

## **Ships and Navigation Student Worksheet**

### **Introduction:**

Throughout the Age of Exploration, European navigators relied on the technology of their time to help them explore the seas. Developments in shipbuilding and navigational equipment enabled voyages of exploration to reach places they would not previously have been able to go. The Portuguese caravel, for example, had features that made it particularly well suited for exploration. Caravels enabled Portuguese fleets to explore the African coast and made Portugal a leader among European nations in world exploration. They did not, however, allow for extremely long voyages such as Ferdinand Magellan's circumnavigation of the world (which you'll learn about in another lesson in this unit). Navigational instruments such as the cross-staff and mariner's astrolabe were used to figure out latitude, but they had limitations. For example, they could only be used when the navigator could see the sun or the stars and were therefore useless on a cloudy day. In this activity, you will see pictures of several technologies that Europeans used to explore the world, and you'll answer questions about what you see.

All Web links for this lesson can be found at:  
<http://www.socialstudies.com/worldlinks.html>.

### **Directions:**

#### **Portuguese *Barca***

<http://www.abc.se/~m10354/bld/img/paolo/lisbporx.jpg>

#### **Portuguese Caravel**

<http://bvapush.pbworks.com/w/page/4313437/caravel>

Compare and contrast these two depictions of Portuguese ships. The *barca* was commonly used in the early days of the Age of Exploration. The caravel was a Portuguese ship developed in the 15<sup>th</sup> century (although it was based on Arab and European ship designs that had existed for centuries).

1. Describe the general appearance of each of the ships. How many masts does each have? What shape are their sails? Which appears larger? Which appears wider?
2. Which ship do you think could sail faster? Why?
3. Exploration often involved careful navigation around coastlines and even sailing up rivers. Which ship do you think would be the easiest to maneuver in such situations? Why?

### **Navigation Methods**

<http://www.heritage.nf.ca/exploration/navigate.html>

Scroll down to the 16<sup>th</sup>-century illustration of a man using a cross-staff. This instrument

was used to measure latitude. The navigator would hold one end of the cross-staff up to his eye and move the cross piece back and forth until its upper edge was aligned with the sun or the North Star and its lower edge was aligned with the horizon. He then noted where the cross piece lined up with the longer piece and looked at a table to convert this number into the latitude of the location where he was standing.

The word “ORIZONTE” at the bottom of the image means “horizon.”

4. In addition to the cross-staff, what is helping this man measure his latitude?
5. Why was it important to be able to locate the Big Dipper?

### **Mariner’s Astrolabe**

<http://astrolabes.org/mariner.htm>

The astrolabe was another instrument used to measure latitude. The navigator hung it by the ring at the top and adjusted the *alidade* (the “hand”) to line up with the sun or a star. It was not particularly accurate but was commonly used.

6. Why do you think this astrolabe was used so frequently if it was not that accurate?
7. What might have been the consequences of measuring latitude incorrectly? What if Columbus and his crew hadn’t measured latitude accurately on their second, third, or fourth voyages to the “New World”?

### **Expanding Horizons**

<http://www.ibiblio.org/expo/1492.exhibit/full-images/globe.gif>

This globe was used to teach people of the 16<sup>th</sup> century how the world and celestial bodies looked and related to each other. It shows the earth at the center of the solar system, with the planets, sun, moon, and several stars revolving around it. The brass strips around the globe represent the planets’ and the sun’s movements around the earth. It was created in 1543, the same year that Copernicus published his theory saying that the sun was actually the center of the solar system and that the earth and other planets revolved around the sun.

8. Why do you think something like this globe would have been valuable to the people in the 16<sup>th</sup> century? If you were a student during the 16<sup>th</sup> century, what might you have been able to learn from this globe?
9. Imagine that you are a 16<sup>th</sup>-century European explorer planning an expedition to find new trade routes to Asia. Write a paragraph in which you describe some of the navigational instruments you’d use and how these instruments will help you find and record your way.