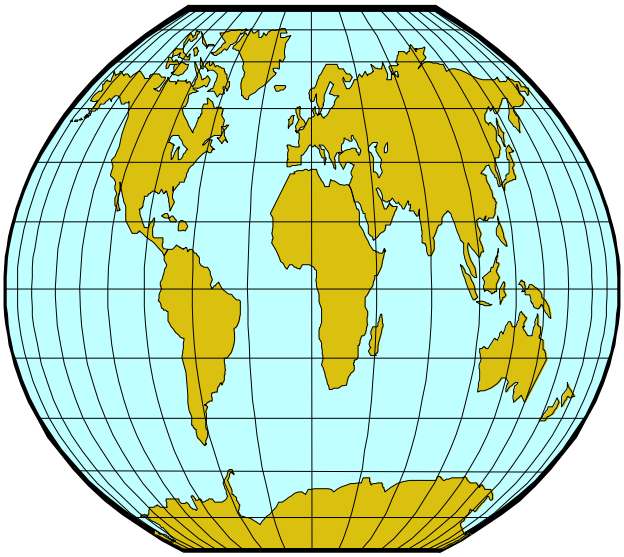
LATITUDE & LONGITUDE



CFE 3263V

OPEN CAPTIONED
NAIONAL GEOGRAPHIC
SOCIETY
1994
Grade Levels: 7-12
22 minutes

DESCRIPTION

How did early seafarers know where they were, or where they were going? How did they navigate? How do today's airplanes and ships know? What are latitude and longitude? How are they useful? Explains the development and use of latitude, longitude, sextant, chronometer, the prime meridian, and other navigational methods from ancient to modern times.

INSTRUCTIONAL GOALS

- To examine the need for knowing direction when traveling on the open sea.
- To identify astronomical bodies used in navigation.
- To investigate navigational methods used by ancient mariners.
- To describe the use of grid systems in mapping.
- To apply the use of grid systems in marking lines of latitude and longitude.
- To describe navigational tools and their functions.
- To recognize navigational needs for aircraft as well as for ships.

BEFORE SHOWING

1. Discuss the need for directions. Give examples of being lost in a strange part of town or while camping in the woods, and explain how one finds the way back.
2. Sketch a map or give directions to one's home or school using only landmarks.
3. Display sixteenth-century maps and interpret their accuracy. Discuss why these maps were often inaccurate.
4. Illustrate a grid system using a city map to explain how to find the location of streets.
5. Discuss jobs in which direction is an important aspect, such as sailor, pilot, astronaut, and civil engineer.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause to discuss inaccuracies in navigating by landmarks only.
3. Pause to compare the parallels and meridians of Greek maps to the grid system used on city maps.
4. Pause to point out the importance of astronomy in navigation.

AFTER SHOWING

Discussion Items and Questions

1. Imagine areas where it is easy to get lost, such as at sea, in a forest, or in space. Discuss ways to calculate how to travel in a straight line to find a way out without going around in circles.
2. Discuss voyages of exploration made in the fifteenth and sixteenth centuries and how it was possible for the sailors to navigate.
3. Examine the accuracy and ease of the use of grid systems.
4. Explore the mathematical aspects of navigation: angles, degrees, and simple arithmetic.
5. Inquire about students' familiarity with Global Positioning Systems (GPS) through personal experience or from films and readings. Discuss how GPS can be used in people's everyday lives.
6. Explain how Polynesians navigated from island to island without sophisticated instruments.
7. Describe and demonstrate how to find the position of a boat on the sea when two landmarks such as a prominent point of land and a lighthouse are visible.
8. Why does time play such an important role in navigation?
9. Discuss why the prime meridian was placed in England. Determine what historical factors might have contributed to choosing England as the navigational focal point of the world.

10. Compare the navigational needs of an airplane pilot and a sea captain. Explain how navigational concepts for the sea apply to the sky as well.
11. Explain the significance of the International Date Line.

Applications and Activities

1. Organize a “Find the Treasure” game in which students hide an object, then write directions or draw a map using only landmarks, not directions such as north or south, right or left, or distances.
2. Demonstrate the proper use of a compass.
3. Organize a “Find the Treasure” game in which students hide an object, then give compass directions from two different points. The treasure should lie at the intersection of two lines marked from the points.
4. Discuss voyages of exploration made in the fifteenth and sixteenth centuries, and how it was possible for the sailors to navigate. Imagine what information they recorded for later navigators.
5. Trace a route followed by an explorer in the age of discovery. Debate whether the route was well planned or haphazard, and compare the route to those taken by modern commercial shipping.
6. Role-play what a navigator in training underwent in the sixteenth century. Study the school for navigators sponsored by Prince Henry of Portugal and the methods for finding a route around Africa to India.
7. Draw a grid system over a map of the school. Make an index of school buildings or areas showing coordinates.
8. Organize the class into teams to locate coordinates for specific streets or places from a city map.
9. Draw lines of latitude and longitude on a playground ball using chalk or a permanent marker. Use masking tape to ensure straight lines.
10. Illustrate different projections.
    a. Mark lines of latitude and longitude on a large orange.

b. Carefully peel the skin off so it lies flat like a map.
c. Contrast these representations with photographs of earth taken from space.

11. Draw lines of latitude and longitude on a circle representing the earth. Locate:
    a. The equator
    b. Prime meridian
    c. Parallels
    d. Meridians
    e. The tropic of Cancer
    f. The tropic of Capricorn
    g. Arctic Circle
    h. Antarctic Circle
12. Locate countries on a world map by their latitude and longitude.
13. Chart the path of the sun or the moon. Every hour represents 15 degrees of longitude. Calculate the time in Greenwich, England. Compare lines of time zones to lines of longitude.
14. Using a sextant, observe the angular height of the sun, moon, and stars. Use these observations to plot latitude.
15. Report on satellites orbiting the earth and how they make up the Global Positioning System (GPS). Construct a drawing showing how ships and planes can locate their positions using the GPS.
16. Observe different projection maps of the world: Eckert, Mercator, North Polar, South Polar, and interrupted. Discuss their similarities, differences, and accuracy.
17. Demonstrate how a sextant works. Draw on a chalkboard how angular height is calculated and applied to longitude.

WEBSITE

Explore the Internet to discover sites related to this topic. Check the CFV website for related information (http://www.cfv.org).

SUMMARY

"Where am I?" is a question people often ask themselves. Knowing where one is and how to get to a destination is a question that has plagued travelers for centuries. Ocean-going sailors were perhaps the first travelers who faced travel without familiar landmarks. Their need to know their location and progress led to a system of charting and measurement that today benefits all travelers.

Navigating on the open seas calls for more than luck and help from the gods. Ancient sailors learned to follow the paths of the stars and the sun to help them plot their course. At times the sun and stars were not observable, or ships were blown off course, leaving the ships and crews lost at sea. The problem facing sailors was how to locate their position so they would know what course to take.

The Greeks were the first people to create a grid system to calculate location on earth. Applying these principles, lines of latitude and longitude form a grid on the earth. Lines of latitude, called *parallels*, mark the earth in even lines north and south from the equator. Lines of longitude, called *meridians*, divide the earth into 360 degrees through the North and South Poles. All lines of longitude meet at the poles.

Calculating the latitude of a ship at sea is fairly easy. North of the equator, navigators measure the angle of the North Star above the horizon. That angle is the same number of degrees as the line of latitude from which it is measured. Locating longitude is based on time. The prime meridian, which runs through Greenwich, England, is the line of longitude marked "0." Every hour east or west of this line is 15 degrees

of longitude. So, navigators locate their longitude by knowing the exact time in Greenwich, England, and the time at their present location.

Modern navigators make use of the Global Positioning System (GPS) to find their location. Geostationary satellites in orbit around the earth send out radio signals that allow navigators to pinpoint their position anywhere on earth. Even with the help of modern technology, special care is given to locating and plotting courses to guide ships and airplanes to their destinations.