

Topic: Three Norths & Variation

Primary Goal: Explain to students the differences in the three different ways to determine north. From this, they will be able to understand the concept and importance of magnetic declination or variation

Lesson Objectives:

- Understand and Identify the three different norths
- Identify the scenarios in which you could use each of the three norths
- Understand variation and be able to make calculations and solve problems

Lesson Outline:

- I. The Three Norths
 - a. Grid North – refers to the direction northwards along the grid lines of a topographic map
 - i. The difference between grid north and true north is very small and can be ignored for most navigation purposes
 - b. True North
 - i. Top of the earth upon which the world revolves
 - ii. Direction along the earth’s surface towards the North Pole
 - iii. Lines of Longitude connect to the North and South Poles
 - iv. Think of this as the “geographic north”
 - c. Magnetic North
 - i. Where the needle on a magnetic compass points
 - ii. Different from true north because of the magnetic field that is generated by the earth’s molten core
- II. Magnetic North
 - a. Does the magnetic north pole remain in the same location? NO
 - b. Currents in the nickel iron fluid of the outer core create a constantly moving magnetic north
 - c. Magnetic north is constantly changing (*Earth Declination gif*)
 - d. Moves at an average rate of 25 miles/yr
 - e. *Bring in a 3D globe to provide students with a visual of the difference between True and Magnetic North*
- III. Variation
 - a. Also known as “magnetic declination”
 - b. The difference between true north and magnetic north (measured as an angle)
 - c. A compass rose is a tool on a chart used to measure this angle (different in every location)
 - d. Why does this matter? It can mean the difference between a safe course and a hazardous course

- i. Navigating using a magnetic compass without calculating variation can cause *compounding error* that makes a big difference over time
- IV. Variation Calculations**
- a. If a compass at your location is pointing to the right of true north, declination is positive or east, and if it points to the left of true north, declination is negative or west
 - b. When converting True degrees to Magnetic degrees
 - i. “West is Best” (+) & “East is Least” (-)
 - ii. [Magnetic Bearing] = [True Bearing] + [Variation]

Supplemental Resources:

Earth Declination gif:

http://upload.wikimedia.org/wikipedia/commons/4/43/Earth_Magnetic_Field_Declination_from_1590_to_1990.gif

True vs. Magnetic North Video: <https://www.youtube.com/watch?v=ieW7Hzrr8pw>

Navigation Video by *Nautica*: <http://www.nauticalive.com/navigation/>

Exercises/Activities:

Variation worksheet.

Let the students look at charts from different regions of the world so they can see how variation differs and how important it is to check on a chart.