

## Module 1, Lesson 2

# *Magellan crosses the Pacific Ocean*

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### Lesson overview

Students will follow the path of Ferdinand Magellan and his crew on the second half of their circumnavigation of the globe—from the west coast of South America, across the Pacific Ocean to the Spice Islands, and back to Spain. As they explore the world map, students will identify locations along Magellan’s route using latitude and longitude values, measure distances between stops. Based on their exploration of the world map, students will answer questions about what Magellan’s expedition accomplished.

While lesson 1 and lesson 2 can be done independently, students would benefit from doing both lessons sequentially.

### Estimated time

Two 45-minute class periods

### Materials

The student activity can be found at <http://esri.com/geoinquiries>.

Student activity: TS\_M1L2\_StudentDirections.pdf

### Objectives

After completing the lesson, a student is able to do the following:

- Locate places on a world map
- Identify major lines of latitude and longitude
- Use cardinal directions to navigate from one place to another
- Recognize the difference between small-scale and large-scale maps

### GIS Tools and Functions

- Open a map file
- Zoom to the geographic extent of a layer
- Zoom out to see more of the map (less detail)
- Measure distance on the map
- Compare 2D and 3D maps

## National Geography Standards

Standard	K-4	5-8
<b>1</b> How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information	The characteristics and purposes of geographic representations—such as maps, globes, graphs, diagrams, aerial and other photographs, and satellite-produced images	The characteristics, functions, and applications of maps, globes, aerial and other photographs, satellite-produced images, and models
<b>2</b> How to use mental maps to organize information about people, places, and environments	The location of Earth's continents and oceans in relation to each other and to principal parallels and meridians	How perception influences people's mental maps and attitudes about places
<b>3</b> How to analyze the spatial organization of people, places, and environments on Earth's surface	The spatial concepts of location, distance, direction, scale, movement, and region	How to use spatial concepts to explain spatial structure
<b>17</b> How to apply geography to interpret the past	How places and geographic contexts change over time	How people's differing perceptions of places, peoples, and resources have affected events and conditions of the past

## Teaching the lesson

### Introducing the lesson

Begin this lesson by reviewing these concepts:

- The major lines of latitude and longitude (e.g., Equator, Prime Meridian Tropic of Cancer, Arctic Circle) and how they are used to divide the world into hemispheres and zones
- How latitude and longitude are used to locate features precisely on the earth and on a map
- What is the difference between a 2D and 3D map
- The importance of Magellan's circumnavigation and what it proved about the world
- How the Spanish and the Portuguese divided the world between them

### Student activity

We recommend that you complete this lesson yourself before completing it with students. This will allow you to modify the activity to accommodate the specific needs of your students.

### Teacher Notes

- For younger grades, you can conduct the GIS activity as a teacher-led activity in which students follow along. You can lead students through the GIS steps and ask them the

associated questions as a class.

- Ideally each student will have access to a computer, but students can complete the activities in groups or under the direction of a teacher.
- Throughout the GIS activity, students are presented with questions. The GIS activity sheets are designed so that students can mark their answers directly on these sheets. Alternatively, you can create a separate answer sheet.
- We recommend that students save their work as they progress through the GIS activity. Students can use either the Save command (to save their changes to the original map) or the Save As command (to save their changes to a new map). Please explain to students where and how they should save their work.

The following are things to look for while students are working on this lesson:

- As students work through the steps, are they focusing on the underlying geographic concepts (e.g., What are the spatial relationships between continents? How do major lines of latitude and longitude help us locate places on the earth?).
- Are students answering the questions in the GIS activity as they work through the steps?
- Are students able to use the legends to interpret the map layers?
- Are students aware of changes in scale as they zoom in and out on the map?
- Are students able to switch between browser tabs to use the 2D and 3D maps?

### Concluding the lesson

- Engage students in a discussion about the observations and discoveries they made during their exploration of the world map.
- Ask students about their impressions of Magellan and his circumnavigation.
- Ask students to compare their experience working with a flat map of the world to their experience working with a map that looks like a globe.
- Has this activity raised any questions that students would like to explore further?
- How can GIS help students to learn about world explorers and their discoveries?
- Has this activity changed students' ideas about maps?

### Extending the lesson

- Have students research other circumnavigations and why Magellan's voyage was so important.
- Students can research the treaties between the Spanish and the Portuguese in the fifteenth and sixteenth centuries and how the line of demarcation changed over time.
- Have students research the navigation equipment that Magellan used during his voyage.
- Ask students to pretend they are planning a circumnavigation. Using information from the GIS map, from books, and the Internet, have students write a description of the route they would take and the stops they would make along the way.

## References

- [http://www.ucalgary.ca/applied\\_history/tutor/eurvoya/](http://www.ucalgary.ca/applied_history/tutor/eurvoya/)
- <http://www.nationalgeographic.com/volvooceanrace/geofiles/01/index.html>
- <http://www.expedition360.com/home/circumnavigation.htm>

## Student activity answer key

*Answers appear in blue.*

### Module 1, Lesson 2

## ***Magellan crosses the Pacific Ocean***

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Ferdinand Magellan was the first European explorer to reach the Pacific Ocean by crossing the Atlantic Ocean when his expedition sailed through an opening, or strait, near the tip of South America in 1520. He named the ocean Mar Pacifico, which means peaceful sea. The strait, which connected the Atlantic and Pacific oceans, was later named for him.


At that point in his journey, Magellan and his fleet had been at sea for more than a year. He had lost two of his five ships. Now he would cross the Pacific Ocean with three ships, looking for the coast of Asia and the Spice Islands. However, he had no idea the Pacific Ocean would be so big!

#### Task 1: Open the map

#### Task 2: Enlarge the ArcGIS Online window

#### Task 3: Follow Magellan on his Pacific voyage

 **Q1: What stop number is at this location?** *Stop 8*

 **Q2: Is this location east or west of the Prime Meridian?**

*a. East*

*b. West*


 **Q3: Is this location north or south of the Equator?)**

*a. North*

*b. South*


 **Q4: What is the name of the island at this stop?** *P U K A P U K A*

#### Task 4: They left the island on January 28, 1521, and sailed onward

 **Q5: What happened to your map? Describe the changes in your own words.** *The map changed from flat (like a rectangle) to round (like a globe). The map is centered on the Pacific Ocean. The surface of the map appears curved.*

**Step 5: Magellan's route missed most of the Pacific islands where he could have found food**

 **Q6: What is the name of this stop? (Hint: Click on the stop and read the name in the popup.)** *Guam*

 **Q7: Look at the information in the Measure window. What distance did Magellan travel on his voyage from South America to Asia? (Hint: Use the in the Measurement Results window.) Write the answer here:** *8,064.677 nm (Answers will vary depending on placement of the mouse pointer)*

**Task 5: Magellan decided to sail to the Philippines instead of the Spice Islands (Moluccas)**


 **Q8: How did your map change? (Circle all the correct answers.)**


- a. The map shows more detail (larger scale).*
- b. The map shows less detail (smaller scale).*
- c. The map shows a bigger area.*
- d. The map shows a smaller area.*

 **Q9: What is the name of the island at Stop 10? (Click on the Stop 10 star.)**  
*Homonhon, Philippines*

**Task 7: Magellan further explored the Philippine Islands, from Stop 10 to Stop 11.**

 **Q10: What is the name of the island at Stop 11? (Hint: Click on the star.)**  
*Cebu, Philippines*


 **Q11: What happened to your map? Describe the changes in your own words?**  
*The globe turned toward the east (to the right). The map is now centered on the Indian Ocean instead of the Pacific Ocean. The surface of the map still appears curved.*

 **Q12: What ocean did they cross on their way back to Spain? (Circle the correct answers.)**

- a. Pacific Ocean*
- b. Indian Ocean*
- c. Atlantic Ocean*
- d. Arctic Ocean*

 **Q13:** Look at the length measurement to find out the distance from the Spice Islands to Africa.

Write it here: **6, 3 0 3.2 6 1 nm** (Answers will vary depending on placement of the mouse point)

 **Q14:** Compare your measurement in Q7 (across the Pacific Ocean) with the measurement you just made (across the Indian Ocean). Which ocean is the greatest distance across? (Circle the correct answer.)


- a. Indian Ocean
- b. Pacific Ocean

## Task 8: Heading for home


 **Q15:** What is the name of this cape? **Cape of Good Hope**

 **Q16:** Which stop represents the Cape Verde Islands?


- a. Stop 13
- b. Stop 3
- c. Stop 2
- d. Stop 1

 **Q17:** Which major lines of latitude did they cross on their way to this stop from the tip of Africa? (Circle all the correct answers.)

- a. Antarctic Circle
- b. Tropic of Capricorn
- c. Equator
- d. Tropic of Cancer
- e. Arctic Circle

 **Q18:** Which major line of latitude did they cross on their way from Stop 2 to their final destination? (Circle the correct answer.)

- a. Antarctic Circle
- b. Tropic of Capricorn
- c. Equator
- d. Tropic of Cancer
- e. Arctic Circle

 **Q19: Write a short paragraph explaining what Magellan's expedition accomplished after leaving the South American continent. (Hint: What bodies of water and what major lines of latitude did the expedition cross? What continents and islands did the expedition visit?)**

*After leaving the west coast of South America, the expedition accomplished the following:*

- *Crossed the Pacific, Indian, and Atlantic oceans*
- *Crossed the Tropic of Capricorn and the Equator four times*
- *Visited the continent of Asia*
- *Sailed around the southern tip of Africa (Cape of Good Hope)*
- *Visited the islands of Pukapuka, Guam, The Philippines, and the Spice Islands*

## **Task 9: Conclusion and save your work**