North Dakota Night Sky: Dead Reckoning Activity

State Historical Society of North Dakota

Dead Reckoning
Before the 18th century, the primary method of determining longitude was the coolest sounding method, dead reckoning. This is what Columbus and Cabot used on their voyages, and it's still curriculum for pilots worldwide, regardless of whether the aircraft has GPS.

Here's how it works.
- Start with your known location (fix)
- Know your end location (destination)
- Know your speed and direction

Try out this activity and see how well you score.

Dead Reckoning Activity
What you'll need:
Mobile phone or watch
A map
This formula: Distance=Rate x Time

Step 1 Start at a known location. This is called your "fix."

Step 2 Find the distance to a future point. This is your "destination"

Step 3 Predict estimated time of arrival (ETA) to the "destination."
To do this, you'll have to know how fast you walk.

How did you do?

Remember these formulas:
Distance=Speed x Time
Time=Distance/Speed
Speed=Distance/Time

Dead reckoning is the building block of understanding navigation. It can also be prone to problems. For example, a map may not show obstacles, steep grades, or other hazards that might affect your route and speed.

Example instructions:
Outline your map on the grid. Mark your fix in red and your destination in green. If each box represents a **minute**, when will you arrive at your destination?

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Name _____

Instructions

Outline your map on the grid. Mark your fix in red and your destination in green. If each box represents a _____, when will you arrive at your destination?

Remember these formulas:
Distance=Speed x Time
Time=Distance/Speed
Speed=Distance/Time

North Dakota Night Sky: GPS Activity

Where are we?
Mapping requires locating points on earth using geographic coordinates.
These distances can be calculated. Satellites work by keeping time and measuring distance.

GPS Activity
What you'll need:
Pencils
Ruler or Compass (If available)
Atlas, globe, or Google Earth

Step 1 Assign groups to destinations. Examples: Disney World, New York City, etc.

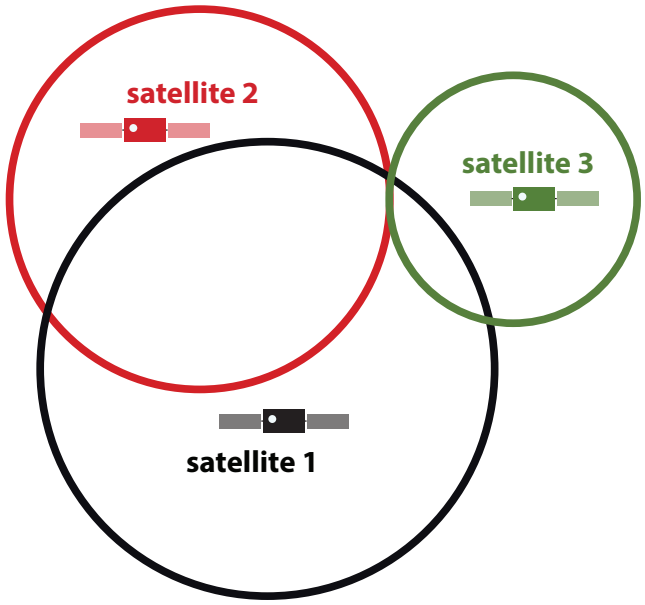
Step 2 Determine your current longitude and latitude.

Step 3 Determine longitude and latitude of your destination.

Example problem:
If you had one friend in **New York** who could tell you were 1,400 miles away,
and another friend in **Los Angeles** who told you that you were 1,300 miles away, and a third friend in **Minneapolis** who told you that you were 400 miles away,
you can triangulate your (mystery) position is in Bismarck, North Dakota.

Your friends act like a GPS satellite. By communicating with each other, the spot where all 3 circles intersect is your location. We call this **trilateration**. Trilateration measures distance, not angles.

Bonus: Would your location be more precise if you had data from 4 or more satellites?
Answer: Yes. GPS works using 24-30 satellites.



North Dakota Night Sky: GPS Activity

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

NAME:_____

Using your atlas, phone, or Google Earth, find the latitudes and longitudes of each of the following cities.

CITY	COUNTRY/STATE	LONGITUDE	LATITUDE
New York	New York		
Philadelphia	Pennsylvania		
Chicago	Illinois		
Kansas City	Kansas		
Austin	Texas		
Los Angeles	California		
Paris	France		
Tokyo	Japan		
Rio de Janeiro	Brazil		
Anchorage	Alaska		
Bombay	India		
Accra	Ghana		
Reykjavik	Iceland		

QUESTIONS:

1. Which of the cities is farthest north?

2. Which of the cities is farthest south?

3. Which of the cities is farthest east?

4. Which of the cities is farthest west?

5. How many miles are there in each degree of latitude?

6. What distance is represented by one minute of latitude (60 minutes for each degree)?

7. What distance is represented by one second of latitude (60 seconds for each minute)?

8. By using your answer to question 5, determine the circumference of Earth.

North Dakota Night Sky: Map Art Activity

State Historical Society of North Dakota

Making maps
You might be a master of measurement, but are you a master communicator? Logos, pictures, and illustrations help people understand logistic information. Use your skills to measure, sketch, and communicate features of your state.

What you'll need:
Pencils, pens, markers
Map of the state

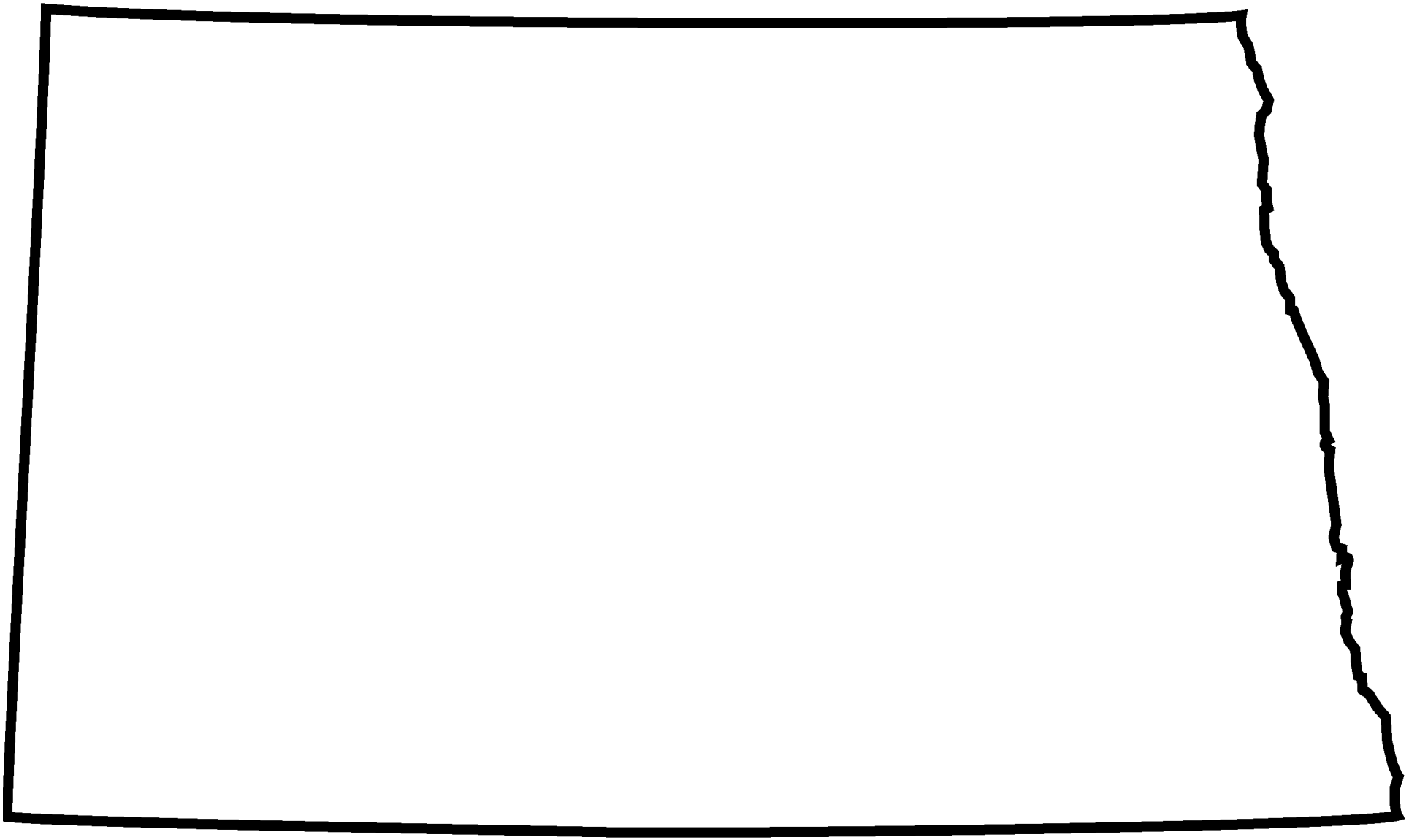
Step 1 Create a map key of icons/colors that identify features on your map.

Step 2 Identify key landmarks of your state. These can be bodies of water, roads, towns, wildlife, features ,or whatever else the map needs to communicate.

How did you do?
Display maps and ask about scale.
Why did you choose these features?
Was the scale to large or small? Why?
Who is the audience for your map?
Do you think your map would be easy or hard for someone to use?
Would the seasons effect how your map might be used?
How do you think you would make a map for Mars?

North Dakota Night Sky: Map Art Activity

Name _____



Key

North Dakota Night Sky: Star Finder Activity

State Historical Society of North Dakota

Finding constellations, planets, and galaxies
Many stars and planets can be viewed with the naked eye. How can you tell the difference between a star and the planet? Becoming familiar with the night sky will help students identify stars, planets, and galaxies. (Hint: planets are not usually represented on star/constellation charts. If you see a bright, star-like object in the night sky and it is not on your chart, it is probably a planet.)

What you'll need:
ND Night Sky 360 video availably at ndstudies.gov/NightSky
Star chart or constellation app

Step 1 Watch the ND Night Sky 360 video.

Step 2 Identify key stars and constellations.

Step 3 Complete worksheet and/or include class discussion

Discussion questions
What stars, constellations, or other things did you find?
How do you think the sky would look 6 months from now?
Name 2 or 3 bright stars in the sky tonight.
Can you see the moon tonight?
Is the moon visiable from anywhere on earth? Even with light pollution? (Yes.)
You can view the constellation Orion all through winter from North Dakota but it is a summer constellation in the Southern Hemisphere. Why?

Traditional stories, perspective, and culture influence mythologies of the night sky. Have younger students create a fact file on a planet, constellation, sun, or moon. Have older students observe and identify how culture and science relate to each other; examples include space themed beauty products today or fins on rockets influenced fins on cars of the 1950s.

North Dakota Night Sky: Star Finder Activity

State Historical Society of North Dakota

Name _____

Use the night sky or the ND Night Sky 360 video to answer the following questions.

1. Name three constellations visible tonight.

_____

2. What is one way of locating the North Star (Polaris.)

_____

_____

_____

3. Draw an interesting constellation you found.

4. What is the name for the band of stars that divides the night sky? (Hint: It's the galaxy you are in.)

_____

5. The big dipper, or plough, is part of another constellation called Ursa Major, a bear. If you were to invent a constellation, what group of stars would it be and how would you explain it to people 2,000 years in the future?

_____

_____

_____