Extend the properties of exponents to rational exponents (Standards N.RN.1–2)	
Standard N.RN.1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to show values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3=5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*	
Concepts and Skills to Master	
• Extend the properties of integer exponents to define the meaning of rational exponents. • Explain the meaning of rational exponents using examples such as: $\sqrt[3]{x^2}=(x^2)^{1/3} = x^{2/3}$	
Related Standards: Current Course	Related Standards: Future Courses
II.N.RN.2, II.A.REI.4, II.A.SSE.1b, II.A.SSE.2, II.A.SSE.3c, II.F.IF.8b	III.A.SSE.2, III.A.REI.2, III.F.BF.4, III.F.IF.7e, III.F.IF.8, P.F.BF.4

Support for Teachers

Critical Background Knowledge
• Properties of integer exponents (8.EE.1) • Work with radical and integer exponents (8.EE.1-4)
Academic Vocabulary
rational exponent, radical, radicand, index, *n*th root
Resources:
Curriculum Resources: https://www.uen.org/core/core.do?courseNum=5620#71464

Extend the properties of exponents to rational exponents (Standards N.RN.1–2)	
Standard N.RN.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.	
Concepts and Skills to Master	
• Translate fluently between radical and exponential forms using properties of exponents.	
Related Standards: Current Course	Related Standards: Future Courses
II.RN.1, II.A.SSE.1b, II.A.SSE.2, II.A.SSE.3c, II.A.REI.4, II.F.IF.8b	III.A.APR.7, III.A.SSE.2, III.A.REI.2, III.F.IF.7e, III.F.IF.8

Support for Teachers

Critical Background Knowledge
• Properties of integer exponents (8.EE.1) • Work with radical and integer exponents (8.EE.1-4) • Know the relationship between radical notation and rational exponent notation (II.N.RN.1)
Academic Vocabulary
rational exponent, radical, radicand, index, *n*th root
Resources:
Curriculum Resources: https://www.uen.org/core/core.do?courseNum=5620#71465

Use properties of rational and irrational numbers (Standard N.RN.3).	
Standard N.RN.3: Explain why sums and products of rational numbers are 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. Connect to physical situations (e.g., finding the perimeter of a square of area 2).	
Concepts and Skills to Master	
• Explain why adding and multiplying two rational numbers results in a rational number. • Explain why adding a rational number to an irrational number results in an irrational number. • Explain why multiplying a nonzero rational number to an irrational number results in an irrational number. • Define closure with an operation, and apply closure to the addition of two rationals and two irrationals and multiplication of two rationals. • Explore whether closure applies when multiplying two irrational numbers, such as $\sqrt{2}$ times$\sqrt{8}$. • Supply examples and counter-examples of properties.	
Related Standards: Current Course	Related Standards: Future Courses
II.N.RN.1, II.N.RN.2, II.A.APR.1, II.A.SSE.2, II.A.SSE.1b, II.A.SSE.3, II.F.BF.1b	III.A.APR.1, III.A.APR.7, III.A.REI.2, III.A.SSE.1b, III.A.SSE.2, III.A.SSE.4, III.F.BF.1b

Support for Teachers

Critical Background Knowledge
• Know that numbers that are not rational are called irrational (8.NS.1) • Use rational approximations of irrational numbers (8.NS.2) • Understand how to perform operations and simplify radicals (8.NS.3)
Academic Vocabulary
rational, irrational
Resources:
Curriculum Resources: https://www.uen.org/core/core.do?courseNum=5620#71467