Since 1975 the Polynesian Voyaging Society (PVS) has sailed the Hōkūle'a and its sister-ship, the Hawai‘iloa, to Tahiti six times. These voyagers do this the same way ancient Hawaiian navigators did it, using the sky to find their way … and doing a lot of math!

PVS is now training 18 navigators, and in the future they hope to have more. One of them could be you!

Practice thinking like a navigator by doing these computations below.

1. The Hōkūle'a travels 4 miles per hour. How many miles can it travel in one day? ________

2. Ancient kāhuna divided the planet into 32 houses, while modern sailors think of it as having 360°. PVS navigators use both systems today, & they know that 1° is equal to 48 miles. How many degrees can the Hawai‘iloa travel in 1 day? ________

3. If you were navigating the Hōkūle’a to the equator, which is 0° & you left from Honolulu, which you know is 21° North, how many days would it take you to reach the equator? ________

4. Your destination is Kahiki (Tahiti), which is 17° South of the equator. How many days will it take you to get there from the equator? ________

5. How many days does it take a sailing canoe to get from Honolulu to Tahiti & back? ________
1.2.b Nā Hōkū/Stars Unit: Where in the World Are We?

Look at the open ocean in the photo and imagine seeing this in every direction - all 360°! Long ago, Hawaiian voyagers knew where in the world their sailing canoe was by looking at nā Hōkū, and by understanding nature’s many messages all day and night.

Voyagers knew how climate affects the ocean and sky at different times of the year. They “read” the winds, ocean swells and the colors and types of clouds. They sensed temperature changes in the water and air and changes in humidity. They watched the ocean for different kinds of fish, birds, turtles and mammals and carefully observed their behaviors because that could tell them about the weather.

When European captains traveled to Asia with these expert wayfinders, they were astounded by how accurately they could chart a course without the use of any modern instruments such as astrolabes or sextants, or any written maps or charts showing latitude and longitude.

Today, Hawaiian voyagers use both ancient and modern systems to find their way. They don’t use GPS (the global positioning system), but coordinates help them chart their position on the globe.

Voyagers here use all these direction words now:

- North – ‘Ākau
- South – Hema
- East – Hikina
- West – Komohana

Science in Hawai‘i: Nā Hana Ma Ka Ahupua’a – A Culturally Responsive Curriculum Project
Navigator's Coordinates are just the numbers wayfinders use to describe where they are in the world, and where their destination is. If you coordinate (put together) your latitude & longitude, the numbers can tell anyone where to find you!

DIRECTIONS: Read the information below and answer the questions to see how it works.

- Lines of Latitude are parallel to the Equator
- Lines of Longitude are parallel to the Prime Meridian

Hawai‘i is found above the Equator, at about 21° ’Ākau (north).

1. This is Hawai‘i’s ______________________________.
   But Florida and lots of other places are found at 21° N too, so we also need to know Hawai‘i is found at about 157° Komohana (west)
   2. This is Hawai‘i’s ______________________________.

- Lines of Latitude tell if you are North or South of the Equator
- Lines of Longitude tell if you are East or West of the Prime Meridian

Get it? Then find a classmate and a globe or atlas and challenge each other. Do the following questions &/or make up your own!

3. What are the coordinates of Hawai‘i’s southern-most point? _______________ by _______________

4. What are the coordinates of Hawai‘i’s northern-most point? _______________ by _______________

5. What are the coordinates of the place opposite on the globe from Hawai‘i? __________ by __________
1.2.c Nā Hōkū/Stars Unit:

What the Heck is an Astrolabe?!

This astrolabe in the picture was made by the French scientist Jean Fusoris in about 1400 A.D. The astrolabe is a very ancient astronomical computer for solving problems relating to time and the position of the Sun and stars in the sky. True astrolabes were invented over 2,400 years ago!

Several types of astrolabes have been made. By far the most popular type is the planispheric astrolabe. This kind projects the night sky onto the equator.

Old astrolabes were made of brass and were usually about 6 inches (15 cm) in diameter, although much larger and smaller ones were made, too. Astrolabes show how the sky looks at a specific place at a given time. This is done by drawing the sky on the face of the astrolabe and marking it, so positions in the sky are easy to find. Astrolabes can help us to find the time of day or night or check where a star should be in the sky.

This picture shows a mariner’s astrolabe which is simply a ring marked in degrees for measuring altitude. This helps us figure out the latitude of a ship at sea by measuring how high up the Sun is at noon, or the altitude of a known star when it was on the meridian (lined up with due north or south). However, astrolabes do not tell longitude, so western voyagers had to guess at that!

(photo courtesy Adler Planetarium and Astronomy Museum)