MAFS.912.N-RN.1.2 Also assesses MAFS.912.N-RN.1.1 Also assesses MAFS.912.N-RN.2.3	Rewrite expressions involving radicals and rational exponents using the properties of exponents. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{\frac{1}{3}}$ *to be the cube root of* 5 *because we want* $\left(5^{\frac{1}{3}}\right)^3 = 5^{(\frac{1}{3})3}$ *to hold, so* $\left(5^{\frac{1}{3}}\right)^3$ *must equal* 5. Explain why 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.
Item Types	Editing Task Choice – May require choosing a value, an expression, or a statement. Equation Editor – May require creating a value or an expression. GRID – May require identifying parts of an algebraic proof. Hot Text – May require dragging and dropping values, expressions, or explanations. Matching Item – May require matching equivalent expressions. Multiple Choice – May require selecting a value or an expression from a list. Multiselect – May require selecting multiple values. Open Response – May require explaining why two rational exponent expressions are equivalent or why two expressions are equivalent.
Clarifications	Students will use the properties of exponents to rewrite a radical expression as an expression with a rational exponent. Students will use the properties of exponents to rewrite an expression with a rational exponent as a radical expression. Students will apply the properties of operations of integer exponents to expressions with rational exponents. Students will apply the properties of operations of integer exponents to radical expressions.

	Students will write algebraic proofs that show that a 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.
Assessment Limits	Expressions should contain no more than three variables. For N-RN.1.2, items should not require the student to do more than two operations.
Stimulus Attribute	Items should be set in a mathematical context.
Response Attributes	Items may require the student to complete an algebraic proof. Items may require the student to determine equivalent expressions or equations. Responses with square roots should require the student to rewrite the square root so that the radicand has no square factors.
Calculator	No

Sample Item	Item Type
	Multiple Choice

Jeremy shows that $\sqrt{9} = 9^{\frac{1}{2}}$. Part of his work is shown.

$\sqrt{9} = 3 = 3^1 = 3^{\frac{1}{2}+\frac{1}{2}} =$ _____ $= 9^{\frac{1}{2}}$

Which expression or equation can be placed in the blank to correctly complete Jeremy's work?

Ⓐ $(3^2)^1$

Ⓑ $3^{\frac{1}{2}} + 3^{\frac{1}{2}}$

Ⓒ $3^{\frac{1}{2}} \bullet 3^{\frac{1}{2}} = (3 \bullet 3)^{\frac{1}{2}}$

Ⓓ $3^{\frac{1}{2}} \bullet 3^{\frac{1}{2}} = (3 \bullet 3)^{\frac{1}{2}+\frac{1}{2}}$