(8th) Unit 9: Real Numbers & The Pythagorean Theorem

Content Area: **Math**
Course(s): **Math**
Time Period: **May**
Length: **3 weeks**
Status: **Published**

Unit Overview

In this unit, students will learn about the following topics:

- Perfect squares & square roots

- The Pythagorean Theorem

- Perfect cubes & finding cube roots

- Rational Numbers

- Irrational Numbers

- The Converse of the Pythagorean Theorem

Enduring Understandings

SWBAT:

- Find square roots of numbers

- Identify perfect squares

- Find missing legs of right triangles using The Pythagorean Theorem (a^2+b^2=c^2)

- Find missing hypotenuses of right triangles using The Pythagorean Theorem (a^2+b^2=c^2)

- Solve real-world problems that can be modeled by right triangles in the coordinate plane

- Convert fractions to decimals

- Convert decimals and repeating decimals to fractions

- Classify real numbers by the sets they belong to (i.e. rational vs irrational, integers, whole numbers, natural numbers)

- Approximate irrational numbers

- Apply The Converse of the Pythagorean Theorem to prove if three side lengths make up a right triangle

Essential Questions

How can we:

- find square roots of numbers?
- identify perfect squares?
- evaluate expressions involving square roots?
- use square roots to solve equations?

How can we:

- derive the Pythagorean Theorem?
- use the Pythagorean Theorem to find unknown side lengths of triangles?
- use the Pythagorean Theorem to find distances between points in the coordinate plane?

How can we:

- find cube roots of numbers?
- identify perfect cubes?
- evaluate expressions involving cube roots?
- use cube roots to solve equations?

How can we:

- define rational numbers?
- write fractions & mixed numbers as decimals?
- write repeating decimals as fractions or mixed numbers?

How can we:

- classify real numbers as rational or irrational?
    - if so, then integer --> whole --> natural?
- approximate irrational numbers?
- solve real-world problems involving irrational numbers?

How can we:

- prove the Converse of the Pythagorean Theorem?
- identify right triangles given three side lengths?
- identify right triangles in a coordinate plane?

Instructional Strategies & Learning Activities

- Guided Practice
- Daily Do Now
- Extra Practice & Puzzle Time (Resources)
- Scavenger Hunts
- Coloring Activities
- Task Cards (Around the World)
- Maze Activities
- Quizizz Online Assignments
- Kahoot! Online Games
- GimKit Online Games

Integration of 21st Century Themes and Skills

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
TECH.9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
TECH.K-12.P.4	Demonstrate creativity and innovation.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

Technology & Design Integration

CS.6-8.8.1.8.AP.8	Systematically test and refine programs using a range of test cases and users.
CS.6-8.8.1.8.DA.5	Test, analyze, and refine computational models.
TECH.8.1.8.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.2.8.A.CS2	The core concepts of technology.
TECH.8.2.8.D.CS1	Apply the design process.

Interdisciplinary Connections

ELA.L.KL.8.2.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
ELA.L.KL.8.2.B	Gather vocabulary knowledge when selecting a word or phrase important to comprehension or expression.
ELA.L.VL.8.3.A	Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
ELA.L.VL.8.3.B	Analyze the impact of specific word choices on meaning and tone.
ELA.L.VL.8.3.C	Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., precede, recede, secede).
ELA.L.VL.8.3.D	Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.
VPA.1.3.8.D.1	Incorporate various art elements and the principles of balance, harmony, unity, emphasis, proportion, and rhythm/movement in the creation of two- and three- dimensional artworks, using a broad array of art media and art mediums to enhance the expression of creative ideas (e.g., perspective, implied space, illusionary depth, value, and pattern).

Differentiation

Definitions of Differentiation Components:

- Content – the specific information that is to be taught in the lesson/unit/course of instruction.
- Process – how the student will acquire the content information.
- Product – how the student will demonstrate understanding of the content.
- Learning Environment – the environment where learning is taking place including physical location and/or student grouping

Differentiation occurring in this unit:

- High-achieving students will assist low-achieving students in mixed ability groupings for games and activities.
- High-achieving students can complete sudoku puzzles and logic puzzles as extension activities.
- Limit number/difficulty of problems for low-achieving students to demonstrate mastery.
- Narrow down problem choice to core concepts for low-achieving students.
- Leveled group-based activities, determined by formative assessment.

Modifications & Accommodations

- High-achieving students will assist low-achieving students in mixed ability groupings for games and

activities.

- High-achieving students can complete sudoku puzzles and logic puzzles as extension activities.
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- Narrow down problem choice to core concepts for low-achieving students.
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Benchmark Assessments

Schoolwide Benchmark assessments:

- Linkit Benchmarks (Form A in September, Form B in January, Form C in June): Linked to NJSLA standards

Additional Benchmarks used in this unit:

- IXL Diagnostic + continued practice during IXL periods

Formative Assessments

Formative Assessments used in this unit:

- Kahoot! Games

- Quizizz Games

- Homework

- Q & A

- Scavenger Hunts

- Coloring Activities

- Task Cards

- Partner Activities

- Math Mugshots Activity

Summative Assessments

Summative assessments for this unit:

- Chapter Test
- Quizzes

Instructional Materials

1. Big Ideas Math: Math & You 6th Grade Textbook
2. Quizizz
3. Kahoot!
4. Scavenger Hunts
5. Task Cards
6. Coloring Activities
7. GimKit
8. Math Mugshots Activity

Standards

NEW STANDARDS

(Adapted 2023)

8.NS.A.3 Understand that the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

8.EE.A.2b Simplify numerical radicals, limiting to square roots (i.e. nonperfect squares).

MATH.8.NS.A.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a rational number.
MATH.8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).
MATH.8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number.
MATH.8.G.B.6	Explain a proof of the Pythagorean Theorem and its converse.

MATH.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.
MATH.8.G.B.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.