Unit 10: Radicals, Systems of Measurement, PARCC

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 30**
Length: **4 Weeks**
Status: **Published**

Unit Overview

This unit will introduce square roots. Students will learn how to simplify radical expressions by utilizing the order of operations and multiplication. They also will learn how to solve equations that include exponents. This will lead directly to the introduction of the Pythagorean Theorem. Students will utilize the Pythagorean Theorem to find the missing length of the hypotenuse and any leg. Also included in this unit will be the study of rational and irrational numbers and systems of measurement (customary and metric). Students will learn how to identify which unit of measure is the most appropriate for a given situation and how to convert among different units of measure within the same system. Time at the end of the unit will be utilized to review/prepare for the NJASK.

Standards

MA.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.
MA.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).
MA.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. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
MA.8.G.B.6	Explain a proof of the Pythagorean Theorem and its converse.
MA.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.
MA.8.G.B.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Essential Questions

- How do we build upon previously-learned topics, such as equations and order of operations, and apply them to radicals?
- In which professions is it imperative to have a strong foundation in measuring skills?
- Why do you believe the United States is the only country in the world to still use the customary system

Application of Knowledge and Skills...

Students will know that...

- A perfect square is a square of any whole number.
- A rational number is any number that can be written as a fraction, and is either a repeating or terminating decimal.
- A square root is equal to a number squared that is equal to the number under the radical symbol.
- An irrational number cannot be written as a fraction, and is a non-repeating/non-terminating decimal.
- In order to "undo" a variable raised to the second power in an equation, you must take the square root of both sides of the equation.
- In the United States, we use the customary system of measurement; all other countries use the metric system.
- The Pythagorean Theorem can be used to find the measure of a missing side length in any right triangle.
- To estimate the square root of a number, you identify which two perfect squares the number falls between and select the one that is closest.
- When converting among different units in the metric system, you move the decimal point left or right.
- When converting among different units in the metric system, you move the decimal point left or right.
- When evaluating radical expressions, you follow the order of operations and determine the square root last.
- You can simplify a radical by changing it to a multiplication statement.
- You divide when converting from a small unit to a larger unit in the customary system.
- You multiply when converting from a large unit to a smaller unit in the customary system.

Students will be able to:

- Add and subtract units of measure in the customary system.
- Apply their knowledge of order of operations to evaluate a radical expression.
- Convert among different units of measure in the customary and metric systems.
- Evaluate and estimate the square root of a number.
- Identify whether a number is rational or irrational.
- Identify which unit of measure is the most appropriate for any given situation.
- Simplify a radical by changing it to a multiplication statement.
- Solve an equation involving a variable raised to the second power.
- Solve to find the missing side length in a right triangle by utilizing the Pythagorean Theorem.

Assessments

Digits Readiness Assessments:

The readiness assessment screens students on their understanding of the prerequisite content of a unit. Students are then assigned invidualized intervention lessons to address specific needs.

- Do Now Exercises Diagnostic: Instructional/Assessment Focus The purpose of these do now exercises is to review and remediate when necessary the concepts learned throughout the unit.
- Jeopardy NJASK Review Formative: Self Assessment This review game will serve as a review of grade-level content to prepare students for the NJASK.
- Math Olympics Formative: Other written assessments This assessment will require students to participate in "games" in which they must measure how far they've jumped or thrown an object. Students will add together the results from everyone in their group.
- Pythagorean Theorem Stations Formative: Other written assessments By completing the activities in these stations, students will apply the Pythagorean Theorem to real-world problems.
- Radicals and Measurement Unit Test Summative: Written Test This unit test will include all unit content.
- Radicals Unit Quiz Formative: Written Test This unit quiz will focus on radicals and the Pythagorean Theorem.
- Store Activity Formative: Personal Project For this project, students will record and balance funds in a checkbook, budget their money, and shop.

Activities

- **Math Olympics:** in this teacher-generated activity, students will compete in the “long jump” and “paper ball throw”. In groups of three,students will be responsible for measuring the lengths of their teammates' jumps and throws. Using the data collected, students will complete a worksheet.
- **Store Activity:** in this teacher-generated activity, students will learn about writing checks and maintaining a checkbook, creating their own store, and shopping at their classmates' stores. Students will create a poster for their store that shows the items they are selling and the cost per item so that classmates can plan their shopping experiences.
- Interactive Smartboard presentations will address radicals and the Pythagorean Theorem. Students will also use the Smartboard to classify numbers as rational or irrational by dragging them to the correct column. Students will also see the different ways to change a radical to a multiplication statement.
- Smart pal review games will review square roots, Pythagorean Theorem, and measurement.
- Digits cd grade 8

Launch Activity

Ocean Waves r3: In this activity students will solve problems about squaring numbers, finding square roots of perfect suares and approzimating square roots.

- Digits cd grade 6

Launch Activity

Restaurant Math r3: In this activity students will look at examples about eating at a restaurant to review the order of operations.

Activities to Differentiate Instruction

- **MINCH Activity:** in this teacher-generated activity, students review simplifying fractions as they create their own "ruler" by folding a sheet of paper a given number of times. Students mark their paper rulers with the appropriate units (1/4, 3/8, etc). Students respond to questions requiring them to utilize their rulers to measure a variety of items.
- When converting in the customary system, students will learn the "hand motions" to symbolize when they would multiply and when they would divide.
- **Jeopardy PARCC Review:** in this teacher-generated review game, students work in groups to answer questions about concepts they've learned throughout the year.
- Completed study guides as needed.
- Calculators to provide assistance with large calculations.
- Individual PARCC reference sheets for assistance with customary conversion factors.

- Digits Supported Materials:

    - Math XL Printables
    - Leveled Homework G and K
    - Help Me Solve This: This function scaffolds math problems by asking prompting question at each individual step.
    - View An Example: This function provides a fully worked out step-by-step solution of a similar problem.
    - Readiness Assessment: After a student completes the readiness assessment intervention lessons are individually assigned to address prerequisite skills .
    - Tools: On line manipulatives

Integrated/Cross-Disciplinary Instruction

- **Physical Education:** students compete in Math Olympics and measure their jumps and throws.
- **Architecture/Construction:** connections to accurate measurements; Internet video clips of engineering disasters.

Resources

Digits teacher materials and support: www.pearsonrealize.com

Digits student access and support: www.MyMathUniverse.com

SMART Exchange

Smartboard Lessons

Punchline/Pizzazz worksheets (self correcting)

Kuta generated worksheets dealing with radicals and measurement

PARCC reference sheets

Teacher generated math Olympics directions

Directions for the store activity

Pythagorean Theorem Real World Examples

Calculators

Engineering disaster video clips (why measurements are important)

21st Century Skills

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.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.