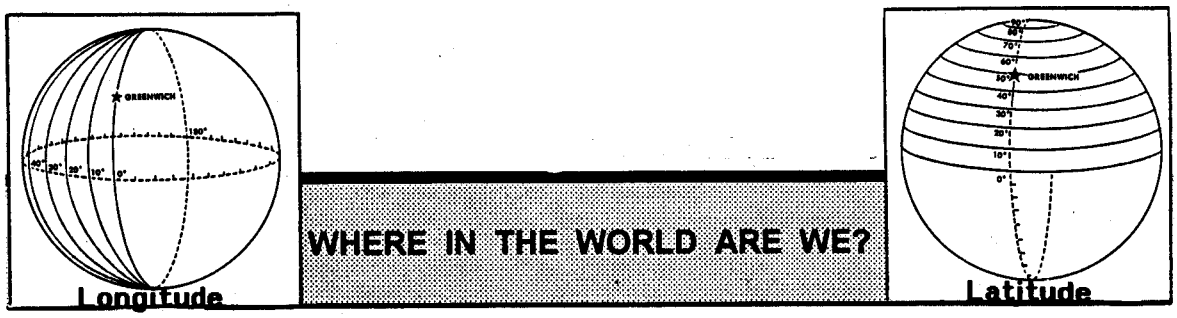


OBJECTIVE

The objective of this activity is to determine your location by using mathematical calculations to find latitude.

BACKGROUND

Knowing where you are on planet Earth is the key to any navigation problem. The early cartographers mapped the Earth by drawing imaginary lines between the two poles, North and South, and by making East and West lines that were parallel to the Equator. The Equator is exactly halfway between the North Pole and the South Pole. Lines parallel to the Equator were given the name "latitude."

Imagine a line that goes from the Equator straight down to the exact center of the Earth. Let this line to be the base of a triangle. Next, let's say you are a student, at the university in Boulder, Colorado, who is standing at a crosswalk on Baseline Road. If an imaginary line from you to the center of the Earth were drawn, it would form an angle with the line that was drawn from the Equator to the center of the Earth. The angle formed would be exactly 40 degrees. So . . . at that crosswalk on Baseline Road, your **latitude** is 40 degrees.

Okay, let's carry it a step further. If you, the college student, started walking east on Baseline Road and went all the way around the Earth, you would come right back to Boulder, Colorado, again. Your imaginary path around the Earth would be parallel to the Equator and no matter what cities you passed through, or what other wonderful places you would see, the latitude is still 40 degrees. That's how latitude works.

As a point of reference, the Equator has a latitude of zero (0) degrees. If a line was drawn from the North Pole to the center of the Earth, it, too, would form an angle with the line that was drawn from the Equator to the center of the Earth. The North Pole is exactly 90 degrees from the Equator – and, for that matter, so is the South Pole. So latitude has not only degrees, but also is defined by being either North latitude or South latitude.

If you draw a line from North Pole to South Pole, you will have a line of longitude. That's relatively easy to see. A line going from the North Pole to the

South Pole passing through a suburb of London, England, is called the Prime Meridian and its mathematically assigned number is zero. The suburb, by the way, is known as Greenwich.

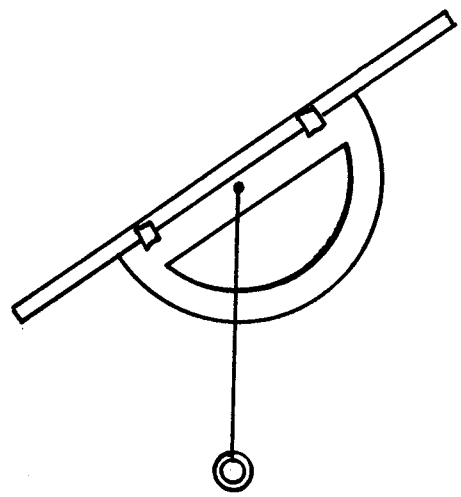
MATERIALS

1. A soda straw from a fast food place will be needed for each cadet or each team of cadets participating in the activity.
2. Each cadet or team will be required to have a plastic protractor.
3. Something that can act as a weight, such as a washer, will be needed.
4. A piece of thread about a foot long should be scrounged up for each team.
5. Cellophane (Scotch-type) tape will be needed to bond some of the parts.

PROCEDURE

1. Tape the straw to the base of the protractor as shown in **40-1**.

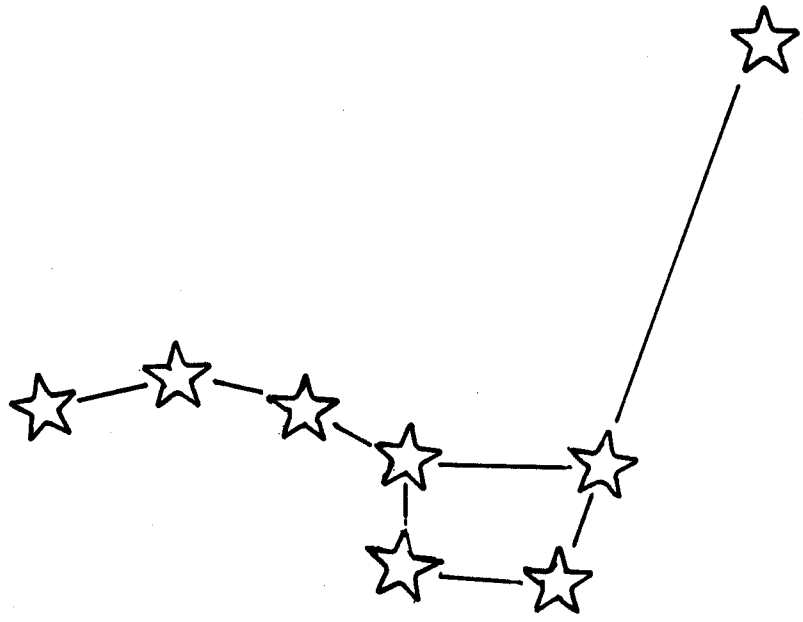
YOUR STARGAZING APPARATUS



40-1

2. Attach the thread to the center of the base of the protractor and attach a washer, nut, or whatever, weight to the other end.
3. The AEO should now take the cadets outdoors to locate the North Star. It can easily be found by following the leading edge of the dipper portion of the Big Dipper constellation straight upward as shown in **40-2.**

LOCATION OF POLARIS, THE NORTH STAR



40-2

4. Have cadets sight through their soda straws at Polaris, the North Star, and hold that position while their team mate reads the angle on the protractor that is under the thread line.
5. The cadets should then switch and let their team mate read the protractor.
6. Using the **conversion table** shown in **40-3**, have them determine the latitude of their location.
7. The cadets can then be brought back in the meeting room and all of the figures obtained are averaged.

DISCUSSION

1. The group could discuss how a sundial works based on these observations.
2. The cadets should research how Polaris was used by early aviators to navigate by night.
3. Interesting question -- when standing on the North Pole of the Earth, in what direction are you looking? Is everywhere south? What direction is up? If you're looking between your feet, how far would it be to the South Pole?

CONVERSION TABLE

READING FROM PROTRACTOR	DEGREES OF LATITUDE
105	15
110	20
115	25
120	30
125	35
130	40
135	45
140	50
145	55
150	60
155	65
160	70
165	75
170	80
175	85
180	90

40-3