

# GEOGRAPHY

## OVERVIEW

Students will explore the geographic features of Antarctica and create planar and cylindrical map projections of the continent.

## BACKGROUND FOR EDUCATOR

Antarctica is Earth's southernmost continent with landforms that include high plateaus, active volcanoes, and massive ice sheets that cover most of the continent. Early sightings of the continent were made by maritime explorers, whalers, and seal hunters. By the mid-1800s, drawn by trade, imperialism, and/or curiosity, a number of expeditions had braved the icy continent's brutal conditions. As expeditions to this mysterious continent became more frequent, maps became more detailed and accurate.

## BEFORE YOUR VISIT

### Class Discussion: Geography of Antarctica

Call on students to share what they know about the geography of Antarctica. Ask:

- Where is Antarctica?  
*(Answer: It's in the southern hemisphere; the southern most continent.)*
- If you were to compare Antarctica to another country or continent, how big would you say it was?  
*(Answer: about the size of the United States and Mexico combined.)*

Display a topographic map of Antarctica or have students examine one online. (You can view one online at

[maps.grida.no/go/graphic/antarctica-topography-and-bathymetry-topographic-map](http://maps.grida.no/go/graphic/antarctica-topography-and-bathymetry-topographic-map))

Discuss what challenges the continent's location and geography posed for early explorers. Ask:

- On their quests to reach the South Pole what type of terrains would the explorers have encountered?  
*(Answers may include: mountains, glaciers, and the polar plateau.)*

### Activity: Antarctica in Images

[photolibrary.usap.gov](http://photolibrary.usap.gov)

Have students view photographs from the United States Antarctic Program. Have them use what they observe in the photographs to draw conclusions about the geography of the continent.

### Activity: Which Map is the Best Map?

[amnh.org/resources/rfl/pdf/aa\\_a06\\_best\\_map.pdf](http://amnh.org/resources/rfl/pdf/aa_a06_best_map.pdf)

This classroom activity helps students understand the benefits and drawbacks of globes, Mercator maps, and polar map projections. After closely examining all three, students can discuss how a spherical object like Earth is represented on a flat surface. Have students decide which of the three maps is the best to use in Antarctica and why. *(Answer: The polar projection map is the best map to use because it provides an entire view of the continent. The Mercator map and the globe offer only partial views of the Antarctic continent.)*

Mercator map: [amnh.org/resources/rfl/web/antarctica/mercator.html](http://amnh.org/resources/rfl/web/antarctica/mercator.html)

Polar map: [amnh.org/resources/rfl/web/antarctica/polar.html](http://amnh.org/resources/rfl/web/antarctica/polar.html)

## NYS Social Studies Core Curriculum

**Standard 3:** Students will use a variety of intellectual skills to demonstrate their understanding of the geography of the interdependent world in which we live—local, national, and global—including the distribution of people, places, and environments over the Earth's surface.

**Plan how your students will explore *Race to the End of the Earth*.** In the exhibition, students will investigate early maps, globes, and navigation of Antarctica using the **student worksheets**. You might choose to have students work in small groups as they explore the exhibition.

Distribute copies of the student worksheets before coming to the Museum.

## DURING YOUR VISIT

### Race to the End of the Earth Exhibition

#### 4th floor (30–45 minutes)

Have students use their **student worksheets** as they investigate the early maps, globes, and navigation of Antarctica. Students should pay special attention to the longitude and latitude display, the compass interactive, Scott's and Amundsen's planned route to the Pole, and the Antarctica Today map interactive.

**Just beyond the theater, students can “Meet the Men.”** As students go through the exhibition, encourage them to pay close attention to the decisions the British and Norwegian teams made about clothing, transportation, and timing, and to the consequences of those choices.

### Hall of North American Mammals

#### 1st floor (20–30 minutes)

In this hall students can explore the geography of North America. Have each student choose each one of the following dioramas to focus on: the mountain goat, Alaskan brown bear, musk ox, white sheep, Grant caribou, or bighorn sheep. Have them explore the geographic landscapes shown in the dioramas and note keywords used to describe landscapes mentioned in the exhibit text. (*Keywords [with diorama locations] include: glacier [mountain goat and bighorn sheep dioramas], tundra [grant caribou and musk ox dioramas], cirques [Alaskan brown bear diorama], and moraines [white sheep and mountain goat dioramas].*) On the back of their worksheets have them describe the diorama, its location, and its geographical features.

## BACK IN THE CLASSROOM

### Class Discussion: Geography of Antarctica

Discuss with students what they learned during their visit. Ask:

- What challenges did Scott and Amundsen face as they journeyed to the Pole? (*Answers may include: much of their journey was over uncharted territory, geographical features, such as mountains and dangerous terrain (crevasses) slowed them down, they faced extreme cold and wind.*)
- What did these explorers use to navigate? (*Answers may include: They used the Sun's location, along with compasses (which were often inaccurate), sextants, sledge-meters, and chronometers.*)
- What were the advantages and disadvantages of the route Scott chose? (*Answer: Advantage: a previous explorer had chartered most of the Scott's route. Disadvantage: It was a longer route than the one chosen by Admundsen.*)
- What were the advantages and disadvantages of the route Admundsen chose? (*Answer: Advantage: The route was a direct route to the Pole and shorter than Scott's route. Disadvantage: The route was totally uncharted, so Amundsen did not know what he might encounter.*)

### Activity: Geography of North America

Call on students to describe the geography of the dioramas they viewed in the Hall of North American Mammals. Review vocabulary associated with the geographic landscapes (cirque, glacier, moraine, and tundra). Distribute copies of the North America map. Have each student plot the location of each diorama using the following latitude and longitude coordinates:

1. Musk Ox: North Ellesmere Island: 81°N, 72°W
2. Alaskan Brown Bear: Canoe Bay, Alaska Peninsula: 56°N, 163°W
3. Grant Caribou: Sand Point and Tundra of Alaska Peninsula: 60°N, 150°W
4. Mountain Goat: Fords Terror Inlet, Endicott Arm, Alaska: 57°N, 133°W
5. Bighorn Sheep: Jasper Park, Alberta, Canada: 52°N, 118°W
6. White Sheep: Mt. McKinley National Park, Alaska: 63°N, 151°W

As an extension, students can measure the distance between two diorama locations using the map scale. Have them cut out the scale and then fold it along the indicated edges to measure out distance either in miles or in kilometers. Students can confirm their distances in miles with Google Maps enabling 'Latlng' tooltip and marker under Google Map Labs, then using place markers to plot their locations and the distance between them with the Distance Measurement tool.

### Activity: Making Map Projections

[amnh.org/resources/rfl/pdf/aa\\_a07\\_map\\_projection.pdf](http://amnh.org/resources/rfl/pdf/aa_a07_map_projection.pdf)

In this activity students will work in groups to create planar and cylindrical map projections of Antarctica.

**SUGGESTED READINGS**

Let's Talk with Jane Ferrigno about Using GPS in Antarctica  
[amnh.org/resources/rfl/pdf/aa\\_i08\\_ferrigno.pdf](http://amnh.org/resources/rfl/pdf/aa_i08_ferrigno.pdf)

Letters from Stephanie: Maps  
[amnh.org/resources/rfl/pdf/aa\\_ss05\\_maps.pdf](http://amnh.org/resources/rfl/pdf/aa_ss05_maps.pdf)

**ONLINE RESOURCES**

Antarctica: The Farthest Place Close to Home  
[amnh.org/resources/antarctica](http://amnh.org/resources/antarctica)

This award-winning curriculum connects students to the continent's biology and geology, and helps them master important science skills. Easily tailored to your time frame and grade level.

The *Race to the End of the Earth* exhibition follows two explorers, Norway's Roald Amundsen and England's Robert Falcon Scott, as they race to be the first to reach the South Pole. In the exhibition you will investigate the geology of Antarctica, and the maps of this continent and how they changed over time.

**1 Maps of Antarctica**

In the *First Glimpses* section, find the panel titled "Antarctica Imagined" (it's located under two paintings).

On the left side of the panel, you'll find a map from the 1500s titled "TYPVS ORBIS TERRARVM." Compare this map to the modern flat map to the right. How have people's perception of Antarctica changed since the 1500s?




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On the right side of the panel, you'll find a circular map of Earth today. Compare it to the flat map above. Which one do you think is the most accurate, and why?

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Look closely again at the spherical map on the right side of the panel. Locate your home state and mark it on this map.

What is the approximate latitude of where you live?

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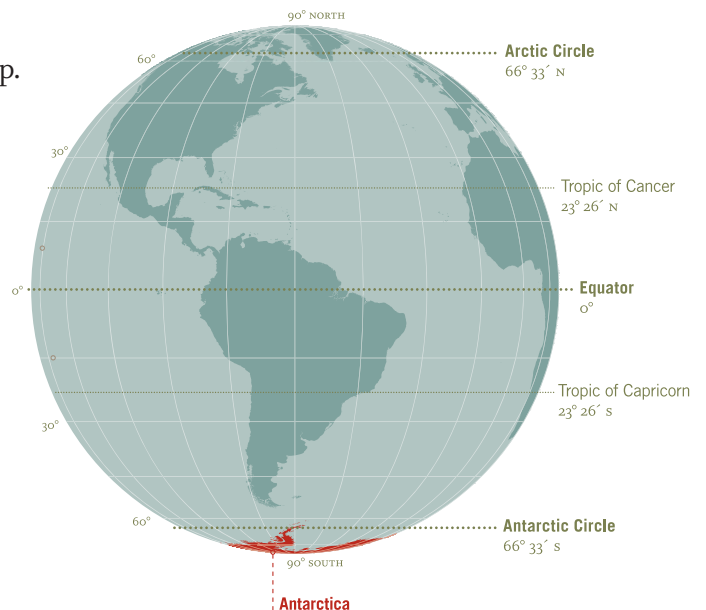
Locate Antarctica on the spherical map. What is its latitude?

How were longitude and latitude helpful to explorers going to Antarctica?

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**2 Quirky Compass**

In the *Two Teams, One Goal* section, locate the compass display.

Slowly slide the compass towards the South Pole. Describe what happens to the compass needle.

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Why do you think the needle behaves this way? \_\_\_\_\_

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**3 Geographic Features**

In the *To the Pole!* section, look for the wall panel that compares “Amundsen’s Polar Team” and “Scott’s Polar Team.” Draw the route of each team on the map to the right.

What geographic features did the teams travel through?

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List other geographic features of Antarctica that you have seen in this exhibition.

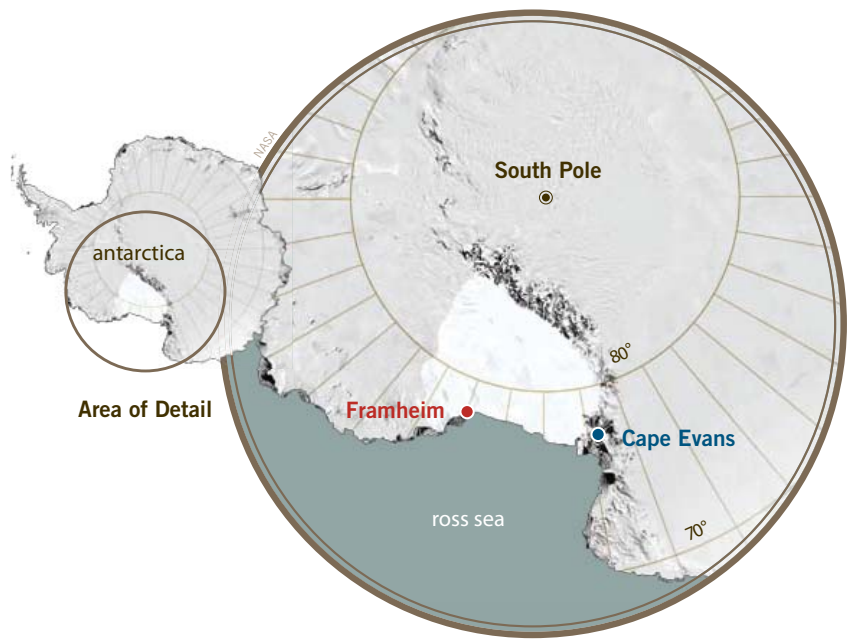
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**4 Antarctica Interactive Map**

In the *Antarctica Today* section, explore the interactive map. List two facts about the continent that are interesting to you.

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ANSWER KEY

The *Race to the End of the Earth* exhibition follows two explorers, Norway’s Roald Amundsen and England’s Robert Falcon Scott, as they race to be the first to reach the South Pole. In the exhibition you will investigate the geology of Antarctica, and the maps of this continent and how they changed over time.

**1** Maps of Antarctica

In the *First Glimpses* section, find the panel titled “Antarctica Imagined” (it’s located under two paintings).

On the left side of the panel, you’ll find a map from the 1500s titled “TYPVS ORBIS TERRARVM.” Compare this map to the modern flat map to the right. How have people’s perception of Antarctica changed since the 1500s?



*(Answers may include: Antarctica is not the huge land that people once thought it to be.)*

On the right side of the panel, you’ll find a circular map of Earth today. Compare it to the flat map above. Which one do you think is the most accurate, and why?

*(Answers may include: A globe provides the most accurate representation of the Earth because it is the same shape – a sphere. Because of its bulkiness a globe is not practical for the many functions for which we require maps. The flat rectangular map projection is only accurate along the equator, and becomes more distorted into the high latitudes and the poles. The circular projection is the most accurate as it is the closest representation to a globe.)*

Look closely again at the spherical map on the right side of the panel. Locate your home state and mark it on this map.

What is the approximate latitude of where you live?

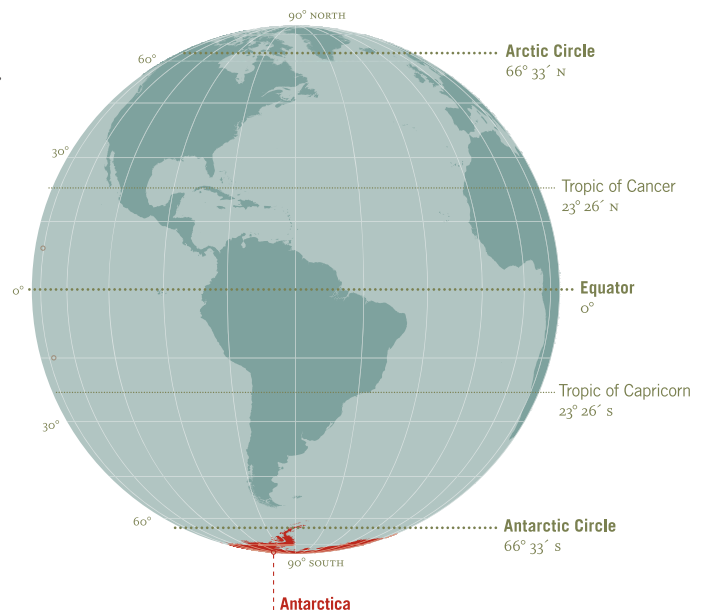
*(Sample Answer: New York 40°N)*

Locate Antarctica on the spherical map. What is its latitude?

*(Answer: 90°S)*

How were longitude and latitude helpful to explorers going to Antarctica?

*(Answer: Using longitude and latitude they could determine when they had reached the South Pole.)*



ANSWER KEY

**2** Quirky Compass

In the *Two Teams, One Goal* section, locate the compass display.

Slowly slide the compass towards the South Pole. Describe what happens to the compass needle.

*(Answer: The compass needle dips steeply down.)*

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Why do you think the needle behaves this way?

*(Answer: In Antarctica, Earth's magnetic field lines curve steeply downward. So a compass needle will dip steeply down, too, instead of pointing north and south.)*

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**3** Geographic Features

In the *To the Pole!* section, look for the wall panel that compares “Amundsen’s Polar Team” and “Scott’s Polar Team.” Draw the route of each team on the map to the right.

What geographic features did the teams travel through?

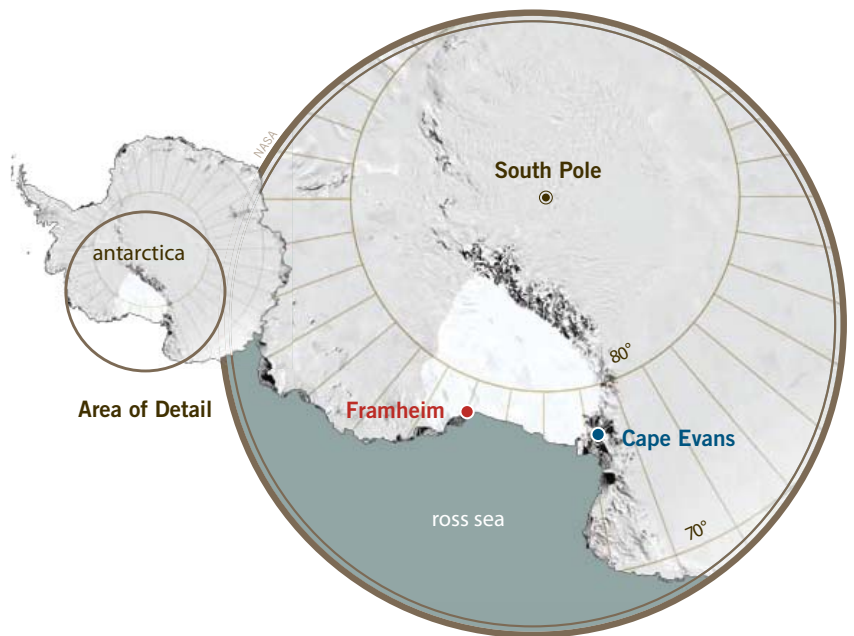
*(Answers include: ice shelf, mountains, ice sheets.)*

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List other geographic features of Antarctica that you have seen in this exhibition.

*(Answers may include: glaciers, icebergs, sea ice, ghost mountains – the Gamburtseys – completely buried under the ice Lake Vostok – the largest of Antarctica’s under ice lakes)*

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**4** Antarctica Interactive Map

In the *Antarctica Today* section, explore the interactive map. List two facts about the continent that are interesting to you.

*(Answers will vary; for example: Katabatic winds: These ferocious winds occur when dense frigid air builds up on the polar plateau.*

*As the air spills over the plateau it gathers speed like an avalanche as it races towards the coastline. The Gamburtseys, a whole mountain range that is completely buried under the ice.)*

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# MIDDLE SCHOOL

Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
LE 4	3.2b: Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to permit its survival. Extinction of species is common. Fossils are evidence that a great variety of species existed in the past.								●
	3.2c: Many thousands of layers of sedimentary rock provide evidence for the long history of Earth and for the long history of changing life forms whose remains are found in the rocks. Recently deposited rock layers are more likely to contain fossils resembling existing species.							○	●
	5.1g: The survival of an organism depends on its ability to sense and respond to its external environment.						○	○	
	5.1a: Animals and plants have a great variety of body plans and internal structures that contribute to their ability to maintain a balanced condition.	○				○			●
	5.1b: An organism's overall body plan and its environment determine the way that the organism carries out the life processes.	○				○			●
	5.1f: Regulation of an organism's internal environment involves sensing the internal environment and changing physiological activities to keep conditions within the range required for survival. Regulation includes a variety of nervous and hormonal feedback systems.								●
	5.1g: The survival of an organism depends on its ability to sense and respond to its external environment.						○	○	
	5.2b: Foods contain a variety of substances, which include carbohydrates, fats, vitamins, proteins, minerals, and water. Each substance is vital to the survival of the organism.						●		
	5.2d: Energy in foods is measured in Calories. The total caloric value of each type of food varies. The number of Calories a person requires varies from person to person.						●		
	5.2e: In order to maintain a balanced state, all organisms have a minimum daily intake of each type of nutrient based on species, size, age, sex, activity, etc. An imbalance in any of the nutrients might result in weight gain, weight loss, or a diseased state.						●		
6.1b: Food webs identify feeding relationships among producers, consumers, and decomposers in an ecosystem.								●	



PS 4	1.1f: The latitude/longitude coordinate system and our system of time are based on celestial observations.		●		●				
	1.1i: The tilt of Earth's axis of rotation and the revolution of Earth around the Sun cause seasons on Earth. The length of daylight varies depending on latitude and season.				●				
	2.1f: Fossils are usually found in sedimentary rocks. Fossils can be used to study past climates and environments.								●
	2.2d: Continents fitting together like puzzle parts and fossil correlations provided initial evidence that continents were once together.								●
	2.2e: The Theory of Plate Tectonics explains how the "solid" lithosphere consists of a series of plates that "float" on the partially molten section of the mantle. Convection cells within the mantle may be the driving force for the movement of the plates.								●
	2.2m: Most local weather condition changes are caused by movement of air masses.								○
	2.2n: The movement of air masses is determined by prevailing winds and upper air currents.								○
	3.1a: Substances have characteristic properties. Some of these properties include color, odor, phase at room temperature, density, solubility, heat and electrical conductivity, hardness, and boiling and freezing points.					●			
	3.1h: Density can be described as the amount of matter that is in a given amount of space. If two objects have equal volume, but one has more mass, the one with more mass is denser .					●			
PS 7	Connections: The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.		●	●	●	●			
	Strategies: Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.		●	●	●	●			

# Race to the End of the Earth • New York State Social Studies Core Curriculum

**KEY:** LE = Living Environment  
PS = Physical Setting

● = Content alignment addressed in-depth in exhibition section  
○ = Content alignment addressed in some depth in exhibition section

## ELEMENTARY SCHOOL

Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
2: World History	2.1a: Read historical narratives, myths, legends, biographies, and autobiographies to learn about how historical figures lived, their motivations, hopes, fears, strengths, and weaknesses.		●	●	●	●	●		
	2.2d: Compare important events and accomplishments from different time periods in world history		●	●	●	●	●		●
	2.3a: Understand the roles and contributions of individuals and groups to social, political, economic, cultural, scientific, technological, and religious practices and activities.		●	●	●	●	●	●	
	2.4c: View historic events through the eyes of those who were there, as shown in their art, writings, music, and artifacts.		●	●	●	●	●		
3: Geography	3.1c: Locate places within the local community, State, and nation; locate the Earth's continents in relation to each other and to principal parallels and meridians		●	●	○				●
	3.2a: Ask geographic questions about where places are located; why they are located where they are; what is important about their locations; and how their locations are related to the location of other people and places.	●	●	●					

## MIDDLE SCHOOL

Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
2: World History	2.1c: Interpret and analyze documents and artifacts related to significant developments and events in world history		●	●	●	●	●		
	2.4a: Explain the literal meaning of a historical passage or primary source document, identifying who was involved, what happened, where it happened, what events led up to these developments, and what consequences or outcomes followed.		●	●	●	●	●		
	2.4c: View history through the eyes of those who witnessed key events and developments in world history by analyzing their literature, diary accounts, letters, artifacts, art, music, architectural drawings, and other documents		●	●	●	●	●	●	

3: Geography	3.1a: Map information about people, places, and environments		•	•	o				•
	3.1b: understand the characteristics, functions, and applications of maps, globes, aerial and other photographs, satellite-produced images, and models		•	•	o				•

## HIGH SCHOOL

Standard	Major Understandings	Introduction	First Glimpses	The Race Begins	Two Teams: One Goal	To the Pole!	Back from the Pole	Aftermath	Antarctica Today
2: World History	2.2c: Analyze evidence critically and demonstrate an understanding of how circumstances of time and place influence perspective		•	•	•	•	•		
	2.4b: Interpret and analyze documents and artifacts related to significant developments and events in world history		•	•	•	•	•		
3: Geography	3.1a: Understand how to develop and use maps and other graphic representations to display geographic issues, problems, and questions		•	•	o				•
	3.1b: Describe the physical characteristics of the Earth's surface and investigate the continual reshaping of the surface by physical processes and human activities			•					•
	3.1e: Analyze how the forces of cooperation and conflict among people influence the division and control of the Earth's surface								•