

The Monumental Pyramids of Egypt and the Pythagorean Theorem

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Grade Level 8
Duration 2 class periods

National Standards

GEOGRAPHY
Element 2:
Places and Regions
 4. The physical and human characteristics of places
Element Five:
Environment and Society
 14. How human actions modify the physical environment

AZ Standards

ELA
Reading
Key Ideas and Details
 8.RI.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

MATHEMATICS
Geometry
 8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two and three dimensions.

SCIENCE
Core Ideas for Using Science
 U 1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

Arizona Social Science Standards

Geography
The use of geographic representations and tools helps individuals understand their world.
 8.G1.1 Use geographic tools and representations to analyze historical and modern political and economic issues and events. Key tools and representations such as maps, globes, aerial and other photos, remotely sensed images, tables, graphs, and geospatial technology
Human-environment interactions are essential aspects of human life in all societies.
 8.G2.2 Evaluate how political, social, and economic decisions throughout time have influenced cultural and environmental characteristics of various places and regions.

SIOP Elements

Preparation Adapting content Linking to background Linking to past learning Strategies used	Scaffolding Modeling Guided practice Independent practice Comprehensible input	Grouping Option Whole class Small groups Partners Independent
Integrating Processes Reading Writing Speaking Listening	Application Hands on Meaningful Linked to objectives Promotes engagement	Assessment Individual Group Written Oral

Arizona English Language Proficiency Standards

The Monumental Pyramids of Egypt and the Pythagorean Theorem

Grade 6-8

Basic

Listening and Reading

Standard 1 By the end of each language proficiency level, an English learner can construct meaning from oral presentations and literary and informational text through grade appropriate listening, reading, and viewing.

B-2: recount specific details and information in a variety of texts.

Listening, Speaking, Reading, and Writing

Standard 6 By the end of each language proficiency level, an English learner can participate in grade-appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.

B-5: contribute relevant information and evidence to collaborative oral and written discussions.

Standard 7 By the end of each language proficiency level, an English learner can conduct research and evaluate and communicate findings to answer questions or solve problems.

B-1: gather information from multiple provided resources to answer questions.

B-2: paraphrase observations/information notes with labeled illustrations, diagrams, or other graphics, as appropriate.

Overview

Several ancient cultures around the world have created pyramids but the best-known ones are perhaps the Egyptian pyramids. These pyramids were a monumental engineering feat, and students should know how they were constructed and how does math play a part in the story of the pyramids.

Purpose

In this lesson students will use various resources to analyze the strategies that ancient Egyptians might have used in building the huge pyramids and the impact of building these pyramids on daily life and the landscape. Students will also learn and apply the Pythagorean Theorem to calculate the missing side of a right triangle.

Key Vocabulary

exert: apply force to something

intact: something is still whole not damaged

technique: a special way of doing something

Materials

- Venn Diagram Graphic Organizer
- Monumental Pyramids images
- Projection device/computer/Internet
- How Did Pyramids Affect People's Lives in Ancient Egypt?
<https://classroom.synonym.com/did-pyramids-affect-peoples-lives-ancient-egypt-9926.html>
- How the Pyramids Were Built reading

<https://www.thegreatcoursesdaily.com/how-did-egyptians-build-the-pyramids/>

- We May Finally Know How the Pyramids Were Built
<https://www.discovery.com/exploration/how-the-pyramids-were-built>
- 3D models of pyramids
- Pythagorean Theorem—Egyptian Pyramids video (1.20 min) <https://pythagoreantheorem-pyramids.tumblr.com/>
- Math Interactives video: Shape and Space: Pythagoras (1.09 min)
https://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.PYTH&lesson=html/video_interactives/pythagoras/pythagorasSmall.html
- Pythagorean Theorem Inquiry
- Pythagorean Theorem Water Demo video (1.04 min)
<https://www.youtube.com/watch?v=CAkMUdeB06o>
- Pythagorean Theorem Practice and Vocabulary Practice
- Anchor Chart
- Independent or Group Practice and Answer Key
- Vocabulary Quiz

Objectives

The student will be able to:

- Locate countries on a world map.
- Cite the possible strategies used in building huge pyramids of Egypt.
- Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two and three dimensions.

The Monumental Pyramids of Egypt and the Pythagorean Theorem

- Explain the impact of building of pyramids on the daily life of ancient Egyptians and on the physical landscape.

Procedures

Prerequisite Knowledge: Students know how to calculate squares and square roots.

SESSION ONE:

Engage:

1. Distribute the Venn Diagram Graphic Organizer. Project the images labeled Monumental Pyramids. In a pair/share have students describe and compare the two pictures using the Venn Diagram. Have the students identify which picture is of an Egyptian Pyramid (Image Two) and which one is Chichen Itza from Mexico (Image One). **(Preparation: Linking to background)**
2. Have students locate these places (Egypt and Mexico) on the world map by drawing a triangle in these two countries.
3. Ask if students know of any pyramids in other part of the world (Cambodia, China, Iraq, Sudan, Java—Indonesia, Guatemala, Italy, Peru, etc.). Have students locate and identify these countries on the map with additional triangles. **(Grouping Option: Small groups, Integrating Processes: Listening, Writing, Reading)**

Explore:

4. Pose the question: What strategies do you think ancient Egyptians used to build those pyramids? Provide the sentence starter: I think ancient Egyptians used _____. Record their ideas on the whiteboard. **(Preparation: Strategies used, Grouping Option: Whole class)**
5. Project YouTubevideo- Building the Pyramids (3.04 min)
<https://www.youtube.com/watch?v=Tc2M2RmdJAg>
6. Instruct students to watch the video and look for any strategies that might have been used in building the pyramids. Give students the sentence starter: From the video, I learned that _____ might have been used in building the pyramids. **(Preparation: Adapting content)**
7. Have students predict how the building of pyramids might have affected the lives of the Egyptians. **(Preparation: Linking to past learning)**

Explain:

8. Project or have students access How Did Pyramids Affect People's Lives in Ancient Egypt? <https://classroom.synonym.com/did->

[pyramids-affect-peoples-lives-ancient-egypt-9926.html](https://www.thegreatcoursesdaily.com/how-did-egyptians-build-the-pyramids/) and distribute the Reading

Worksheets. Have students read the article, complete that part of the worksheet, and then share their answers with the class. Randomly call on students and have them use the sentence starter: In the article we found the impact of building pyramids on people was _____.

(Preparation: Adapting content;

Application: Promotes engagement and Linked to objectives; Integrated Processes: Reading, Writing, Speaking)

9. Project the Vocabulary Cards for exert, intact, and technique. Discuss the terms. **(Scaffolding: Comprehensible input)**
10. Project or have students access How Did Egyptian Build the Pyramids? <https://www.thegreatcoursesdaily.com/how-did-egyptians-build-the-pyramids/> and We May Finally Know How the Pyramids Were Built <https://www.discovery.com/exploration/how-the-pyramids-were-built> Have students read the articles individually or as a whole class, complete that part of the worksheet, and then share their answers with the class. Randomly call on students and have them use the sentence starter: In the article it says that one of the techniques used in building the pyramids might have been _____. **(Preparation: Adapting content; Application: Promotes engagement and Linked to objectives; Integrated Processes: Reading, Writing, Speaking)**

SESSION TWO

Elaborate:

11. Divide students into groups of four. Provide each group with a concrete 3D model of a geometrical pyramid. Have students examine the shape of pyramid and determine the mathematical shapes they see. Randomly call on students and have them use the sentence starter: Some of the shapes we saw were _____. **(Preparation: Adapting content and Past learning; Application: Promotes engagement and Linked to objectives)**
12. List the shapes that students shared on the whiteboard. Lead a discussion about triangles--types of triangles and then specifically right triangles. **(Preparation: Linking to past learning)**
13. Project video Pythagorean Theorem—Egyptian Pyramids (1.20 min only)
<https://pythagoreantheorem-pyramids.tumblr.com/> and project How did they create the pyramids? Discuss how the rope and knots could be materials already in their

The Monumental Pyramids of Egypt and the Pythagorean Theorem

environment and used for measuring accurately.

(Scaffolding: Comprehensible input)

14. Project Math Interactives video: Shape and Space: Pythagoras (1.09 min) to see a real-world application of the theorem.
https://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.PYTH&lesson=html/video_interactives/pythagoras/pythagorasSmall.html
15. Distribute or project the Pythagorean Theorem Inquiry. Have the groups of four write their observations on the whiteboard or on the paper.
(Grouping options: Small group)
16. Project Pythagorean Theorem Water Demo video to understand how the Pythagorean Theorem works for right triangles. (1.04 min)
<https://www.youtube.com/watch?v=CAkMUdeB06o> **(Application: Linked to objectives)**
17. Review the definitions for right triangle, hypotenuse, and Pythagorean Theorem.
18. Project the Pythagorean Theorem Practice worksheet that has a vocabulary practice at the bottom. Have students orally practice the vocabulary.
19. Model problem-solving using Pythagorean Theorem using the problem of Alex and the ladder.
20. Project or post the Anchor Chart which helps students see the process. **(Scaffolding: Modeling and Guided Practice, Grouping Options: Whole class)**
21. Project or distribute the Independent or Group Practice. Share how the work will be evaluated by the teacher or by another student.
(Assessment: Group or Individual, Written)

Evaluate: (See Assessment)

Assessment

Geography

The Venn Diagram Graphic Organizer and map work can be graded for completeness and accuracy. Mastery will be considered a score of 80% or higher.

Geography, Science, and ELA

The Readings Worksheet can be graded for completeness and accuracy. Mastery will be considered a score of 80% or higher.

ELA and Science

Vocabulary acquisition can be measured using the Vocabulary Test. Mastery will be considered a score of 80% or higher.

Mathematics

The Pythagorean Theorem Inquiry can be graded for completeness. Mastery will be considered a score of 90% or higher.

The Pythagorean Theorem Practice can be graded for completeness. Mastery will be considered a score of 90% or higher.

Independent or Group Practice can be graded for accuracy. Mastery will be considered a score of 80% or higher or a 3-4 on the Scoring Rubric.
(Assessment: Written, Individual or Group)

Extensions

Further extension of application of this concept will be solving other real-world problems including 2D and 3D objects.

Sources

How did Pyramids Affect People's Lives in Ancient Egypt?

<https://classroom.synonym.com/did-pyramids-affect-peoples-lives-ancient-egypt-9926.html>

Video link: connection between pyramid building and Pythagorean Theorem

<https://pythagoreantheorem-pyramids.tumblr.com>

Video link: real world Pythagorean application

https://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.PYTH&lesson=html/video_interactives/pythagoras/pythagorasSmall.html

Video link: Pythagorean Theorem Demo

<https://www.youtube.com/watch?v=CAkMUdeB06o>

How Did Egyptian Build the Pyramids?

<https://www.thegreatcoursesdaily.com/how-did-egyptians-build-the-pyramids/>

We May Finally Know How the Pyramids Were Built

<https://www.discovery.com/exploration/how-the-pyramids-were-built>