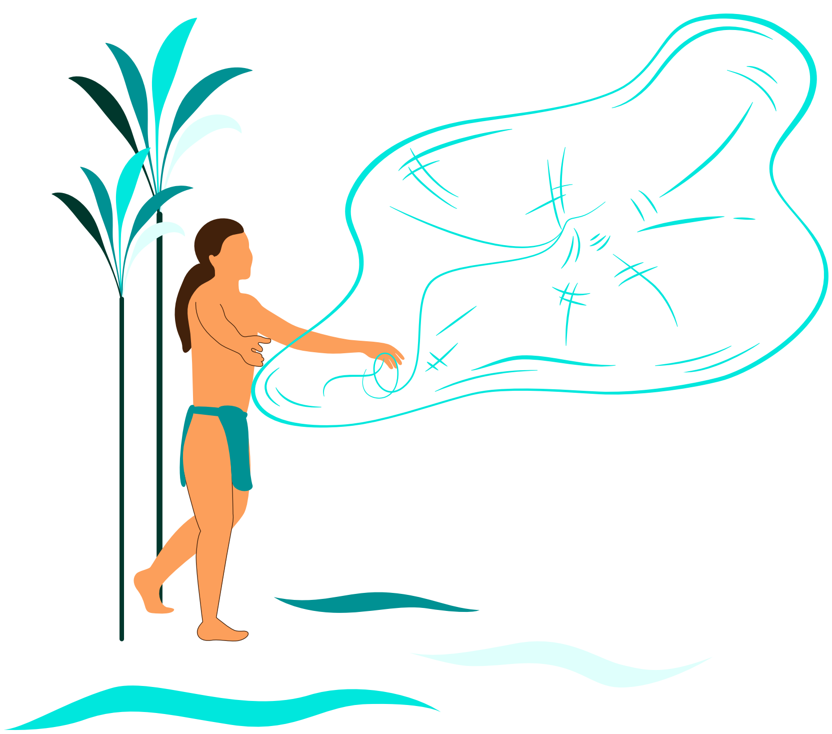
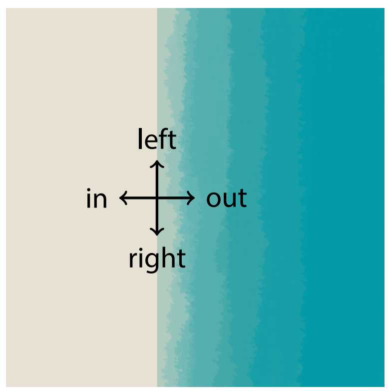
Unit 5: Measurement Geometry



Activity 5.1

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s)	1 H: Understand and apply the Pythagorean theorem.
Content Domain	Geometry
Standard(s)	8.G.B.8
DOK	2
Activity Key	*17 feet*

You want to lay a net in a straight line from where you are on the water's edge to a point that is 15 feet straight out and 8 feet to that position's right. How long a net do you need?

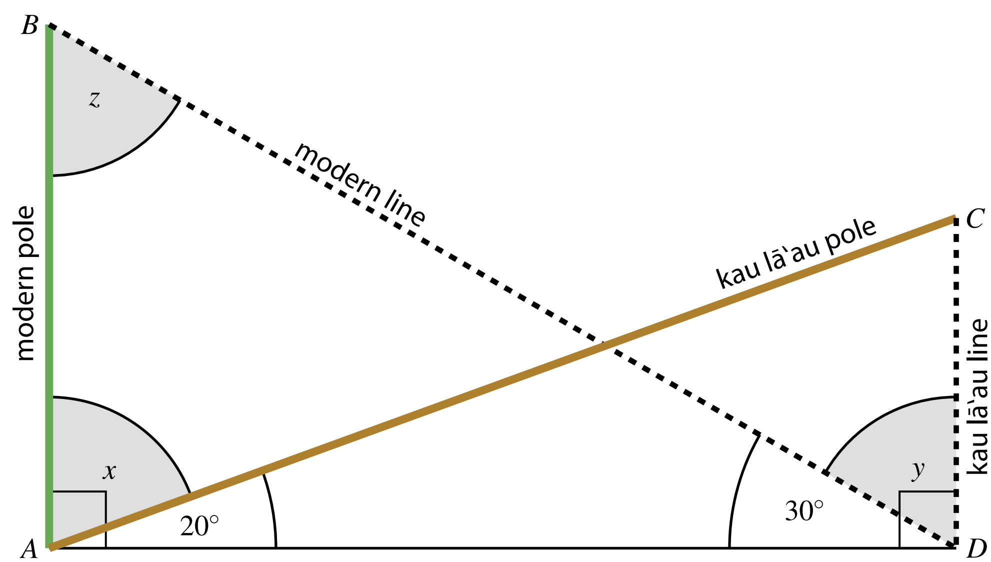


Activity 5.2

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s)	1 G: Understand congruence and similarity using physical models, transparencies, or geometry software. 1 D: Analyze and solve linear equations and pairs of simultaneous linear equations.
Content Domain	Geometry
Standard(s)	8.G.A.5, 8.EE.C.7
DOK	1
Activity Key	$x = 70°$, $y = 60°$, and $z = 60°$

Ancient Hawaiians didn't use fishing reels—not even when catching *ulua* (a large predatory reef fish). Instead, Hawaiians used a traditional method was called *kau lā'au* "hang stick". Check out this YouTube video on Hawaiian ulua fishing: `http://bit.ly/2pTqTs2`.

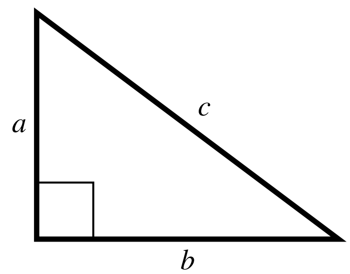
Kau lā'au involves using a long stick with a rope at the end, which hangs a bait directly below it. Below is an image of a modern pole, represented by the line segment AB and its fishing line represented by BD. The pole used in the kau lā'au is represented by AC and it's line CD. Find the angles x, y, and z.



Activity 5.3

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s)	1 H: Understand and apply the Pythagorean theorem.
Content Domain	Geometry
Standard(s)	8.G.B.7, 8.G.B.8
DOK	1
Activity Key	*Answers will vary.*

When constructing a speargun, it is easiest to start with a block of wood that is a rectangular prism, like a long shoe box. Every angle of a rectangular prism is perpendicular, and you can check your angles with a special tool called a *square*. If you do not have a square, then you can make one with Pythagorean triples. We just need to get 3 pieces of wood each cut to a length of a, b, and c, such that $a^2 + b^2 = c^2$.



Find *two* sets of numbers (measurements) that our a, b, and c sticks might have to make our square tool.

Activity 5.4

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s)	1 B: Work with radicals and integer exponents.
Content Domain	Equations and Expressions
Standard(s)	8.EE.A.2
DOK	1
Activity Key	*1. The box should be 8 in $\times$ 8 in $\times$ 1 in.* *2. The box should be 10 in $\times$ 10 in $\times$ 10 in.*

1. Fishing gear takes up a lot of room and organization really helps with getting your fishing set up ready. One common item among all fishermen is a tackle box. It is a box used to organize fishing gear such as hooks, swivels, lead, etc. Say you wanted to make your own tackle box which has a square bottom, a height of 1 inch, and a volume of 64 cubic inches. What should the dimensions of your final tackle box be?

2. Say you wanted a tackle box for your lures, which are quite big, and you wanted your box to be a cube with a volume of 1,000 cubic inches. What should the dimensions of the lure tackle box be?

Activity 5.5

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Assessment Target(s)	1 B: Work with radicals and integer exponents.
Content Domain	Equations and Expressions
Standard(s)	8.EE.A.2
DOK	2
Activity Key	*A. 256 in^3 and 361 in^3* *B. 1 ft^3 and 64 in^3* *C. 125 in^3* *D. 96 in^3, 200 in^3, and 333 in^3*

You are looking online to buy a new cooler for your fishing trip. The website you are looking at has the following description of their coolers:

"These new *cube* coolers are perfect for fishing trips!. Get your coolers with the following volumes: 1 ft^3, 64 in^3, 96 in^3, 125 in^3, 200 in^3, 256 in^3, 333 in^3, 361 in^3!"

You want a cooler that has *integer dimensions*. Sort the coolers out in the following table to help you decide which cooler to get.

A. Perfect square volumes (not perfect cubes)	B. Both perfect square and perfect cube volumes	C. Perfect cube volumes (not perfect squares)	D. Neither perfect cube nor perfect square volumes

Activity 5.6

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts 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)	2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. 1 I: Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.
Content Domain	Geometry
Standard(s)	8.G.C.9
DOK	1
Activity Key	*Answers will vary*

It is illegal to catch papio that are too small. In order to figure out how long it takes papio to grow to a legal catching size, you decide to raise some baby papio. To raise baby papio, you need to make a *cylindrical* tank with a volume between 100 and 120 cubic feet. Find 3 different possible configurations that will give you your desired tank size.

	Tank #1	Tank #2	Tank #3
Radius (feet)			
Height (feet)			
Volume ($feet^3$)			

Activity 5.7

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts 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)	2 B: Select and use appropriate tools strategically. 1 I: Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. 1 B: Work with radicals and integer exponents.
Content Domain	Geometry
Standard(s)	8.G.C.9, 8.EE.A.2
DOK	3
Activity Key	*The radius of the sphere cage should be 12 feet.*

Native Hawaiians have always been excellent at building ponds for farming fish. In modern times, many societies raise fish in large cages or nets in ocean. When fish farming, it is important to consider the volumes of the cages. If we had a cone cage with a height of 27 feet and a base diameter of 32 feet but wanted a sphere cage with the *same volume*, then what should the radius of the sphere be?

Activity 5.8

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency. Claim 2: Problem Solving Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. Claim 3: Communicating Reasoning Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.
Assessment Target(s)	3 F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions. 1 I: Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. 2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.
Content Domain	Geometry
Standard(s)	8.G.C.9
DOK	3
Activity Key	*Both the sphere and the cylinder have the same volume.*

Floaters are often used in fishing to keep baits and lures off of the ground. Some floaters float better than others and *how much something tends to float* is called *buoyancy*. The more volume an object has, the more buoyancy it also has. Suppose that you have two floaters: one is a sphere with radius of r, and the other is a right cylinder with a radius of r and a height of $\frac{4}{3}r$. Does the sphere have a greater volume, the cylinder have a greater volume, or do they both have the same volume?

Activity 5.9

Grade	08
Claim(s)	Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts 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.
Assessment Target(s)	3 B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. 1 H: Understand and apply the Pythagorean theorem. 3 F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions..
Content Domain	Geometry
Standard(s)	8.G.B.7, 8.G.B.8
Mathematical Practice(s)	2, 3, 6, 7
DOK	4
Activity Key	*Your conjecture is true. The inequality* $x < y < z$ *is consistent with an obtuse triangle.*

While out on a fishing and camping trip with your friends, a storm began to approach. So you and your friends rush to make a frame for your shelter. Between you and your friends, you have sticks of lengths x, y, and z inches, such that $x < y < z$. You also notice that $x^2 + y^2 < z^2$.

One of your friends say that this is perfect and that you can create a right triangle to build part of your frame for your shelter. You, on the other hand, think that this is not correct and that you will have an obtuse triangle, which won't be good for your shelter since it won't be standing properly. Come up with a reasoning to justify who is right.