Unit 5: Exponents & Roots

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

UNIT RATIONALE

Correctly applying the properties of exponents and square and cube roots helps us to solve problems found in the world around us. The knowledge and skills taught in this unit will prepare students for such situations.

ESSENTIAL QUESTIONS

-Why is it important to understand and apply irrational numbers?

-Why is estimation an important skill to have in life?

-How can we use our understanding of radical numbers to solve for missing sides/distances in right triangles?

-How can we use properties of exponents to understand and define scientific phenomena?

STANDARDS

NEW JERSEY STUDENT LEARNING STANDARDS: CONTENT AREA

New Jersey (NJSLS) - Grade 8 - Mathematics (2020)

MA.8.NS	The Number System
MA.8.NS.A	Know that there are numbers that are not rational, and approximate them by rational numbers.
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	Work with radicals and integer exponents.
MA.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
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 $\sqrt{2}$ is irrational.
MA.8.EE.A.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
MA.8.EE.A.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.
MA.8.G.B	Understand and apply the Pythagorean Theorem.
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.

New Jersey (NJSLS) - K-12 - Math Practice Standards (2020)

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

NEW JERSEY STUDENT LEARNING STANDARDS: CAREER READINESS, LIFE LITERACIES AND KEY SKILLS

TECH.9.4.8.TL.1	Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
TECH.9.4.8.TL.5	Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration.
TECH.9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.

NEW JERSEY STUDENT LEARNING STANDARDS: COMPUTER SCIENCE AND DESIGN THINKING

CS.6-8.8.2.8.ED.2   Identify the steps in the design process that could be used to solve a problem.

PRE-ASSESSMENTS

None given for this unit.

INSTRUCTIONAL PLAN

MODULE 4

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning how to simplify and evaluate zero and negative exponents so that we can simplify expressions that involve multiplication and division rules for exponents.
Student Learning Strategies	-Peardeck Lesson on Zero and Negative Exponents -IXL Lessons D.6 through D.8
Success Criteria	I can evaluate a base number to a zero or negative exponent. I can write an expression with negative exponents as a fraction with positive exponents.
Formative Assessment (drives instructional decisions)	-Peardeck lesson interaction & feedback. -Quizizz, Kahoot!, or Blooket results. -Whiteboard practice problems. -Exit ticket.
Activities and Resources	Interactive notebooks.
Suggested Modifications	Students can work in groups.

MODULE 3

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning how to simplify expressions using rules of exponents so that we can evaluate exponents with large bases.
Student Learning Strategies	-Peardeck Lesson on Rules of Exponents -IXL Lessons D.9 through D.12
Success Criteria	I can apply the rules of exponents to simplify expressions involving multiplication and division. I can explain and demonstrate why the rules of exponents work.
Formative Assessment (drives instructional decisions)	-Peardeck lesson interaction & feedback. -Quizizz, Kahoot!, or Blooket results. -Whiteboard practice problems. -Exit ticket.
Activities and Resources	Interactive notebooks. Exponent sorting activity.
Suggested Modifications	Students can work in groups.

MODULE 2

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning how to evaluate exponents so that we can apply exponents to real-world applications such as the Pythagorean Theorem and finding square roots.
Student Learning Strategies	-Peardeck Lesson on Exponents -IXL Lessons D.1 through D.5
Success Criteria	I can use expanded notation to find the value of an exponent. I can identify the base and the exponent in an expression. I can evaluate exponents with base numbers that are integers and fractions.
Formative Assessment (drives instructional decisions)	-Peardeck lesson interaction & feedback. -Quizizz, Kahoot!, or Blooket results.

	-Whiteboard practice problems. -Exit ticket.
Activities and Resources	Interactive notebooks. Exponent sorting activity.
Suggested Modifications	Students can work in groups.

MODULE 1

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning about different sets of numbers so that we can classify numbers as either rational or irrational.
Student Learning Strategies	-Peardeck Lesson on Sets of Numbers -IXL Lessons I.1 through I.4
Success Criteria	I can describe the difference between rational and irrational numbers. I can classify a given number as rational or irrational
Formative Assessment (drives instructional decisions)	-Peardeck lesson interaction & feedback. -Quizizz, Kahoot!, or Blooket results. -Whiteboard practice problems. -Exit ticket.
Activities and Resources	Graphic Organizer for Sets of Numbers Interactive Notebook
Suggested Modifications	Students can work in groups on graphic organizers.

MODULE 5

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning about scientific notation so that we can express really large or really small numbers in compact form.
Student Learning Strategies	-Peardeck Lesson on Scientific Notation

	-IXL Lessons E.1 through E.6
Success Criteria	I can convert numbers between standard form and scientific notation. I can explain the magnitude difference when comparing numbers written in scientific notation.
Formative Assessment (drives instructional decisions)	-Peardeck lesson interaction & feedback. -Quizizz, Kahoot!, or Blooket results. -Whiteboard practice problems. -Exit ticket.
Activities and Resources	Interactive notebooks.
Suggested Modifications	Students can work in groups.

MODULE 6

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning how to evaluate and estimate square roots so that we can apply square roots to real-world applications including the Pythagorean Theorem.
Student Learning Strategies	-Peardeck Lesson on Square Roots -IXL Lessons F.1 through F.6
Success Criteria	I can identify perfect squares and use them to estimate the value of square roots.
Formative Assessment (drives instructional decisions)	-Peardeck lesson interaction & feedback. -Quizizz, Kahoot!, or Blooket results. -Whiteboard practice problems. -Exit ticket.
Activities and Resources	Interactive notebooks.
Suggested Modifications	Students can work in groups.

MODULE 7

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning how to apply the Pythagorean Theorem so that we can find the length of the sides of a right triangle.
Student Learning Strategies	-Peardeck Lesson on Pythagorean Theorem -IXL Lessons T.1 through T.6
Success Criteria	I can identify the parts of a right triangle (legs and hypotenuse). I can apply the Pythagorean Theorem to find the missing length of either a leg or hypotenuse in a right triangle. I can use the Pythagorean Theorem to determine if a triangle's given lengths are a right triangle.
Formative Assessment (drives instructional decisions)	-Peardeck lesson interaction & feedback. -Quizizz, Kahoot!, or Blooket results. -Whiteboard practice problems. -Exit ticket.
Activities and Resources	Interactive notebooks.
Suggested Modifications	Students can work in groups.

REFLECTIONS

Due to time constraints, this unit was only briefly touched on.

INTERDISCIPLINARY CONNECTIONS: NEW JERSEY STUDENT LEARNING STANDARDS FOR ELA, SOCIAL STUDIES, SCIENCE AND/OR MATHEMATICS

LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.W.8.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.W.8.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.