Unit 3: Pythagorean Theorem & Transformations
Algebra Prep
12 Class Meetings
Revised May 2023

Essential Questions

- How can we use the Pythagorean Theorem to solve problems?
- How do translations, reflections, rotations, and dilations relate to each other?

Enduring Understandings with Unit Goals

EU 1: The Pythagorean Theorem can be used to solve problems about a right triangle.
- Determine the missing side of a right triangle using the Pythagorean Theorem
- Decide if a triangle is a right triangle by using the Pythagorean Theorem
- Calculate the distance between two points in the coordinate plane by using the Pythagorean Theorem

EU 2: Shapes can change shape position on the coordinate plane.
- Transform shapes on the coordinate plane using translations, reflections, rotations, and dilations.
- Identify a series of transformations that has occurred in the coordinate plane

Standards

Common Core State Standards:

- **8.G.B.6:** Explain a proof of the Pythagorean Theorem and its converse.
- **8.G.B.7:** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- **8.G.B.8:** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
- **8.G.A.1:** Verify experimentally the properties of rotations, reflections, and translations
- **8.G.A.2:** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
- **8.G.A.3:**   Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
- **8.G.A.4:** Understand that a two-dimensional figure is similar to another is the second can be obtaines from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.
Competency 2: Speak to diverse audiences in an accountable manner.
Competency 3: Develop the behaviors needed to interact and contribute with others on a team.
Competency 4: Analyze and solve problems independently and collaboratively.
Competency 5: Be responsible, creative, and empathetic members of the community.

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Unit Content Overview

1. **The Pythagorean Theorem**
   - Identify the sides of a right triangle
   - Find the length of the hypotenuse using the Pythagorean Theorem.
   - Find the length of a missing leg using the Pythagorean Theorem.
   - Use the distance formula to find the distance between two points.
   - Vocabulary: 90-degree angle, leg, hypotenuse, square-root, radicand, rounding, distance, axes, point, grid, coordinate plane, right triangle, base
2. **Using Transformations on the Coordinate Plane**
   - Translate a shape on the coordinate plane
   - Reflect a shape on the coordinate plane over the x- and y-axis.
   - Rotate a shape on the coordinate plane
   - Dilate a shape on the coordinate plane
   - Vocabulary: ordered pair, coordinate plane, axes, translate, reflect, rotate, dilate, grid

Interdisciplinary Connection:
   - Language Arts - Word Problems
   - Science – Unit Task (Engineering Process)

Daily Learning Objectives with *TWPS*

Students will be able to…
- Determine the length of the hypotenuse of a right triangle using the Pythagorean Theorem
  - *TWPS – Solve for the hypotenuse of the right triangle and explain how you got your answer.*
- Solve for the length of a missing leg of a right triangle and determine if a triangle is a right triangle using the Pythagorean Theorem
  - *TWPS – How is solving for a leg different than solving for the hypotenuse in a right triangle?*
- Apply the Pythagorean Theorem to real-world scenarios to solve various problems
  - *TWPS – Write a word problem using right triangles.*
- Calculate the distance between two points in the coordinate plane using the Pythagorean Theorem
  - *TWPS – How could Jeremy determine the direct distance between his house and the market?*
- Translate a shape in the coordinate plane
  - *TWPS – How can you tell whether to add or subtract values in an algebraic representation?*
- Reflect a shape over a line of reflection in the coordinate plane
  - *TWPS – Where do you see reflections in the real world. How can you tell?*

- Rotate a shape about the origin in the coordinate plane
  - *TWPS – What is different between rotations, reflections, and translations?*
- Dilate a shape in the coordinate plane given the scale factor
  - *TWPS – Are the ratios of corresponding sides of dilated figures the same as the ratio of their areas? Explain.*
- Identify and describe a series of transformations that occurred to a shape in the coordinate plane
  - *TWPS – In which order did the following transformations occur? Does the order matter? Explain.*

Instructional Strategies/Differentiated Instruction

- Whole-group instruction
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Guided notes
- Independent problem-solving
- Collaborative problem-solving
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Manipulatives
- Cumulative Homework
- Visuals to support instruction
- Small group instruction
- Pre-teaching and reteaching
- Multiplication charts
- Number lines
- Explicit instruction
- Color-coding
- Small group check in
- Differentiated homework assignments
- Differentiated assessments

EL DIFFERENTIATED INSTRUCTION:

- Word Walls with visuals
- TWPS (Think, Write, Pair, Share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit Modeling
- Key Vocabulary
- Graphic Organizers
- Strategic Grouping
- Non-verbal Assessments

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Assessments

FORMATIVE ASSESSMENTS:
    ● Whiteboards
    ● Mid-class check-ins
    ● Exit Slips
    ● Student-led instruction
    ● Cumulative Homework
    ● Accountable Talk Discussions
    ● Daily Do Now
    ● Performance Task – Get the Robot on the Stage
        ○ Problem Solving Rubric
 	
SUMMATIVE ASSESSMENTS:
    ● Edulastic Quiz – EU 1
    ● Unit 3 Test – EU 1 and EU 2
    ● Performance Task – Get the Robot on the Stage

Unit Task
Unit Task Name: Get the Robot on the Stage **Description:** Students will use information learned in this unit about the Pythagorean Theorem (EU 1) and how a figure is transformed in the coordinate plane (EU 2) in order to complete a set of tasks specific to getting a robot onto a stage and facing the audience. Students will be designing and analyzing different options for ramps that can be used to help the robot get on the stage. They will be asked to write and solve a series of problems as well as review and apply the algebraic terms and concepts learned in this unit. **Evaluation**: Problem Solving Rubric

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Unit Resources
● Worksheets   ● Calculator   ● Laptops   ● SBAC Prep Online   ● Edulastic   ● Kahn Academy   ● Gimkit   ● Quizizz   ● Individual Whiteboards   ● 2 Truths & One Lie   ● State Common Core Standards Transition Tasks   ● Online resources