2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.

4 CST items

Key Vocabulary

Opposite	**Additive Inverse**	**Reciprocal**	**Multiplicative Inverse**
Simplify	**Radical**	**Square Root**	**Cube Root**
Fractional Power	**Exponent**	**Negative Exponent**	**Raised**

Instructional Objectives

1 Find (and compute with) the opposite of a number or expression.

1. Find the opposite of -5.
2. Find the opposite of ¾.
3. Find the opposite of $3x - 12$.
4. What is 7 plus the opposite of 3?

2 Find the reciprocal of a number or expression.

1. Find the reciprocal of ⅔.
2. Find the reciprocal of -6.
3. Find the reciprocal of $\frac{2x}{x^2+3}$.
4. Find the reciprocal of 12^{-3}.

3 Simplify radical expressions including square roots and cube roots.

1. Simplify: $\sqrt{36} + \sqrt[3]{27} + \sqrt{81}$
2. Simplify: $\sqrt{200} - \sqrt{50}$
3. Simplify: $\sqrt{(x^4+64)^2}$
4. Simplify: $\sqrt[3]{64x^{12}}$

4 Simplify an expression raised to a fractional power.

1. Simplify: $8^{2/3} + 25^{1/2} + 81^{3/4}$
2. Simplify: $28^{1/2}$
3. Rewrite using a fractional exponent: $\sqrt[5]{x^2}$
4. Simplify: $(64x^{27})^{1/3}$

5 Apply the rules of exponents to simplify multiplied expressions.

$$x^m \cdot x^n = x^{(m+n)}$$

When monomials with the same base are multiplied, the product will be the base raised to the sum of the exponents.

1. $5^3 \cdot 5^8 = 5^x$ What is the value of x?
2. Simplify: $x^2 \cdot x^6$
3. Simplify: $x^3(6x^2y^7 + 4x^5 + y^2)$
4. Simplify: $(x^2)(3y)(7x^3y^3)(x)$

6 Apply the rules of exponents to simplify divided expressions.

$$x^m \div x^n = x^{(m-n)}$$

When monomials with the same base are divided, the quotient will be the base raised to the difference of the exponents.

1. Simplify: $\frac{12^5}{12^3}$
2. Simplify: $\frac{x^9}{x^4}$
3. Simplify: $\frac{x^8y^3}{x^5y^5}$
4. Simplify: $\frac{15x^2y^4z}{3x^3y^2z}$

7 Apply the rules of exponents to simplify repeated power expressions.

$$(x^m)^n = x^{(m \cdot n)}$$

When an exponential expression is raised to a power, the result will be the base raised to the exponent times the power.

1. Simplify: $(2^3)^4$
2. Simplify: $(5x^6)^3$
3. Simplify: $(6p^2q^5r)^2$
4. Simplify: $(2x^6 \bullet 3x^2)^3$

8 Interpret exponents as repeated multiplication and negative exponents as repeated division. Simplify expressions with negative and "0" exponents.

1. Evaluate: 5^{-3}
2. Simplify: $\frac{x^5}{x^9}$
3. Simplify: $\frac{8x^{-3}y^5}{6x^2y}$
4. Simplify: $\frac{10x^7y^{-2}}{5^{-2}x^{-4}z^0}$

9 Apply the rules of exponents to simplify polynomial expressions.

1. Simplify: $-3^2 + (-4)^3 + (-5)^4$
2. Simplify: $\frac{5x^3}{10x^7}$
3. Simplify: $\frac{3x^5y^{-3}z^6}{12x^2y^7z^{-3}}$
4. Simplify: $\frac{(10x^7)^2}{(2x^2)^4}$