Portraying the Earth
A brief history of maps

- 2300 BC clay tablets
- 1100 BC natural resources and roads
- 800 BC rock formations and ocean currents
- 384-194 BC Aristotle and Eratosthenes
• 100 AD Ptolemy
  • Roman Empire
  • Guide to Geography
  • maps
• 1000 AD al-Idrisi
  • built upon Ptolemy
• 1400 - 1700 AD
  • maps of new lands
1507 Waldseemuller World Map
• Most Expensive map ever sold
• Library of Congress
Modern Mapping

- Aerial Photography
- World War 1
- World War 2
  - Infrared
- Satellites
Modern Mapping

- Global Positioning System
  - Department of Defense
  - Scientific research
  - Automobile navigation
- Geographic Information Systems
  - Computer based
  - Wealth of information
Maps

- Two dimensional representation of the Earth
  - Displays the spatial distribution of selected phenomena
- Shows distance, direction, size and shape
- Maps have limitations
Map Scale

• A map is always smaller than the portion of the Earth it represents
• The ratio of the image on a map to the real world
  • relates a unit on the map to a similar unit on the ground
• Makes it possible to measure distance, area and compare sizes
Types of Scales

• Graphic map scale
  • Line marked off for distance
  • Simple
  • Remains correct when enlarging or shrinking map

• Fractional map scale
  • One unit on the map = X units on the earth
  • 1:63,360
  • Incorrect when map is resized

• Verbal map scale
  • Word scale
  • 1 inch = 125 miles
  • Incorrect when map is resized
Map Essentials

- Maps must contain a few basic components for clarity.
- Title - What is the map of?
- Date - When was the map produced?
- Legend - Explains symbols on map.
- Scale
- Direction - Which way is north?
- Location - System for locating places on the map
Maps must contain a few basic components for clarity:

- **Title**: What is the map of?
- **Date**: When was the map produced?
- **Legend**: Explains symbols on map.
- **Scale**: 
- **Direction**: Which way is north?
- **Location**: System for locating places on the map.

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**Japan (Tohoku) tsunami, March 11, 2011**

**Maximum wave amplitudes**

NOAA Center for Tsunami Research

NOAA Research Product, not an official forecast
Map Projections

• System to transform the spherical surface of the earth onto a flat surface

• Conversion from three dimensional globe to two dimensional flat map causes distortion
  • Distance, direction, area, shape and proximity
  • Always some degree of distortion on flat maps
  • Less distortion the larger the scale map
• Cylindrical projections
  • No distortion at center
  • progressively gets more distorted the further away
• Conical
  • Uses a cone which meets the earth along a parallel of latitude
  • Useful for long east-west map
Mercator: The most famous projection

- 1569 - Gerardus Mercator
- Originally navigational chart
- Relatively undistorted in low latitudes
- Distortion rapidly increases in mid and high latitudes
- Kept shape of land masses in return for distorted size of land masses
- Creates misconceptions
Greenland 800,000 square miles
Africa 11,600,000 square miles
Isolines

- An isoline is a line that connects points of equal value
  - Always closed lines with no ends
  - Represent gradations in a quantity
  - Never cross each other
  - The interval between two isolines is always the same
Time Zones

• Not a problem for small countries
• United States spans 90 degrees of longitude
  • 1870 22 time changes from Maine to San Francisco
• Standard time zones set at 1884 conference
• Daylight Savings Time
  • Extend daylight for evening activities to save energy during war time
  • Number of days under daylight savings has been extended in the past
• Roughly every 15 degrees of longitude is an hour time change