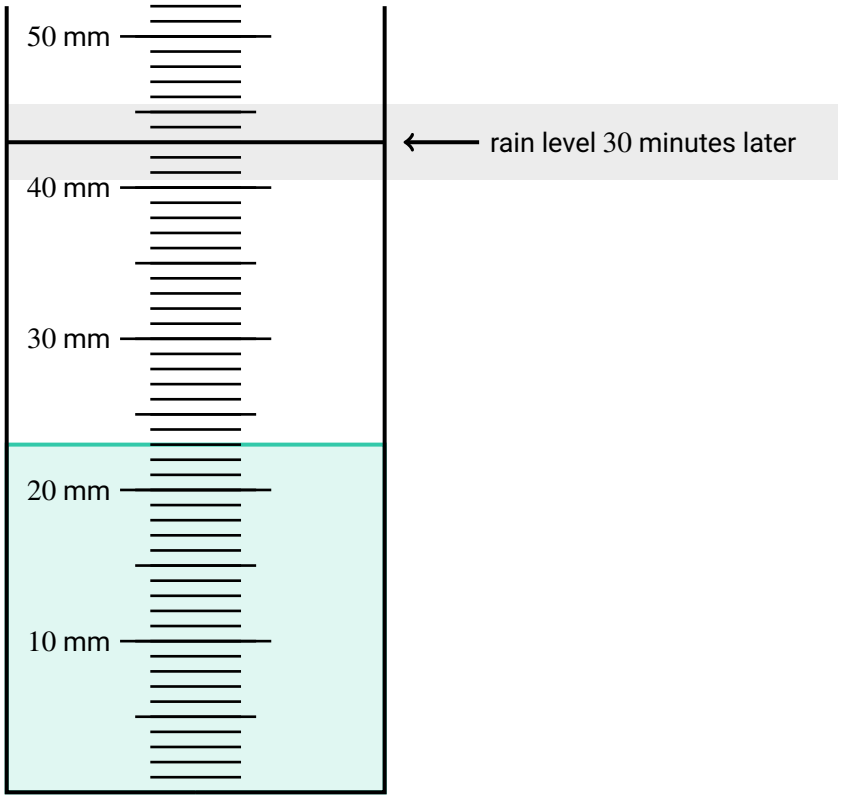
$100 \text{ millimeters of rain} \times \frac{3 \text{ minutes}}{2 \text{ millimeters of rain}} = 150 \text{ minutes}$

It would take 150 minutes for 100 millimeters of rain to fall.

4. The rain gauge shows the rain collected for a certain amount of time during the rain storm. Draw a line that represents the amount of rain that will be in the gauge in 30 more minutes.

$$30 \text{ minutes} \times \frac{2 \text{ millimeters of rain}}{3 \text{ minutes}} = 20 \text{ millimeters of rain}$$

After 30 minutes the rain level should increase by 20 millimeters.



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 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** Understand ratio concepts and use ratio reasoning to solve problems. **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.
Content Domain:	Ratios and Proportional Relationships
Standard(s):	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.RP.3c** Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
DOK:	1 & 2

Unit 2: Ratios and Proportional Relationships *Activity 7*

It is important for scientists and engineers to know how wet the ground will get. If it is too wet or too dry, it will slide downhill easily, which could be really dangerous for people who live around hills, mountains, coastlines, etc. So this affects almost everyone in Hawai'i!

Suppose you have a large box with 24 gallons of saturated mud. This means that the mud cannot absorb any more water, but it also doesn't have any extra water to leak out. During a storm, 6 gallons of rainwater fall into the box and mix evenly with the mud. This makes 30 gallons of mix.

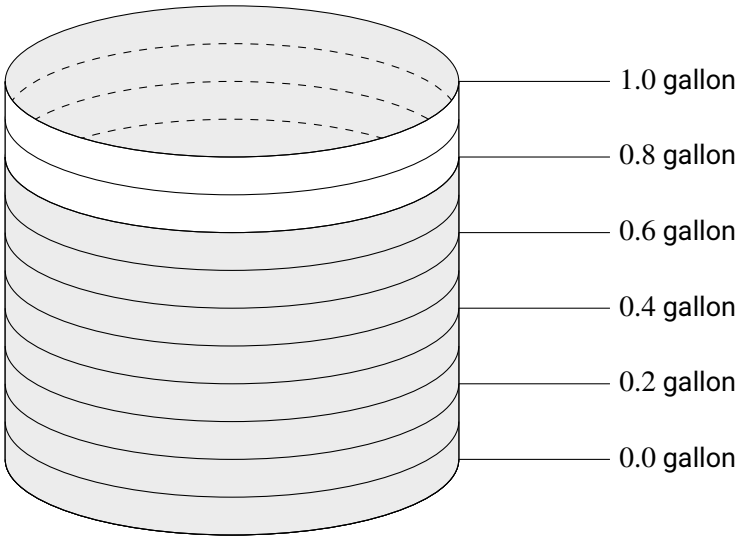
1. If you scoop a gallon of the mix out of this box, what percentage of that mix will be **rainwater**?

   $$\frac{6 \text{ gallons rainwater}}{30 \text{ gallons mix}} = \frac{6}{30} = \frac{1}{5} = 0.2 = 20\%$$

   The mix will be 20% rainwater.

2. If you wait long enough, the mix will separate as the mud falls to the bottom and the clean water rises to the top of your container. Color some of the bottom sections of the bucket until it shows how much **mud** was in a gallon of the mix.

   If 20% of the mix is rainwater then 80% of it is mud. 80% of a gallon is 0.8 gallon.



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 D** Apply and extend previous understandings of numbers to the system of rational numbers. **1 F** Reason about and solve one-variable equations and inequalities. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 E** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
Content Domain:	Expressions and Equations
Standard(s):	**6.EE.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **6.EE.8** Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
DOK:	1 & 2

Unit 3: Expressions and Equations *Activity 1*

1. An inequality is shown.

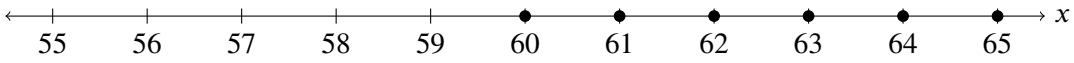
$$x > 60$$

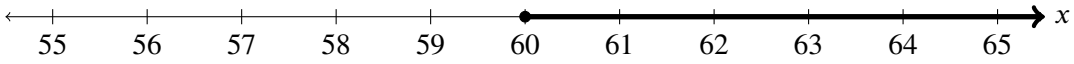
Select the statement(s) and number line(s) that can be represented by the inequality. Check all that apply.

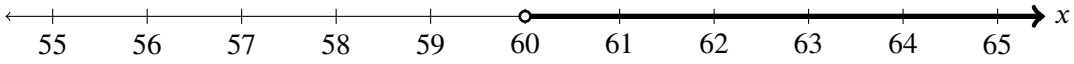
(a) The temperature in Waiʻanae, Oʻahu is greater than 60°F.

(b) The value of a number substituted for x is greater than 60.

(c) The number of rainy days in Kauaʻi increased by 60 this year.

(d)


(e)


(f)


All cases that show that a quantity is greater but not equals to 60 is correct. The correct answers are (a), (b), and (f).

2. For each of the following statements, describe the unknown quantity with the variable x and an inequality.

(a) The waves were at least 10 feet tall.

$x \geq 10$ or similar works.

(b) The temperature at Haleakalā can get as low as -10°C.

$x \geq -10$ or similar works.

(c) The lava in lava tubes reach temperatures up to 1250°C.

$x \leq 1250$ or similar works.

(d) There is no sunlight at altitudes below -1000 meters.

$x < -1000$ or similar works.

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.
Assessment Target(s):	**1 A** Understand ratio concepts and use ratio reasoning to solve problems. **1 B** Apply and extend previous understandings of multiplication and division to divide fractions by fractions. **1 F** Reason about and solve one-variable equations and inequalities. **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:	Expressions and Equations
Standard(s):	**6.RP.2** Understand the concept of a unit rate a/b associated with a ratio a:b with b $\neq$ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Note: Expectations for unit rates in this grade are limited to non-complex fractions.) **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.RP.3b** Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* **6.NS.1** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.). How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* **6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2a** Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* **6.EE.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

Continued on next page

Standard(s):	**6.EE.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **6.EE.7** Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.
DOK:	1

Unit 3: Expressions and Equations *Activity 2*

A high priest is walking up Mauna Kea for a religious ceremony. He has 3 and $1/2$ miles left to walk to reach the heiau (temple), but due to the high altitude and low oxygen, he can only walk $3/4$ of a mile at a time before he needs to stop and catch his breath.

1. Which of the following equations can be used to find w, the total number of $3/4$ mile stretches of walking before the priest reaches the heiau? Select all that apply.

   (a) $3\frac{1}{2} \times \frac{3}{4} = w$

   (b) $3\frac{1}{2} \div \frac{3}{4} = w$

   (c) $3\frac{1}{2} + w = \frac{3}{4}$

   (d) $3\frac{1}{2} - w = \frac{3}{4}$

   (e) $\frac{3}{4} \times w = 3\frac{1}{2}$

   (f) $\frac{3}{4} \div w = 3\frac{1}{2}$

   We can use either equation (b) or (e).

2. Use one of the equation(s) you've chosen in part 1 to find w. Show your work and give your answer as a simplified fraction.

   Solving equation (b) or (e) gives the result of $w = 4\frac{2}{3}$ (or $\frac{14}{3}$).

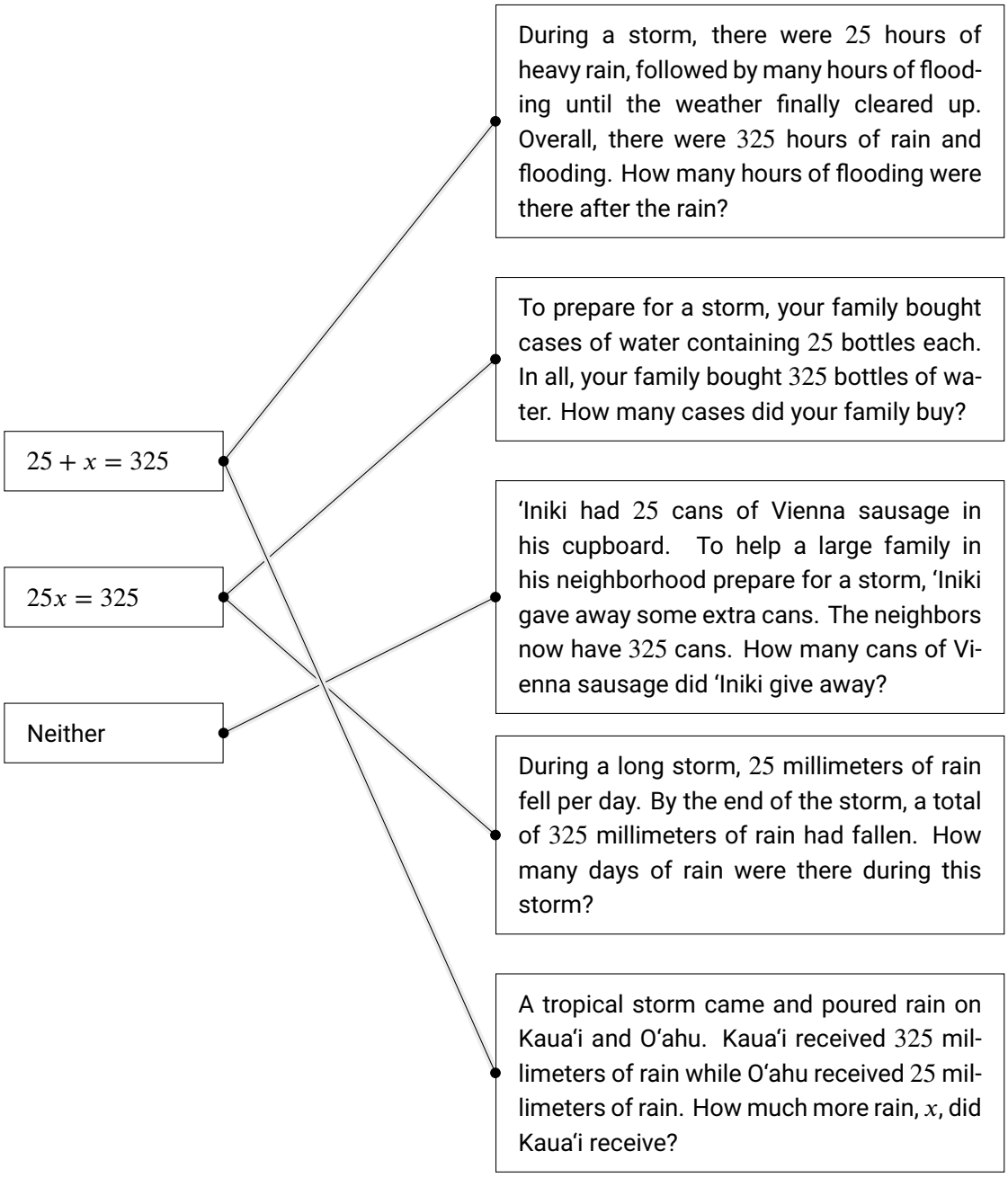
   $$\begin{aligned} 3\frac{1}{2} \div \frac{3}{4} &= w \\ \frac{7}{2} \div \frac{3}{4} &= w \\ \frac{7}{2} \times \frac{4}{3} &= w \\ \frac{14}{3} &= w \\ 4\frac{2}{3} &= w \end{aligned}$$

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 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 F** Reason about and solve one-variable equations and inequalities. **1 G** Represent and analyze quantitative relationships between dependent and independent variables. **4 A** Apply mathematics to solve problems arising in everyday life, society, and the workplace. **4 E** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
Content Domain:	Expressions and Equations
Standard(s):	**6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2a** Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* **6.EE.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **6.EE.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **6.EE.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*
DOK:	2

Unit 3: Expressions and Equations *Activity 3*

1. Read each of the following problems. Match each situation with the equation that could be used to solve the problem. If neither equation works, select "Neither." The labels may be used more than one time.



2. In each of the following stories, there are two variables. Write an equation that shows the relationship between the variables.

   (a) During a lightning storm, I heard thunder a total of T number of times. Of the L number of lightning I saw, I could only hear thunder from one-tenth of them.

   $\frac{1}{10}L = T$ or $L = 10T$ or similar works.

   (b) I visited Kaua'i with my family and it was sunny for S number of days and rainy for R number of days. There were 20 more rainy days than sunny days.

   $R = S + 20$ or $R - 20 = S$ or similar works.

   (c) When dry, a nearby river is only D feet deep. But during a heavy rain, it will double to a depth of W.

   $W = 2D$ or $\frac{1}{2}W = D$ or similar works.

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. **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** Understand ratio concepts and use ratio reasoning to solve problems. **1 C** Compute fluently with multi-digit numbers and find common factors and multiples. **2 C** Interpret results in the context of a situation. **3 D** Use the technique of breaking an argument into cases. **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 D** Interpret results in the context of a situation.
Content Domain:	Expressions and Equations
Standard(s):	**6.RP.2** Understand the concept of a unit rate a/b associated with a ratio a:b with b $\neq$ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Note: Expectations for unit rates in this grade are limited to non-complex fractions.) **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.RP.3b** Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* **6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2a** Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*

Continued on next page

Standard(s):	**6.EE.2c** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length s = 1/2.*
DOK:	1, 2, & 3

Unit 3: Expressions and Equations *Activity 4*

A huge rainstorm is coming, and you plan to collect the rainwater in water barrels and use it for your garden after the storm.



Water barrel

- From your garden, 40 to 50 trees will survive the storm.
- One (1) water barrel can hold enough water for 3 to 4 trees for the rest of the year.
- Each water barrel costs $\$40.50$.

1. Suppose that you had $\$400$ to buy water barrels to care for the trees that survive the storm. Is this enough money?

    - If it is definitely not enough money, then explain why not and show your work.
    - If it is definitely enough money, then explain why and show your work.
    - If it is enough money, but only under specific conditions, then give an example and show your work.

    $\$400 \div \$40.50 \approx 9.88$

    $\$400$ will buy 9 water barrels.

    9 barrels $\times\ 3 \frac{\text{trees}}{\text{barrel}} = 27$ trees $\qquad$ 9 barrels $\times 4 \frac{\text{trees}}{\text{barrel}} = 36$ trees

    Those 9 barrels can hold enough water for 27 to 36 trees.

    At least 40 trees will survive the storm so this is definitely not enough money.

2. Suppose that you had $\$1000$ to buy water barrels to care for the trees that survive the storm. Is this enough money?

    - If it is definitely not enough money, then explain why not and show your work.
    - If it is definitely enough money, then explain why and show your work.
    - If it is enough money, but only under specific conditions, then give an example and show your work.

    $\$1000 \div \$40.50 \approx 24.69$

    $\$1000$ will buy 24 water barrels.

    24 barrels $\times\ 3 \frac{\text{trees}}{\text{barrel}} = 72$ trees $\qquad$ 24 barrels $\times 4 \frac{\text{trees}}{\text{barrel}} = 96$ trees

    Those 24 barrels can hold enough water for 72 to 96 trees.

    No more than 50 trees will survive the storm so this is definitely enough money.

3. If you wanted to collect enough rainwater to take care of all of your surviving trees for the rest of the year, but you don't want to buy too many extra water barrels, how many barrels should you buy? Show your work and justify your answer.

Answers will vary. So, an explanation is necessary.

In the most demanding situation, b barrels will hold enough water for just $3b$ trees and 50 tress will survive the storm.

$$\begin{aligned} 3b &= 50 \\ \div 3 &\quad \div 3 \\ b &= 16 \text{ remainder } 2 \end{aligned}$$

Thus, 17 barrels will provide enough water for the most demanding situation.

In the least demanding situation, b barrels will hold enough water for $4b$ trees and only 40 trees will survive the storm.

$$\begin{aligned} 4b &= 40 \\ \div 4 &\quad \div 4 \\ b &= 10 \end{aligned}$$

Thus, 10 barrels will provide enough water for the least demanding situation, but it is a bit risky to buy the minimum amount.

Therefore, 10 to 17 barrels are reasonable answers with justification. Barrel numbers less than 10 will not be enough and numbers more than 17 will be excessive.

4. Write an expression to show the total cost of buying b number of water barrels.

$40.5b$ is the cost of buying b number of water barrels.

5. What is the total cost of buying the number of water barrels you determined in Part 3?

Answers will vary.

Barrels	Cost
10	$405.00
11	$445.50
12	$486.00
13	$526.50

Barrels	Cost
14	$567.00
15	$607.50
16	$648.00
17	$688.50

SBAC alignment for *Unit 3: Expressions and Equations Activity 5*

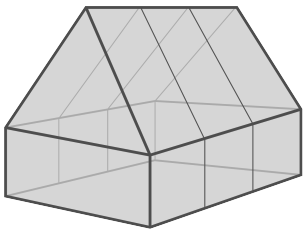
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making 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 E** Apply and extend previous understandings of arithmetic to algebraic expressions. **1 F** Reason about and solve one-variable equations and inequalities. **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:	Expressions and Equations
Standard(s):	**6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2a** Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* **6.EE.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **6.EE.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **6.EE.7** Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. **6.EE.8** Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
DOK:	1 & 2

Unit 3: Expressions and Equations *Activity 5*

Aunty Lehua wants to grow some mountain naupaka. However, her home garden is too sunny for the naupaka to thrive so Aunty Lehua decides to build a shade house. A shade house is a house that is made of a material that lets some sunlight in, but not too much.



Naupaka flower
(not to scale)



Shade house

1. Aunty Lehua's shade house requires 245 square feet of shade material. She only has 98 square feet and needs to go to the local hardware store to get more.

   (a) Write an equation that can be used to find s, the amount of shade material that Aunty Lehua needs.

   $98 + s = 245$ or similar works.

   (b) The store only sells shade material in the following packs:

   - 40 square feet
   - 85 square feet
   - 135 square feet
   - 190 square feet
   - 250 square feet

   What is the smallest pack that Aunty Lehua should buy to complete the shade house? Explain what your answer means in the context of the story.

   We need to find which pack would be large enough to build the shade house when combined with the material that Aunty Lehua initially has.

   $$\begin{aligned} 98 + s &= 245 \\ -98 &\quad -98 \\ s &= 147 \end{aligned}$$

   With the 98 square feet of shade material, Aunty Lehua needs to buy a pack of 190 square feet of material to have the 147 total necessary to build her shade house.

2. Later, Aunty Lehua picks up 6 naupaka plants to grow in the shade house. Each plant has an area of n square feet, and the shade house can hold up to 50 square feet of plants. Write an inequality you could use to find out how much room each plant would have.

   $6n \leq 50$ or similar works.

3. Which of the following plant sizes are possible values for n? Select all the apply.

   (a) 0.1 square feet

   (b) 4 square feet

   (c) 8 square feet

   (d) 9 square feet

   (e) 13 square feet

   (f) 44 square feet

   (g) 56 square feet

   $$\begin{array}{rcl} 6n & \leq & 50 \\ \div 6 & & \div 6 \\ n & \leq & 8\frac{1}{3} \end{array}$$

   All plant sizes that are less than or equal to $8\frac{1}{3}$ square feet will satisfy the inequality. These are the plant sizes (a), (b), and (c). This solution can also be found by "plugging in" each of the options into the inequality.

SBAC alignment for *Unit 3: Expressions and Equations 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 E** Apply and extend previous understandings of arithmetic to algebraic expressions. **1 G** Represent and analyze quantitative relationships between dependent and independent variables. **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 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):	**6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2c** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length s = 1/2.* **6.EE.3** Apply the properties of operations as strategies to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply properties of operations to y + y + y to produce the equivalent expression 3y.* **6.EE.4** Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.* **6.EE.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

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Standard(s):	**6.EE.7** Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. **6.EE.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*
DOK:	1 & 2

Unit 3: Expressions and Equations *Activity 6*

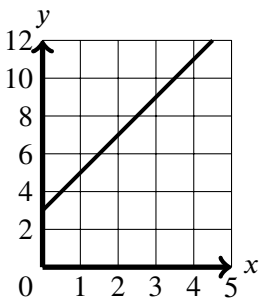
To help kids stay safe, an emergency management team decides to create a free summer program where kids learn about dangerous ocean and weather events like rip currents and flash floods.

The City and County of Honolulu will pay for the program. There will be a one-time cost of 3 thousand dollars to start the program and yearly cost of 2 thousand dollars to run it. If x is the number of years the program will run, then the total cost of the program in thousands of dollars is $y = 3 + 2x$.

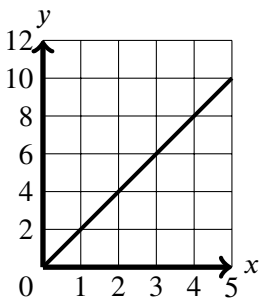


1. Which of the follow graphs and tables show this relationship between the Years and the Cost? Choose all that apply.

(a)



(b)



(c)

x	y
0	3
1	5
3	8
6	15

(d)

x	y
0	3
2	7
4	11
8	19

Options (a) and (d) satisfy the equation $y = 3 + 2x$.

2. If you were to make exact copies of this program in a total of 4 places at once then, which of the following expressions would model the total cost of the programs for x years? Choose all that apply.

(a) $2(3 + 4x)$
(b) $4(3 + 2x)$
(c) $3(4 + 2x)$
(d) $8 + 12x$
(e) $12 + 8x$
(f) $12 + 2x$
(g) $3 + 8x$
(h) $7 + 2x$
(i) $3 + 6x$
(j) $7 + 6x$

One program costs $3 + 2x$ for x years so 4 programs would cost $4(3 + 2x)$. With the distribution property, we have the equivalent expression of $12 + 8x$. This matches with expressions (b) and (e).

3. Which is more expensive: running *one program for four years* or running *four programs for one year*? How much more expensive is it? Show your work.

The cost of one program for x years is $3 + 2x$. For four years, the cost is 11 thousand dollars.

$$\begin{aligned} x &= 4 \\ y &= 3 + 2x \\ &= 3 + 2(4) \\ y &= 11 \end{aligned}$$

The cost of four programs for x years is $4(3 + 2x)$. For one year, the cost is 20 thousand dollars.

$$\begin{aligned} x &= 1 \\ y &= 4\,(3 + 2x) \\ &= 4\,(3 + 2(1)) \\ y &= 20 \end{aligned}$$

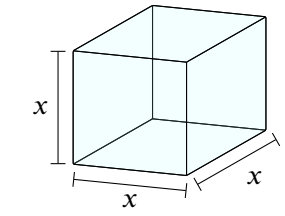
It costs $\$9000$ more to run four programs for one year.

SBAC alignment for *Unit 3: Expressions and Equations Activity 7*

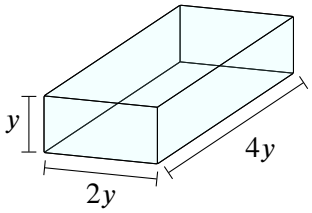
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies.
Assessment Target(s):	**1 E** Apply and extend previous understandings of arithmetic to algebraic expressions. **1 F** Reason about and solve one-variable equations and inequalities. **1 H** Solve real-world and mathematical problems involving 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.
Content Domain:	Expressions and Equations
Standard(s):	**6.EE.1** Write and evaluate numerical expressions involving whole-number exponents. **6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2c** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length s = 1/2.*
DOK:	1

Unit 3: Expressions and Equations *Activity 7*

It's been really warm and sunny lately so you buy some ice for a fishing trip. The amount of ice that we have is described by its *volume*, and the amount of ice that we lose to melting is related to its *surface area*.



Block Braddahs sell ice in the shape of cube. These **blocks** have a volume of x^3 and a surface area of $6x^2$.



Slab Sistahs sell ice in the shape of rectangular prism. These **slabs** have a volume of $8y^3$ and a surface area of $28y^2$.

1. When $x = 5$ and $y = 3$, which shape has more **volume**? The block or the slab? Or do they have the same volume?

$$\begin{aligned} x &= 5 \\ \text{Block volume} &= x^3 \\ &= (5)^3 \\ &= 125 \end{aligned} \qquad \begin{aligned} y &= 3 \\ \text{Slab volume} &= 8y^3 \\ &= 8(3)^3 \\ &= 8 \times 27 \\ &= 216 \end{aligned}$$

The slab has a larger volume.

2. When $x = 3$ and $y = 5$, which shape has more **surface area**? The block or the slab? Or do they have the same surface area?

$$\begin{aligned} x &= 3 \\ \text{Block surface area} &= 6x^2 \\ &= 6(3)^2 \\ &= 6 \times 9 \\ &= 54 \end{aligned} \qquad \begin{aligned} y &= 5 \\ \text{Slab surface area} &= 28y^2 \\ &= 28(5)^2 \\ &= 28 \times 25 \\ &= 700 \end{aligned}$$

The slab has a larger surface area.

3. When $x = 4$ and $y = 2$, which shape has more **volume**? The block or the slab? Or do they have the same volume?

$$\begin{aligned} x &= 4 \\ \text{Block volume} &= x^3 \\ &= (4)^3 \\ &= 64 \end{aligned} \qquad \begin{aligned} y &= 2 \\ \text{Slab volume} &= 8y^3 \\ &= 8(2)^3 \\ &= 8 \times 8 \\ &= 64 \end{aligned}$$

Both the block and the slab have the same volume.

4. When $x = 4$ and $y = 2$, which shape has more **surface area**? The block or the slab? Or do they have the same surface area?

$$\begin{aligned} x &= 4 \\ \text{Block surface area} &= 6x^2 \\ &= 6(4)^2 \\ &= 6 \times 16 \\ &= 96 \end{aligned} \qquad \begin{aligned} y &= 2 \\ \text{Slab surface area} &= 28y^2 \\ &= 28(2)^2 \\ &= 28 \times 4 \\ &= 112 \end{aligned}$$

The slab has a larger surface area.

Unit 4: Geometry



SBAC alignment for *Unit 4: Geometry Activity 1*

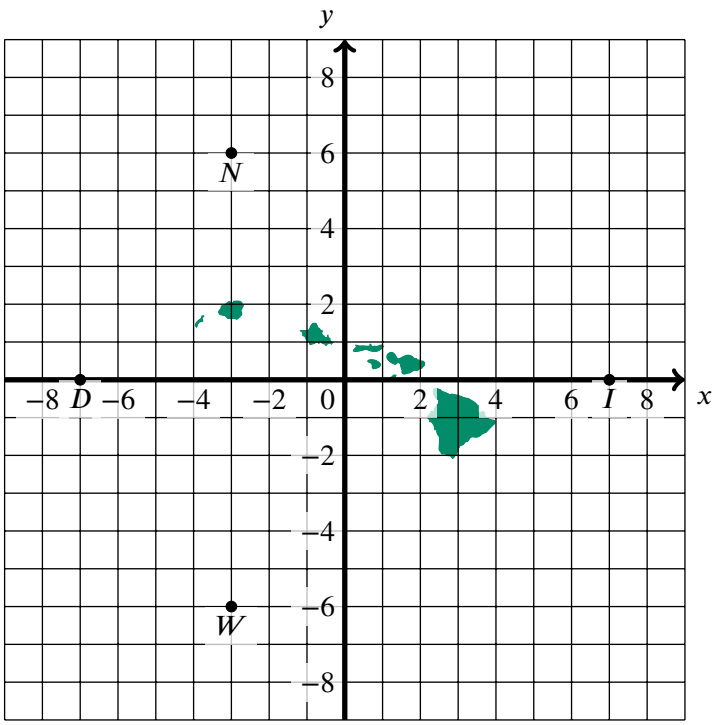
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies.
Assessment Target(s):	**1 D** Apply and extend previous understandings of numbers to the system of rational numbers. **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:	Geometry
Standard(s):	**6.NS.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **6.NS.6b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. **6.NS.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. **6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	1

Unit 4: Geometry *Activity 1*

There are several tropical storms approaching the Hawaiian Islands.

1. Tropical Storm Hema is at point W at $(-3, -6)$ and Tropical Storm Hikina is at point I at $(7, 0)$. A week later, Tropical Storm Hema has moved to the point N, which is a reflection of the point W across the x-axis. At that time, Tropical Storm Hikina has moved to the point D, which is a reflection of the point I across the y-axis.

   Plot and label the points W, I, N, and D on the coordinate plane.



2. How many units did Tropical Storm Hema travel?

   Tropical Strom Hema traveled 12 units from $(-3, -6)$ to $(-3, 6)$.

3. How many units did Tropical Storm Hikina travel?

   Tropical Strom Hikina traveled 14 units from $(7, 0)$ to $(-7, 0)$.

4. There is another storm at the point $(5, -2)$. A week later, its position has reflected across the y-axis. Which quadrant did the storm move to?

   (a) I

   (b) II

   (c) III

   (d) IV

   When the point $(5, -2)$ is reflected about the y-axis, its new coordinates will be $(-5, -2)$. This point is in option (c), Quadrant III.

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 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** Apply and extend previous understandings of numbers to the system of rational numbers. **1 H** Solve real-world and mathematical problems involving area, surface area, and volume. **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:	Geometry
Standard(s):	**6.NS.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **6.NS.6b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. **6.NS.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. **6.G.1** Find area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. **6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	1 & 2

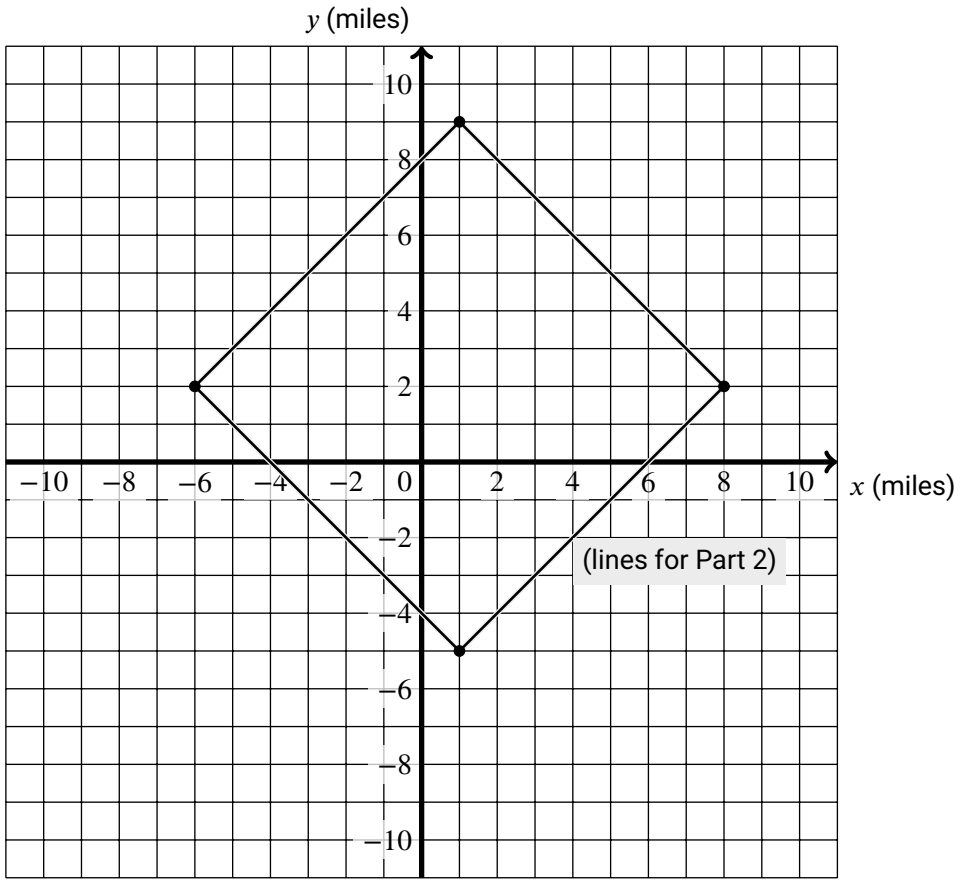
Unit 4: Geometry *Activity 2*

A straight edge is needed for this activity.

A map of a valley is being drawn in the coordinate plane below where the units are measured in miles. The lowest elevation in this valley is at the coordinate $(1, 2)$. A major rain storm is coming and everything within 7 miles of the lowest elevation will be underwater.

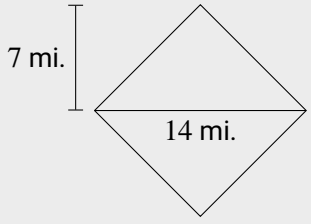
1. Plot four (4) unique points on the coordinate plane that are each 7 miles from the lowest elevation. Each point must contain coordinates with integer values.

The four points are as follows:
$(1 + 7, 2) = (8, 2)$
$(1 - 7, 2) = (-6, 2)$
$(1, 2 + 7) = (1, 9)$
$(1, 2 - 7) = (1, -5)$



2. Draw a quadrilateral by connecting the four points in Part 1 with straight lines.
3. A lot of people live in the area drawn in Part 2. Find the size of this area.

This quadrilateral can be deconstructed into smaller right triangles. Below is one possible deconstruction. This gives us an area of 98 square miles.



$$\begin{aligned}\text{Area of quadrilateral} &= 2 \times \text{Area of triangle} \\ &= 2 \times \left(\tfrac{1}{2} \times (14 \text{ mi.}) \times (7 \text{ mi.})\right) \\ &= 2 \times 49 \text{ mi.}^2 \\ &= 98 \text{ mi.}^2\end{aligned}$$

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.
Assessment Target(s):	**1 D** Apply and extend previous understandings of numbers to the system of rational numbers. **2 A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.
Content Domain:	Geometry
Standard(s):	**6.NS.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **6.NS.6b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. **6.NS.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. **6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	1 & 2

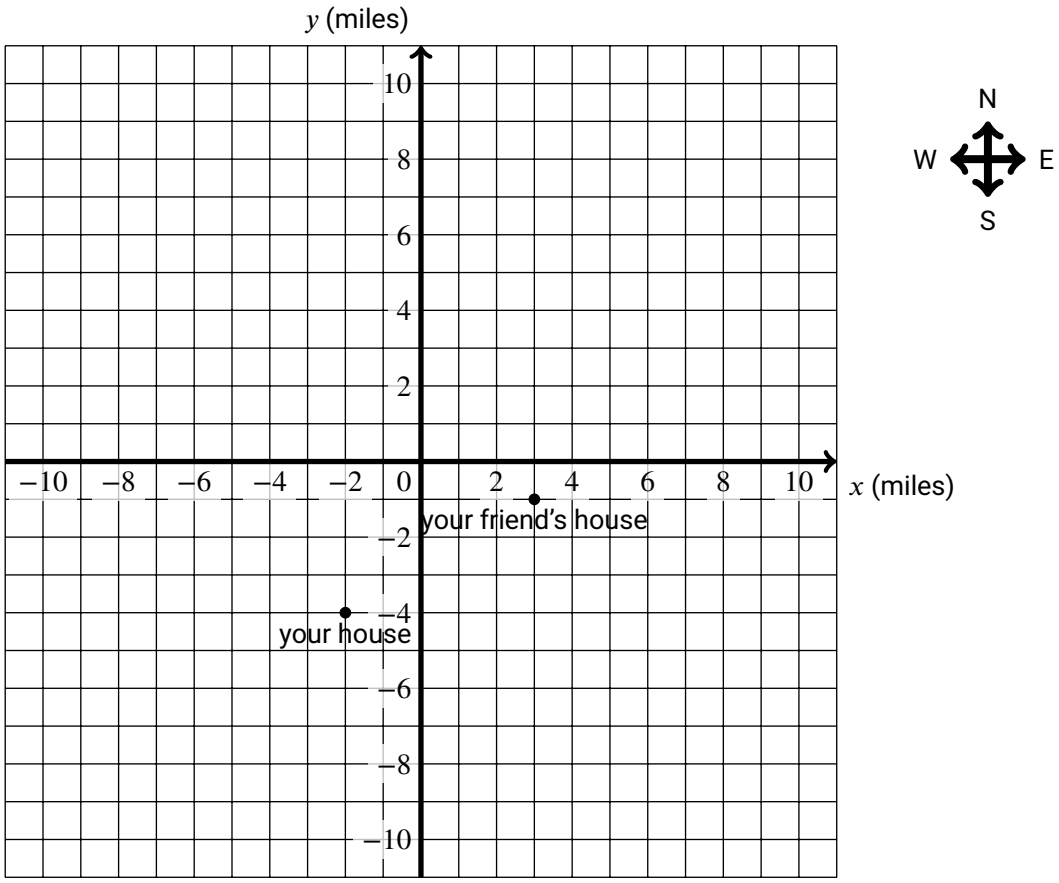
Unit 4: Geometry *Activity 3*

You and your friend are planning to go to a birthday party in a few minutes. Right now, you are at your home located at the coordinates $(-2, -4)$ in the map below. It is not raining where you are, but you can hear thunder in the distance.

1. Your friend called you and said that he will be a little bit late to the party because there is a flash flood warning in his ahupua'a, which is located 5 miles to the east and 3 miles to the north of your location. Plot your location and the location of the friend who called you.

   Your friend's house is at $(3, -1)$.

   $(-2 + 5, -4 + 3) = (3, -1)$



2. The birthday party is exactly 3 miles away from your house (in one direction) and exactly 5 miles away from your friend's house (in one direction). What are the coordinates of the birthday party? Do not round your answer.

   The birthday part is at $(-2, -1)$. Please note that there is one other point that is 3 miles away from your house and 5 miles away from your friend's house. But the second point is found using trigonometry and has irrational coordinates.

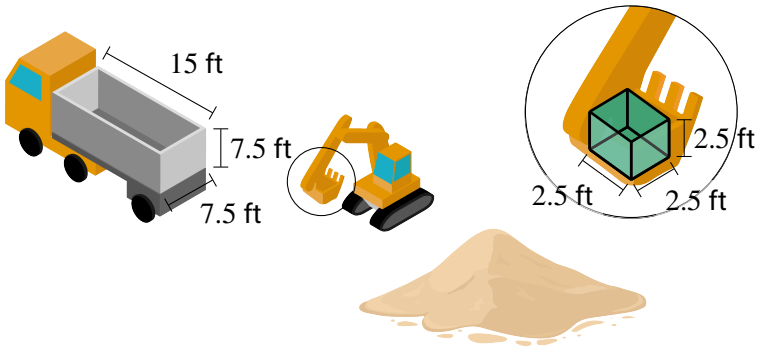
SBAC alignment for *Unit 4: Geometry Activity 4*

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 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 C** Compute fluently with multi-digit numbers and find common factors and multiples. **1 H** Solve real-world and mathematical problems involving 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. **4 D** Interpret results in the context of a situation.
Content Domain:	Geometry
Standard(s):	**6.EE.1** Write and evaluate numerical expressions involving whole-number exponents. **6.EE.2c** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length s = 1/2.* **6.G.2** Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
DOK:	1 & 2

Unit 4: Geometry *Activity 4*

The beaches of Hawai'i are constantly being eroded by the wind and the rain. From residential homes to the beaches of Waikiki, large amounts of sand and shoreline are lost to the ocean every year. One way that the state deals with this loss of sand is by pulling up sand from offshore to fill back the disappearing beaches. Sand is pulled up onto ships, then large excavators are used to move the sand onto trucks, which bring the sand to the beaches where it is needed.

The transporting truck has a container that is shaped like a rectangular prism. This container is 7.5 feet (ft) tall, 7.5 ft wide, and 15 ft long. The space inside of the excavator bucket is shaped like a cube, measuring 2.5 ft on each side.



1. Find the volume of sand, in cubic feet, that can fit inside of the excavator bucket. First write it as an expression with exponents, then evaluate it. Do not round.

   $2.5 \text{ feet} \times 2.5 \text{ feet} \times 2.5 \text{ feet} = (2.5 \text{ feet})^3 = 15.625 \text{ feet}^3$

2. How many scoops of the excavator bucket are needed to fill the container on the transport truck with sand? Show your work and explain how you determined your answer.

   The height of the excavator bucket is 2.5 feet and the height of the container is 7.5 feet tall. So the height of the container is 3 times the height of the bucket. The width of the container is 3 times the width of the bucket for the same reason. The length of the bucket is 2.5 feet and the length of the container is 15 feet long. So the length of the container is 6 times the length of the bucket. So the container can fit 3 buckets height-wise, 3 width-wise, and 6 length-wise. Thus, the container the volume of 54 bucket scoops.

   $3 \times 3 \times 6 = 54$

   Another way to solve this is by dividing the volume of the container by the volume of the excavator bucket.

   Volume of container:
   $7.5 \text{ feet} \times 7.5 \text{ feet} \times 15 \text{ feet} = 843.75 \text{ feet}^3$

   Volume per scoop of bucket:
   $\frac{15.625 \text{ feet}^3}{\text{scoop}}$

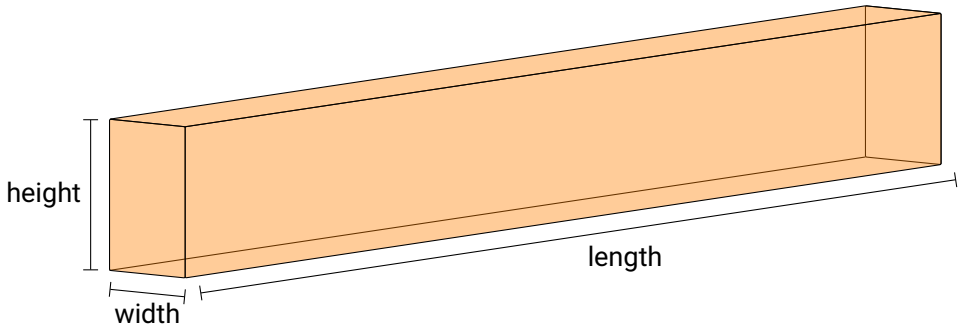
   Number of scoops:
   $843.75 \text{ feet}^3 \div \frac{15.625 \text{ feet}^3}{\text{scoop}} = 843.75 \text{ feet}^3 \times \frac{\text{scoop}}{15.625 \text{ feet}^3} = 54 \text{ scoops}$

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 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 C** Compute fluently with multi-digit numbers and find common factors and multiples. **1 E** Apply and extend previous understandings of arithmetic to algebraic expressions. **1 H** Solve real-world and mathematical problems involving area, surface area, and volume. **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 E** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
Content Domain:	Geometry
Standard(s):	**6.G.2** Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
DOK:	2

Unit 4: Geometry *Activity 5*

There's a small town near a river. The river might flood during a huge storm, so the town decides to build a 4-meter tall wall between the river and the town. You have 202 cubic meters of concrete for this wall. The wall will be in the shape of a rectangular prism.



Is it possible to build this wall?

- **If so**, what is a possible **width** and **length** (in meters) of a prism with a height of 4 meters and a volume of 202 cubic meters?
- **If not**, what is a possible **volume** (in cubic meters)? What is the corresponding **width** and **length** (in meters) if a prism with a height of 4 meters and this volume.

The equation for volume is width (w) $\times$ length (l) $\times$ height (h). So we have $w \times l \times h = 202$.

$$\begin{aligned} w \times l \times h &= 202 \\ w \times l \times 4 &= 202 \\ \div 4 &\quad \div 4 \\ w \times l &= 50.5 \end{aligned}$$

This gives us $w \times l = 50.5$. We can choose any positive number for w and use that to find l or vice versa.

For example, if we choose $w = 5$ then $l = 10.1$.

$$\begin{aligned} w \times l &= 50.5 \\ 5 \times l &= 50.5 \\ \div 5 &\quad \div 5 \\ l &= 10.1 \end{aligned}$$

Or if we choose $l = 10$ then $w = 5.05$.

$$\begin{aligned} w \times l &= 50.5 \\ w \times 10 &= 50.5 \\ \div 10 &\quad \div 10 \\ w &= 5.05 \end{aligned}$$

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 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** Understand ratio concepts and use ratio reasoning to solve problems. **1 H** Solve real-world and mathematical problems involving 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. **4 D** Interpret results in the context of a situation.
Content Domain:	Geometry
Standard(s):	**6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **6.NS.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **6.NS.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. **6.EE.2c** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.*

Continued on next page

Standard(s):	**6.G.1** Find area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. **6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	1 & 2

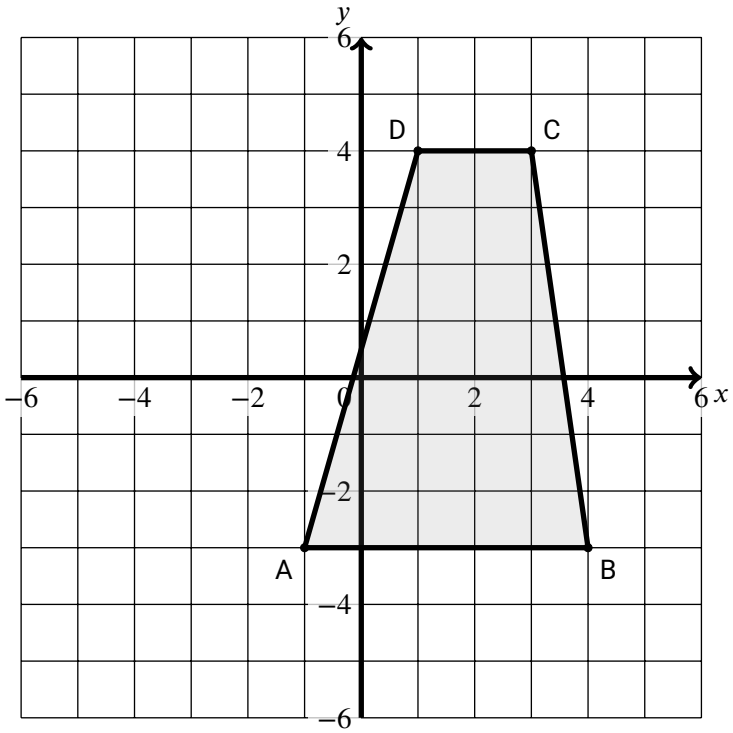
Unit 4: Geometry *Activity 6*

A straight edge is needed for this activity.

To prepare for an upcoming storm, a community maps out the boundaries of a very small ahupua‘a and the areas at-risk of flooding.

1. Draw the boundaries of the ahupua‘a by connecting points A, B, C, and D.

Point A	$(-1, -3)$
Point B	$(4, -3)$
Point C	$(3, 4)$
Point D	$(1, 4)$



2. Each unit of the grid represents 1 mile. What is the area of this ahupua‘a, in square miles?

The ahupua‘a is the shape of a trapezoid. Its area is 24.5 square miles.

$$\begin{aligned} \text{area of trapezoid ABCD} &= \tfrac{1}{2}(2+5)\times 7 \\ &= \tfrac{1}{2}(7)\times 7 \\ &= 24.5 \end{aligned}$$

3. In this ahupua‘a, the triangle ABC has a lot of low spots where rain can collect and cause floods. About $1/5$ of the area of the triangle ABC is at-risk of flooding. How much area, in square miles, is in at-risk of flooding?

The triangle ABC has an area of 17.5. The area that is at-risk of flooding is 3.5 square miles.

$$\begin{aligned} \text{area of triangle ABC} &= \tfrac{1}{2}\times 5\times 7 \\ &= 17.5 \end{aligned} \qquad \begin{aligned} \tfrac{1}{5}(\text{area of triangle ABC}) &= \tfrac{1}{5}(17.5) \\ &= 3.5 \end{aligned}$$

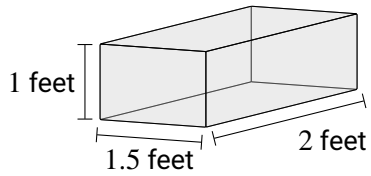
SBAC alignment for *Unit 4: Geometry Activity 7*

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 H** Solve real-world and mathematical problems involving area, surface area, and volume. **2 C** Interpret results in the context of a situation. **3 D** Use the technique of breaking an argument into cases. **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.
Content Domain:	Geometry
Standard(s):	**6.G.4** Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	2 & 3

Unit 4: Geometry *Activity 7*

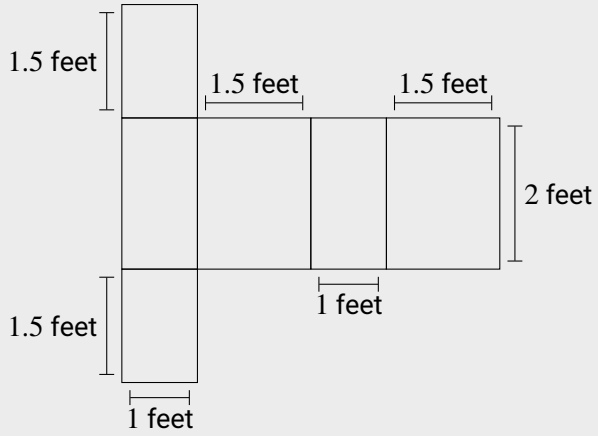
A straight edge is recommended for this activity.

A healthy coral reef can minimize the damage from coastal erosion, storms, and a lot of natural disasters. Unfortunately, human activity has caused a lot of reefs to die off. However, some people are creating artificial reefs often made from concrete blocks like the ones below.



1. Draw the geometric net of the surface of the concrete block. Label the lengths of each edge.

   The following is one possible net.



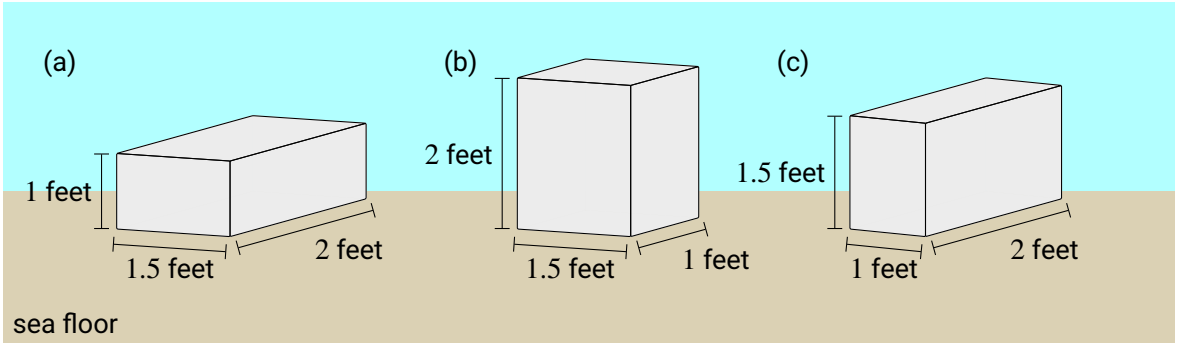
2. If everything goes well, baby coral animals will stick to the outside of the artificial reef and begin to grow. The more surface area the reef has, the more coral can stick to it. What is the total surface area (in square feet) of all six sides of the block?

   Two sides have measurements of 1×1.5 feet; two have measurements of 1×2 feet; and two have measurements of 1.5×2 feet.

$$\begin{aligned} \text{total surface area} &= 2(1 \times 1.5) + 2(1 \times 2) + 2(1.5 \times 2) \\ &= 2\,(1 \times 1.5 + 1 \times 2 + 1.5 \times 2) \\ &= 2\,(1.5 + 2 + 3) \\ &= 2 \times 6.5 \\ &= 13 \end{aligned}$$

   This gives us a total surface area of 13 square feet.

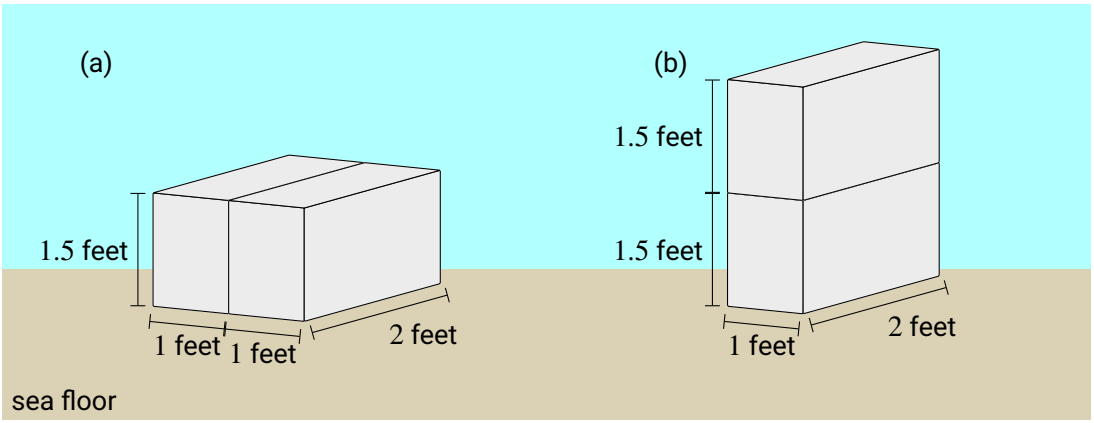
3. Coral can only stick to the surface that is exposed to the open water. When the block is laid down, some of its surface area is hidden. The block can be laid on the sea floor in three different ways. Which way exposes the most surface area to the open water? Explain your answer.



The bottom surface of option (a) has an area of 3 square feet. The bottom of option (b) has an area of 1.5 square feet. And the bottom of option (c) has an area of 2 square feet.

They all have the same total surface area but option (b) covers the least amount of that area. So option (b) exposes the most surface area to the open water.

4. If we want to make stacks of these concrete blocks, which of the following arrangements exposes the most surface area to the open water? Explain your answer.



In both options, the total surface area of the two blocks are equal but the covered areas are different.

In option (a), four faces are covered: the two faces that touch the sea floor and the faces where the two blocks touch each other. The two faces that touch the see floor each have an area of 2 square feet. The two faces where the blocks touch each other have an area of 3 square feet each. In total, 10 square feet is covered.

In option (b), three faces are covered: the bottom face that touches the sea floor and the faces where the two blocks touch each other. All three of these faces have an area of 2 square feet each. In total, 6 square feet is covered, which is less than what is covered in option (a).

Thus, option (b) exposes the most surface area to the open water.

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 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** Apply and extend previous understandings of arithmetic to algebraic expressions. **1 F** Reason about and solve one-variable equations and inequalities. **1 H** Solve real-world and mathematical problems involving 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. **4 D** Interpret results in the context of a situation.
Content Domain:	Geometry
Standard(s):	**6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2c** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length s = 1/2.* **6.EE.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **6.EE.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **6.EE.8** Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

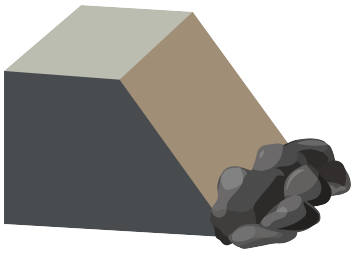
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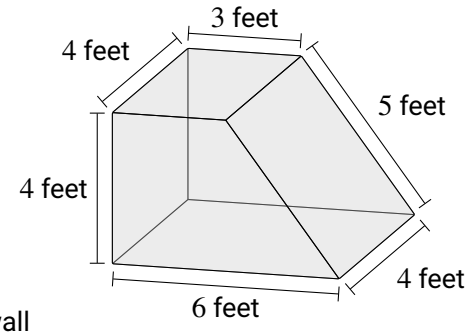
Standard(s):	**6.G.1** Find area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. **6.G.4** Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	1 & 2

Unit 4: Geometry *Activity 8*

A straight edge is recommended for this activity.

To protect against strong storms, many coastlines have a sea wall. Here's a diagram of 4-feet tall concrete sea wall in the shape of a trapezoidal prism.





Sea wall

1. The sea wall made up of 210 pounds of metal and w pounds of concrete. In order to keep this sea wall from floating away, its total weight has to be more than 4608 pounds. Express this as an inequality.

   $210 + w > 4608$

2. Which of the following weights of concrete satisfy your inequality in part 2? Choose all that apply and explain your answer(s).

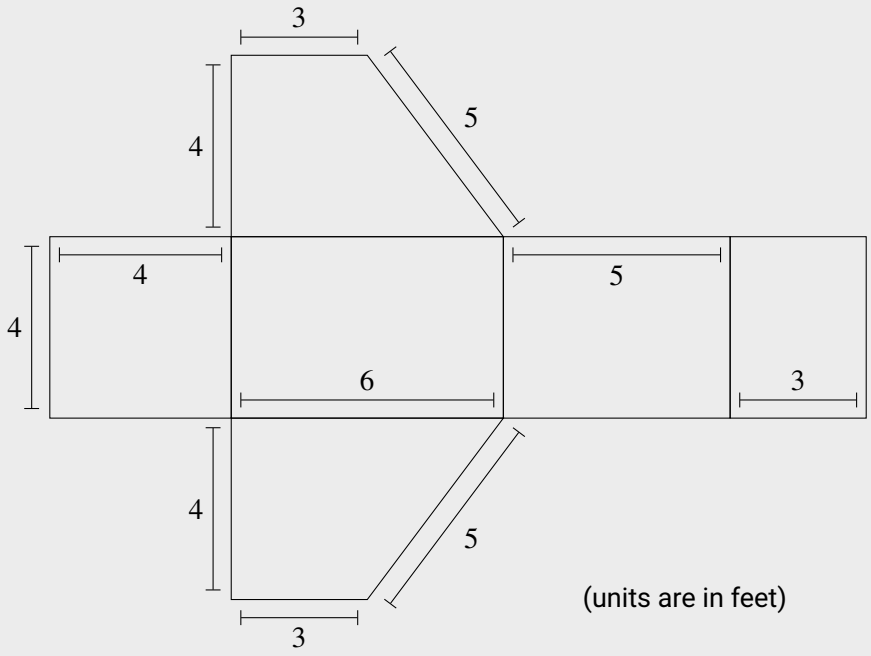
   a) 3000 b) 4000 c) 4200 d) 4400 e) 4800 f) 5000

$$\begin{aligned} 210 + w &> 4608 \\ -210 \quad &\quad -210 \\ w &> 4398 \end{aligned}$$

All weights over 4398 would work. So options (d), (e), and (f) work.

3. Before putting the sea wall into the water, we want to cover it with a protective paint. To do so, we need to know its total surface area.

   (a) Draw a geometric net of the surface of this sea wall. Label the lengths of each edge.



   (b) Find the total surface area of this sea wall.

The surface of the sea wall is made up of four rectangles and two trapezoids.

From left to right (as shown in the geometric net in part 3a) are as follows.

$4 \times 4 = 16$ $4 \times 6 = 24$ $4 \times 5 = 20$ $4 \times 3 = 12$

Each of the two trapezoids have the following area.

$\frac{1}{2} \times (3 + 6) \times (4) = 18$

The total surface area of the six sides is 108 square feet.

$16 + 24 + 20 + 12 + 18 + 18 = 108$

SBAC alignment for *Unit 4: Geometry 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 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** Apply and extend previous understandings of arithmetic to algebraic expressions. **1 G** Represent and analyze quantitative relationships between dependent and independent variables. **1 H** Solve real-world and mathematical problems involving 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. **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. **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):	**6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.EE.2a** Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* **6.EE.2c** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length s = 1/2.*

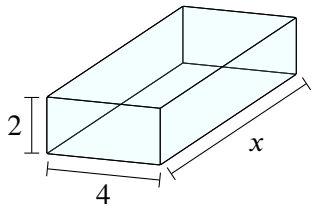
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Standard(s):	**6.EE.3** Apply the properties of operations as strategies to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply properties of operations to y + y + y to produce the equivalent expression 3y.* **6.EE.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **6.EE.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.* **6.G.4** Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
DOK:	1 & 2

Unit 4: Geometry *Activity 9*

A straight edge is recommended for this activity.

It's been really warm lately, so you decide to get some Shave Ice to cool off. The Shave Ice shop uses a machine that can shave any block of ice that is no more than 4 inch wide and 2 inch tall.



Block of ice



Shave Ice cone

The volume of the block of ice tells the shop owner how much Shave Ice can be made.

1. Write the equation for V, the volume of the block of ice in the drawing above.

   The equation is $V = (2)(4)x$, which simplifies to $V = 8x$.

2. What is the volume of the ice block if $x = 5$?

   $$\begin{aligned} V &= 8x \\ &= 8(5) \\ V &= 40 \end{aligned}$$

   The volume of the block is 40 cubic inches.

If two pieces of ice have the same volume but different shapes, then the one with a larger surface area will usually melt faster.

3. Write the equation for A, the surface area of the block of ice in the drawing above. Simplify your equation.

   The total surface area of the six sides is $A = 16 + 12x$.

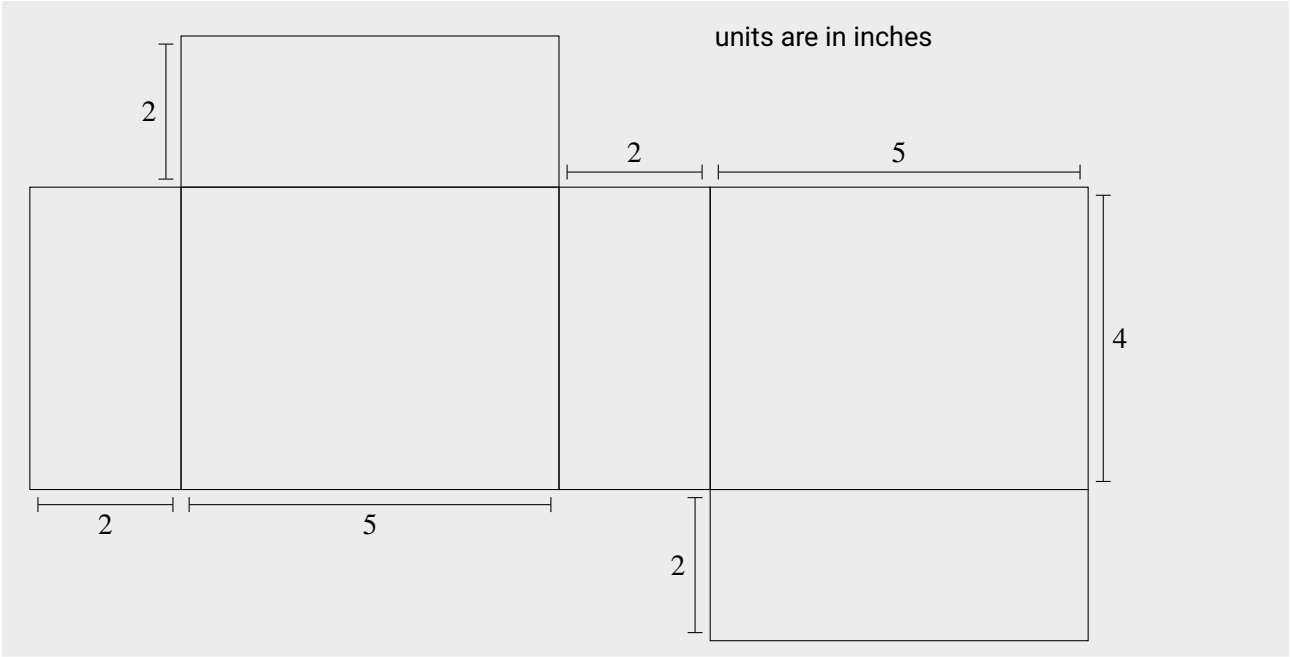
   $$\begin{aligned} A &= (2)(4) + (2)(4) + (2)x + (2)x + (4)x + (4)x \\ &= 2\left((2)(4) + (2)x + (4)x\right) \\ &= 2(8 + 6x) \\ A &= 16 + 12x \end{aligned}$$

4. What is the surface area of the ice block if $x = 5$?

   $$\begin{aligned} A &= 16 + 12x \\ &= 16 + 12(5) \\ &= 16 + 60 \\ A &= 76 \end{aligned}$$

   The total surface area of the block is 76 square inches.

5. Sketch a geometric net of the surface of an ice block where $x = 5$. Be sure to label all the necessary measurements.



Unit 5: Statistics and Probability



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

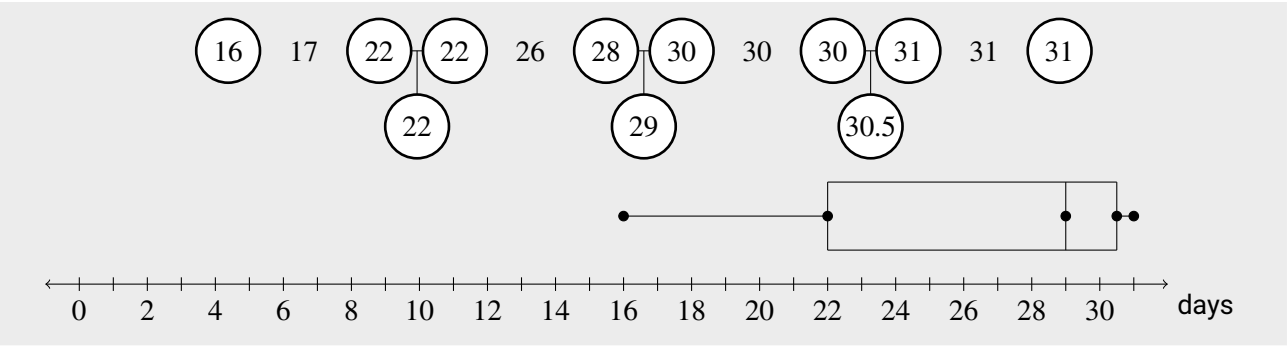
Claim(s)	**Claim 1: Concepts & Procedures** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. **Claim 2: Problem Solving** Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies.
Assessment Target(s):	**1 J** Summarize and describe distributions. **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:	Statistics and Probability
Standard(s):	**6.SP.3** Recognize that a measure of center for a numerical data set summarizes all of its values using a single number, while a measure of variation describes how its values vary using a single number. **6.SP.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **6.SP.5** Summarize numerical data sets in relation to their context, such as by: **6.SP.5c** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
DOK:	1 & 2

Unit 5: Statistics and Probability *Activity 1*

Each month, you counted the number of hot days. Here are your results.

Month	Number of hot days
January	17
February	16
March	22
April	26
May	30
June	30
July	31
August	31
September	30
October	31
November	28
December	22

1. Make a box plot of the data from the table.



2. Use your box plot to answer the following questions.

   (a) Find the median number of hot days per month.

   The median is 29 days.

   (b) Find the mode number of hot days per month.

   The mode is 30 days.

   (c) Your friend was also counting the number of hot days in a nearby town. The interquartile range of your friend's data was 10. Which location had more variation? Explain.

   The interquartile range of your data was 8.5 days so your friend's location had more variation.

   $30.5 - 22 = 8.5$

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 J** Summarize and describe distributions. **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 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.
Content Domain:	Statistics and Probability
Standard(s):	**6.SP.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. **6.SP.5** Summarize numerical data sets in relation to their context, such as by: **6.SP.5c** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. **6.SP.5d** Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.
DOK:	2 & 3

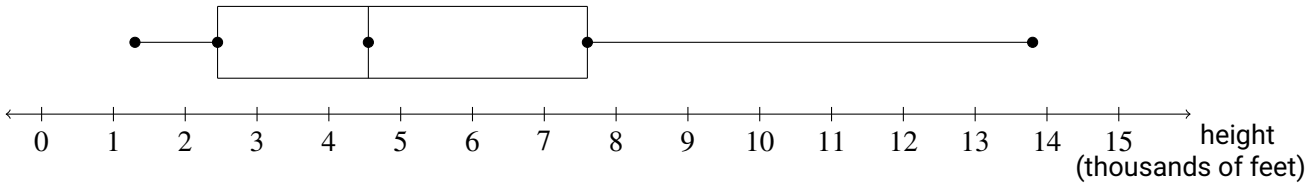
Unit 5: Statistics and Probability *Activity 2*

Mountains on an island dramatically affect the weather that the island experiences. Islands with many tall mountains usually experience a lot of rain or even snow because mountains help clouds to form. On the other hand, flatter islands with small or few mountains are often very windy and dry.

Here is a list of the tallest mountain peaks on each of the main Hawaiian Islands and their heights in thousands of feet.

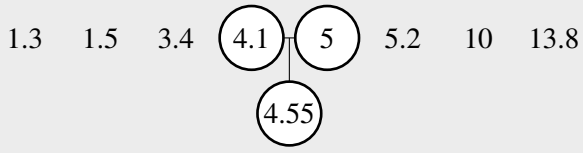
Island	Peak	Height (thousands of feet)
Hawai‘i	Mauna Kea	13.8
Maui	Haleakalā	10.0
Kaua‘i	Kawaikini	5.2
Moloka‘i	Kamakou	5.0
O‘ahu	Ka‘ala	4.1
Lāna‘i	Lāna‘ihale	3.4
Kaho‘olawe	Pu‘u Moaulanui	1.5
Ni‘ihau	Paniau	1.3

The data is also summarized in the box plot below.



Which measure of center, the mean or the median, would most accurately describe this data? Explain why. Then find that value and round to the nearest foot.

The peaks on Hawai‘i Island and Maui are a lot higher than the peaks on the other five islands. If one believes that the peaks on Hawai‘i and/or Maui are outliers, then the median (4550 feet) would be the best measure of center because it is not sensitive to outliers.



If one does not believe that there are outliers in the data set, then the mean (5538 feet) would be a reasonable measure of center.

$$\text{Mean} = \frac{1.3 + 1.5 + 3.4 + 4.1 + 5 + 5.2 + 10 + 13.8}{8} = \frac{44.3}{8} = 5.5375$$

Either the median or the mean are acceptable answers with sufficient justification.

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.
Assessment Target(s):	**1 I** Develop understanding of statistical variability.
Content Domain:	Statistics and Probability
Standard(s):	**6.SP.1** Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* **6.SP.5** Summarize numerical data sets in relation to their context, such as by: **6.SP.5b** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
DOK:	1 & 2

Unit 5: Statistics and Probability *Activity 3*

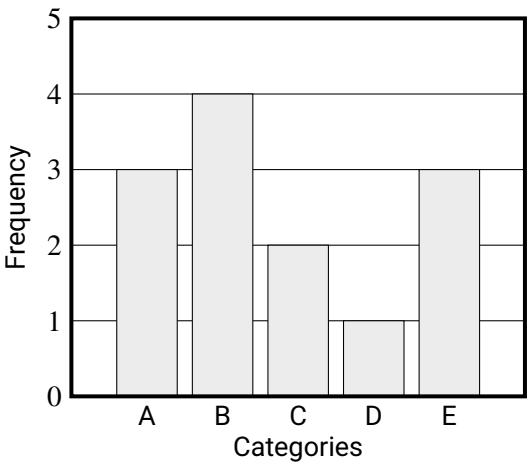
You're doing a research project on weather and climate, and you need some statistical data. Determine which of the following are statistical questions that could be answered with statistical data.

1. Are these statistical questions about rain?
   (a) Did it rain in Waiʻanae (Oʻahu) on May 2, 2020? ☐ Yes ☑ No
   (b) How many rainbows did a typical classmate see last summer? ☑ Yes ☐ No
   (c) How much rain falls on a typical day in June? ☑ Yes ☐ No
   (d) How often does it rain on Hawaiʻi Island? ☑ Yes ☐ No
   (e) Does it rain more in Kailua than Kāneʻohe (Oʻahu)? ☑ Yes ☐ No
2. Are these statistical questions about clouds?
   (a) Is it ever cloudy above Haleakalā? ☐ Yes ☑ No
   (b) Do we have more clouds during the day or night? ☑ Yes ☐ No
   (c) What was Queen Liliʻoukalani's favorite type of cloud? ☐ Yes ☑ No
   (d) How high up are clouds? ☑ Yes ☐ No
   (e) How many hours of sun does Līhuʻe, Kauaʻi experience per day? ☑ Yes ☐ No
3. Are these statistical questions about wind?
   (a) Is it windier on the north shore of Lanaʻi or the south shore? ☑ Yes ☐ No
   (b) Are high and low tides caused by the wind? ☐ Yes ☑ No
   (c) Did a hurricane hit Molokaʻi on January 1, 2020? ☐ Yes ☑ No
   (d) Are tornado winds faster than hurricane winds? ☑ Yes ☐ No
   (e) How fast was the wind created by Hurricane Iniki? ☑ Yes ☐ No

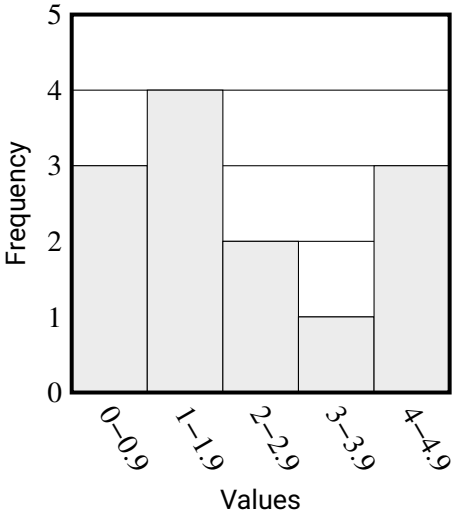
Statistical questions anticipate variability in the data related to the question.

4. Below are a few questions about weather. If the question is a statistical question, state whether a bar graph or a histogram can be used to help answer the question. If it is not a statistical question, say so.

Example bar graph



Example histogram



(a) What is the most common type of cloud in the State of Hawai'i?

- [x] Bar graph
- [ ] Histogram
- [ ] Not a statistical question

(b) How many times did you hear thunder this month?

- [ ] Bar graph
- [ ] Histogram
- [x] Not a statistical question

(c) How long do hurricanes last?

- [ ] Bar graph
- [x] Histogram
- [ ] Not a statistical question

(d) What was the wind speed in 'Aiea yesterday?

- [ ] Bar graph
- [x] Histogram
- [ ] Not a statistical question

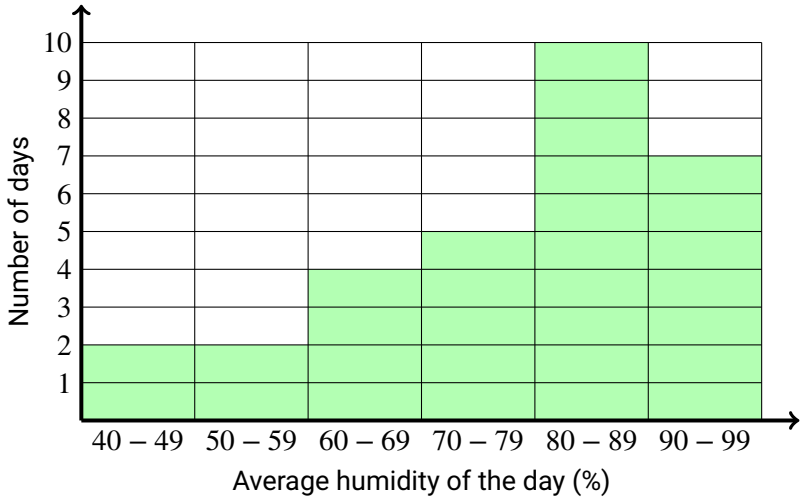
SBAC alignment for *Unit 5: Statistics and Probability Activity 4*

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 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 J** Summarize and describe distributions. **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 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):	**6.SP.5** Summarize numerical data sets in relation to their context, such as by: **6.SP.5a** Reporting the number of observations. **6.SP.5c** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
DOK:	1, 2, & 3

Unit 5: Statistics and Probability *Activity 4*

Humidity is a way of describing *how much water is soaked up in the air*. If the humidity is low, then the air is dry like wrapping ourselves in a dry towel. When we sweat, the dry towel will take the sweat away from our body. On the other hand, if the humidity is high, then the air is wet like wrapping ourselves in a wet towel. When we sweat, the wet towel is already full of water and can't help us dry off. Instead, the sweat just builds up all over our bodies.

Here's a histogram showing the average humidity over the last couple of days.



1. Determine which of the following statements about the data are true. Select True or False for each statement.

Statement	True or False?	
The shape of the data is skewed to the left.	☑ True	☐ False
The interquartile range of the data is greater than 30 (% humidity).	☐ True	☑ False
The median of the data is between 60 and 69% humidity.	☐ True	☑ False
The size of this data set is greater than 40.	☐ True	☑ False

2. Explain your answer(s) from the previous part.

The "tail" end of the data pinches off to the left so the data is said to be skewed to the left.

The size of this data set is 30 so the median value is between the 15th and 16th greatest values. This places the median value between 80 and 89% humidity. The interquartile range is from the 8th to the 23rd greatest values. Therefore, the interquartile range starts between $60-69$% humidity and ends between $80-89$%. So the interquartile range spans no more than 29% (from 60% to 89%).

Please note that *skewness* is not a sixth-grade Common Core concept. However, we've included it here because we've found official sixth-grade SBAC practice problems that assess for it.

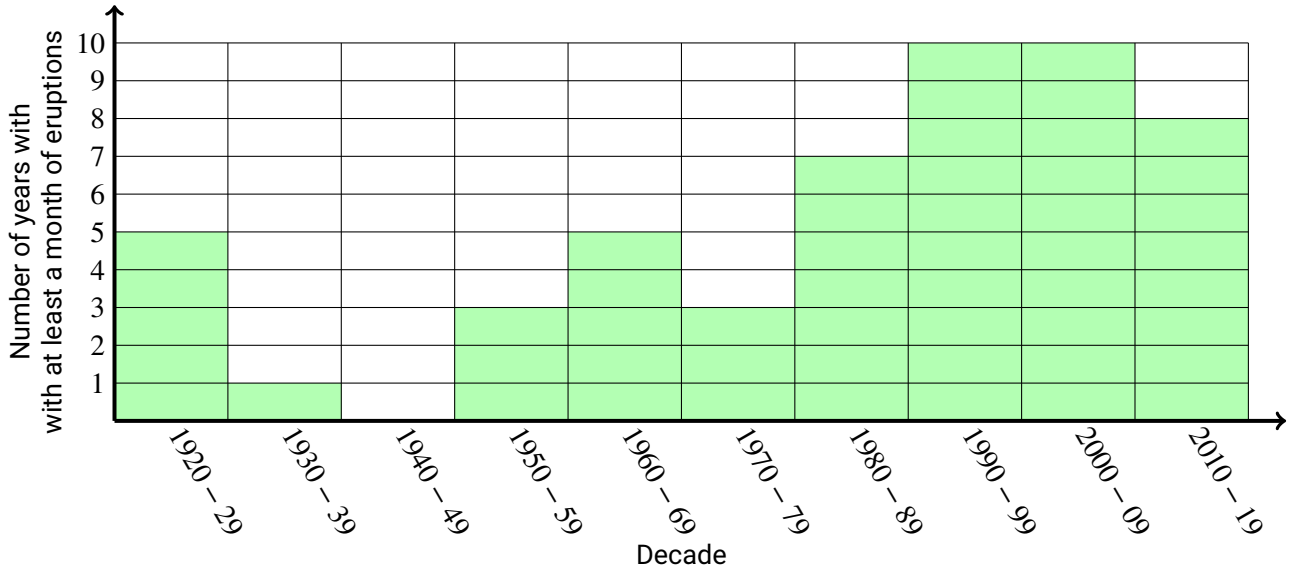
SBAC alignment for *Unit 5: Statistics and Probability Activity 5*

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 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 J** Summarize and describe distributions. **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:	Statistics and Probability
Standard(s):	**6.SP.5** Summarize numerical data sets in relation to their context, such as by: **6.SP.5a** Reporting the number of observations. **6.SP.5c** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
DOK:	1 & 2

Unit 5: Statistics and Probability *Activity 5*

Volcanoes can erupt with little warning, and when they do, it can be hard to tell how long the eruptions will last. Sometimes, the eruptions end in a day, other times, they last many years.

Kīlauea on the Big Island is an active volcano that has been erupting on and off for as long as humans have been in Hawai'i. Here's a histogram showing the number of years that experienced *at least a month of eruptions* from Kīlauea. The data covers a hundred years from 1920 to 2019 and is grouped by decade (ten years).



Determine which of the following statements about the data are true. Select True or False for each statement.

Statement	True or False?	
The shape of the data is skewed to the left.	✓ True	☐ False
The interquartile range of the data is less than 20 (years).	☐ True	✓ False
The median of the data is between 1990 and 1999.	✓ True	☐ False
More than half of years from 1920 to 2019 had experienced an eruption that lasted at least a month.	✓ True	☐ False
People on all islands of Hawai'i should always be prepared for an eruption.	☐ True	✓ False
There was a 5-year long eruption from 1920 to 1929.	☐ True	✓ False

The size of this data set is 52, which means that 52 of the 100 years in the data had experience at least one month-long eruption. This also means that the median is between the 26th and 27th values, which fall in the years between 1990 and 1999. The interquartile range starts between the 13th and 14th value and ends between the 39th and 40th value. Therefore, the interquartile range starts between the years 1960 – 1969 and ends between 2000 – 2009. So the interquartile range spans at least 31 years (from 1969 to 2000).

Please note that *skewness* is not a sixth-grade Common Core concept. However, we've included it here because we've found official sixth-grade SBAC practice problems that assess for it.