Coordinate Systems
Life Connection

Grade Level and Content

Geometry, 9th or 10th Grade Mathematics

Big Idea

Students will read about coordinate systems to reinforce the vocabulary they will need to know for the unit. Students will read about a real-life application of coordinate systems and compare and contrast the geographic system with the one we will use in class.

Objectives

Students will be able to …

1. Correctly define key terms using words and/or illustrations.
2. Adequately demonstrate an understanding of the real-life applications of coordinate planes.
3. Correctly recognize the similarities between the Cartesian and geographic coordinate systems.

PA State Standards

2.5.G.B (Geometry Communication) which states, "Use symbols, mathematical terminology, standard notation, mathematical rules, graphing, and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results."

Common Core State Standards

From section "Reading Standards for Literacy in Science and Technical Subjects 6–12" (p. 62) of the *Common Core State Standards for ENGLISH LANGUAGE ARTS & Literacy in History/Social Studies, Science, and Technical Subjects*, states the following standards:

- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).

Rationale for Students

Students will be interested in this lesson because it is highly visual and interactive and because they will make a connection between what they are learning and real-life. Students collaborate to understand and to compare and contrast coordinate systems.

Materials

- 1 SMART™ Board with computer and projector
- 25 copies each: Crossword Puzzle worksheet, Coordinate Systems reading, Geographic Coordinate System prediction guide, and Coordinate Systems Comparison Matrix
- 5 copies each: Vocabulary Illustration worksheets

Adaptations for Special Needs

The vocabulary illustration worksheet will assist ELL students in learning the vocabulary. It provides space for students to draw and write examples or definitions.

The reading material includes key terms in bold so ELL students can easily find each word as they complete the vocabulary illustration.

The prediction guide will assist ELL students and learning support students in comprehending the material. This exercise provides students with preparation for reading, assistance during reading, and reflection after reading.

The comparison matrix will aid ELL students and learning support students in organizing the higher level concepts.

Technology

The SMART Board will be used to present the lesson. The SMART Board enables the teacher and the students to work out solutions together. The PowerPoint presentation will be posted on the class website with automated animations and voice recordings to allow students receiving learning support, ELL, and/or disability services to review the lesson at home.

Anticipatory Set 5 minutes, 5 minutes

FIRST SLIDE (OCEAN IMAGE)

SCENARIO/QUESTION

You are stranded in the middle of the ocean. You have a raft but no food or water. The sun is high and hot.

What would make it possible for someone to find you and rescue you?

5 lines

If you're stranded in the middle of the ocean, what would make it possible for someone to rescue you?

- ✓ Knowing your exact location (latitude and longitude)

Think about your house. When someone is looking for your house, what do you give them?

- ✓ Directions, address

Your address is the location of your house. To find you, people need your exact location, which is indicated by your street and house number. You wouldn't have a house number and street in the ocean, but you will have an exact location. If you could tell someone that location, they could find you. Today we are going to talk about the system that makes that possible.

Procedure 35 minutes, 40 minutes

COORDINATE SYSTEMS PACKET

Vocabulary Preview with Partners

CROSS WORD PUZZLE: COORDINATE SYSTEMS

Reading

🗎 READING: COORDINATE SYSTEMS

🕮 *Student reads Coordinate Systems section*

Vocabulary Answers and Additional Class Discussion

Across

1. The geographic coordinate system involves a grid and axes based on angles of arc of a great circle.
6. Descartes was the French philosopher who developed the idea of using points on a coordinate grid to describe geometric figures.

Down

2. The Cartesian coordinate system was named after Descartes.
3. The coordinate plane along with the process of graphing and locating points on the coordinate plane is called a coordinate system.
4. All coordinate systems use a grid and axes to locate points.
5. The Cartesian coordinate system is based on a rectangular grid.

What is the coordinate system that we constructed yesterday?

- ✓ Cartesian, rectangular

Why do we call it a rectangular system?

- ✓ It uses a rectangular grid

Why do we call it a Cartesian system?

- ✓ The idea of using points to represent geometric shapes originated with René Des***cart***es

What is another kind of coordinate system?

- ✓ Geographic coordinate system

The Earth is divided into a grid and labeled, much like the Cartesian coordinate system. This geographic grid enables us to locate specific locations on the Earth. If we know the coordinates of a stranded person or lost ship, we can find the person or ship.

Directed Reading—Thinking Activity and Collaboration

🗎 PREDICTION GUIDE: GEOGRAPHIC COORDINATE SYSTEM

🗎 READING: GEOGRAPHIC COORDINATE SYSTEM

Previewing with Partners

Look at the illustration and the titles to preview the material.

Decision Making

After previewing, write notes in the "What I Know after Previewing" column. Consider what you need to learn.

Writing

Look at your Questioning Bookmark and write down some questions. Think about what we did yesterday and consider in what ways the Cartesian and geographic coordinate systems could be compared. Write your questions in the "What I Would Like to Know" column.

Reading

📖 *Students read Geographic Coordinate System section in their groups*

As you read, underline or highlight what you think is important. Write notes in the "Interesting or Important Concepts from My Reading" column.

Reflecting

Write the answers to your questions in the "What I know after the Reading" column.

Write questions that were not answered in the "What I still would like to know" column.

Class Discussion

COMPARE AND CONTRAST

COORDINATE SYSTEMS COMPARISON MATRIX

(Write "Cartesian" and "Geographic" on the whiteboard.)

Look at the Cartesian coordinate system you constructed and labeled yesterday. Now look at the geographic coordinate system on today's reading. How are these coordinate systems similar? Write your thoughts on the board. As students write their ideas on the board, you can write notes on your worksheet.

- ✓ Both systems use a grid
- ✓ Both systems use number lines to provide way for determining coordinates and thus locating or graphing points
- ✓ They both have an origin
- ✓ They both have coordinates for locating points

How are they different? What are the grids like?

- ✓ The geographic grid is not made of squares / the Cartesian grid is made of squares

Our coordinate system is a rectangular coordinate system while latitude and longitude make up a geographic coordinate system based on the angles of arc on a sphere.

- ✓ The horizontal line on the Cartesian system is the x-axis while the horizontal line on the geographic system is the Equator.

- ✓ The vertical line on the Cartesian system is the y-axis while the vertical line on the geographic system is the Prime Meridian.
- ✓ The Cartesian system uses counting numbers while the other uses angles of arc.
- ✓ The origin on Cartesian system is (0, 0). The origin on the geographic system is 0° longitude and 0° latitude
- ✓ The coordinates in the Cartesian system are called the x-coordinate and y-coordinate while the coordinates in the geographic system are called longitude (x-coordinate) and latitude(y-coordinate).

Closing 5 minute, 45 minutes

What are some other real life uses for a coordinate system? How do coordinate systems help people in their careers or everyday life?

- ✓ Football field, grocery store, seating chart, calendar, 2-D table of values, pixels on a computer screen, archeological digs, etc.

Student Evaluation

EXIT TICKET

Homework

Your unit project will be to create a city, amusement park, store, or anything that has locations and structures or objects within those locations. You will layout your "city" on poster board and create a coordinate system around it. There will be other requirements that I will tell you later. Tonight, begin thinking about what you will do for this project.