



Reporting Measure: Rational Exponents and Radicals

Level	Description
Above & Beyond (4.0)	<p>The student will:</p> <ul style="list-style-type: none"> Use the properties of exponents to transform and interpret expressions for exponential functions (for example, the expression 1.15^t can be rewritten as $(1.15^{\frac{1}{12}})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%; identify the percent rate of change in functions such as $y = 1.02^t$, $y = 0.97^t$, $y = (1.01)12^t$, $y = \frac{1.2^t}{10}$, and classify them as representing exponential growth or decay).
3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Proficient (3.0)	<p>The student will:</p> <p>RER1—Explain how the definition of fractional exponents is consistent with the properties of integer exponents (for example, an exponential term raised to a power equals the base raised to the product of the exponents $((a^b)^c = a^{bc})$, so $(5^{\frac{1}{3}})^3 = 5^{\frac{3}{3}} = 5^1 = 5$; since $(\sqrt[3]{5})^3 = 5$ and $(5^{\frac{1}{3}})^3 = 5$, $5^{\frac{1}{3}}$ and $\sqrt[3]{5}$ must be equal; therefore, $x^{\frac{m}{n}} = (\sqrt[n]{x})^m$).</p> <p>RER2—Manipulate expressions involving positive and negative rational exponents (including fractional exponents) and radicals using exponent properties (for example, express $d(4d^4)^{\frac{1}{2}}$ as $2d^3$).</p>
2.5	No major errors or omissions regarding score 2.0 content, and partial success at score 3.0 content
Getting There (2.0)	<p>RER1—The student will recognize or recall specific vocabulary (for example, <i>root</i>) and perform basic processes such as:</p> <ul style="list-style-type: none"> Define the fractional exponent $x^{\frac{m}{n}}$ as the n root of x raised to the m power. For example, $x^{\frac{m}{n}} = (\sqrt[n]{x})^m$. Describe the properties of integer exponents. For example, $(a^b)(a^c) = a^{(b+c)}$; $\frac{a^b}{a^c} = a^{(b-c)}$; $(a^b)^c = a^{bc}$. <p>RER2—The student will recognize or recall specific vocabulary (for example, <i>perfect root</i>) and perform basic processes such as:</p> <ul style="list-style-type: none"> Apply exponent properties when multiplying or dividing terms with the same base (for example, $(a^b)(a^c) = a^{(b+c)}$ and $\frac{a^b}{a^c} = a^{(b-c)}$). Apply the exponent property in which an exponential expression can be raised to a power by multiplying the exponents and keeping the same base $((a^b)^c = a^{bc})$ to expressions involving rational exponents and radicals. Apply the associative, commutative, and distributive properties to expressions involving rational exponents and radicals. For example, $(a^c)(b^c) = (ab)^c$ and $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$.

	<ul style="list-style-type: none"> • Consider the domain of a radical expression to determine if the absolute value sign is necessary when simplifying. • Rationalize the denominators of expressions involving rational exponents and radicals.
1.5	Partial success at score 2.0 content, and major errors or omissions regarding score 3.0 content
Beginning (1.0)	With help, partial success at score 2.0 content and score 3.0 content