Radical Expressions & Equations



Math 20 – Pre-Calculus

Chapter 5

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| **Algebra and Number** | **General Outcome:**  Develop algebraic reasoning and number sense. |
| **Specific Outcomes** | **Achievement Indicators**:  *The following set of indicators may be used to determine whether students have met the corresponding specific outcome* |
| Solve problems that involve operations on radicals and radical expressions with numerical and variable radicands. | 1. Compare and order radical expressions with numerical radicands in a given set. 2. Express an entire radical with a numerical radicand as a mixed radical. 3. Express a mixed radical with a numerical radicand as an entire radical. 4. Perform one or more operations to simplify radical expressions with numerical or variable radicands. 5. Rationalize the denominator of a rational expression with monomial or binomial denominators. 6. Describe the relationship between rationalizing a binomial denominator of a rational expression and the product of the factors of a difference of squares expression. 7. Explain, using examples, that 8. Identify the values of the variable for which a given radical expression is defined. 9. Solve a problem that involves radical expressions |
| Solve problems that involve radical equations (limited to square roots) | *(It is intended that the equations will have no more than two radicals.)*   1. Determine any restrictions on values for the variable in a radical equation. 2. Determine the roots of a radical equation algebraically, and explain the process used to solve the equation. 3. Verify, by substitution, that the values determined in solving a radical equation algebraically are roots of the equation. 4. Explain why some roots determined in solving a radical equation algebraically are extraneous. 5. Solve problems by modelling a situation using a radical equation. |

**Big Ideas:**

*Students will understand …*

* Radical numbers allow us to use exact values in real life situations like measurement, distance and surveying. Radical number operations are the fundamental skills useful in other mathematical topics like trigonometry and coordinate geometry.

By the end of the unit students should:

* That operations performed on radicals are similar to other number systems and algebraic operations.
* Radicals with even indices are limited to non-negative radicands, while odd indices have no restrictions on the radicands.
* Solving radical equations can yield extraneous roots.
* There are conventions for simplifying answers after performing radical operations.

5.1 Working with Radicals

Part I: Simplifying Radicals

Parts of a Radical 

Like Radicals . . .

Restrictions on variables in radicals . . .

State the restriction on the following radicals . . .

   

**Recap from Math 10C:**

**How to Converting from a Radical to a Mixed Radical and Vice Versa**

**Mixed Radical**:

**Entire Radical**:

***Convert Entire Radicals to Mixed Radicals***

(a)  (b) 

(c)  (d) 

(e)  (f) 

(g)  (h) 

(i) 

***Convert Mixed Radicals to Entire Radicals***

(a)  (b) 

(c)  (d) 

***Order Irrational Numbers***

Arrange in order from least to greatest **without** the use of a calculator

* + 1. , , , 
    2. , , , 
    3. , , , 

**Part II: *Adding and Subtracting Radicals***

***Recall***

Simplify *3x – 2y + x + 4y* by collecting “*like terms*”

**Problem #1**

Simplify  by collecting “*like radicals*”.

**Example #1**

Simplify the following:

(a)  (b) 

(c)  (d) 

**Problem #2**

Simplify by writing as simplified radicals first, then adding the coefficients of like radicals

(a) 

**Example #2**

Simplify the following:

(a) 

(b) 

(c) 

(d) 

(e) 

(f) 

(g)

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5.2 Part 1: Multiplying Radicals

**Recall:** Simplify 

# *Steps for Multiplying Radicals*

## Multiplying Monomial Radicals

**Example #1**

**(a)**  **(b)**  **(c)** 

## Multiplying Polynomial Radicals

**Example #2**

(a)  (b) 

(c)  (d) 

***Multiplying a Binomial  Binomial***

##### Example #3

(a)

(b) 

(c) 

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5.2 Part 2: Dividing Radicals

**Recall:** Simplify 

# *Steps for Dividing Radicals*

## Dividing Monomial Radicals

**Example #1**

(a)  (b) 

(c)  (d) 

In general, fractions **should not** be left with **radicals in the denominator**. The technique used to write fractions in another form is called **rationalizing the denominator**.

How to rationalize a MONOMIAL radical denominator . . .

**Example #2**

Rationalize the denominator in the following expressions.

(a) 

(b) 

**(c) **

**(d) **

##### *Rationalizing a Binomial Denominator*

How to rationalize a BINOMIAL radical denominator . . .

##### Example #1

State the conjugate of the following:

(a)  (b) 

**Problem #1:**

Rationalize the denominator of:

(a)  (b) 

**Example #2**

Rationalize the denominator of:

(a) 

(b) 

Homework

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5.3 Radical Equations

##### *Restrictions On Values for the Variable in a Radical Equation*

**Example #1**

State the restrictions on the values for the variable in each radical equation.

a)  b) 

c)  d) 

e) 

##### *Solving Radical Equations Algebraically*

**Example #2**

Solve the following radical equations. Check for extraneous solutions.

1.  b) 

c)  d) 

e)  f) 

g) 

h) .

Homework

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