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Mathematics

Quarter 2 - Module 5:
Laws of Radicals and Simplifying Radical Expressions

AIRs - SLMs

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Quarter 2 - Module 5: Laws of Radicals and Simplifying Radical Expressions
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Mathematics

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Laws of Radicals and Simplifying Radical Expressions

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

Target

Your goal in this module is to construct your understanding on how the laws of radical is derived. Towards the end of this module, you will be encouraged to apply your understanding in simplifying radicals using the different laws and considering the conditions in simplifying radicals.

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After going through this module, you are expected to attain the following objectives:

Learning Competency

- Derives the laws of radicals. **(M9AL-IIf-2)**
- Simplifies radical expressions using the laws of radicals. **(M9AL-IIf-1)**

Subtasks

1. Write expressions with rational exponents to radicals and vice versa.
2. Examine if a radical expression is simplified or not.
3. Use the laws of radicals in simplifying radical expressions.

Before you start doing the activities in this lesson, find out how much you already know about this module. Answer the pretest in a separate sheet of paper. Write the letter that corresponds to the best answer.

Pre-Assessment

Directions: Read and analyze the following questions carefully. Choose the letter of the correct answer and write it on your answer sheets.

1. What is the square root of 9?
   A. 1 B. 2 C. 3 D. 4
2. What rule of radical is illustrated if $\sqrt[n]{a}$ is a real number, then$a^{\frac{1}{n}} = \sqrt[n]{a}$?
   A. General Rule B. Product Rule
   C. Power Rule D. Quotient Rule
3. What is the simplified form of$\sqrt{a^2bc^3}$?
   A. $ac\sqrt{bc}$ B. $abc\sqrt{bc}$ C. $a\sqrt{bc}$ D. $ab\sqrt{c}$
4. What law of radical is applied in the problem $\sqrt{3} \bullet \sqrt{4} = \sqrt{12}$?
   A. General Rule B. Product Rule
   C. Power Rule D. Quotient Rule
5. Using the quotient law of radicals, how is $\frac{\sqrt{27}}{\sqrt{9}}$ simplified?
   A. $\sqrt{2}$ B. $\sqrt{3}$ C. $\sqrt{7}$ D. $\sqrt{9}$

6. How do we describe the squares of the integers; 4,9,16,25, and 36?
   A. Equal B. Even C. Perfect D. Rational
7. What are the factors of $\sqrt{cd}$?
   A. $\sqrt{\frac{c}{d}}$ B. $\sqrt{c}-\sqrt{d}$ C. $\sqrt{c}\bullet\sqrt{d}$ D. $\sqrt{c}+\sqrt{d}$
8. What is in the denominator of the expression $\frac{3}{\sqrt{7}}$ that makes it not considered simplified?
   A. Exponent B. Fraction C. Radical D. Root
9. It refers to radicals with the same indices and radicand.
   A. Dissimilar B. Equal C. Power D.Similar
10. Which of following is not a condition in simplifying radicals?
    A. The index of the radical is in the lowest possible form.
    B. The radical does not contain a fraction in the denominator.
    C. The negative radicand is always defined as rational number.
    D. The radicand has no factor that is a power of n if the index of the radical is n.
11. What do we call the process of removing the radical sign in the denominator?
    A. Evaluation B. Rationalization
    C. Substitution D. Transposition
12. Which of the following is the quotient law of radicals?
    A. $\sqrt[n]{\frac{a}{b}}$ B. $\sqrt[n]{ab}$ C. $(\sqrt[n]{a})^n$ D. $\sqrt[m]{\sqrt[n]{a}}$
13. What is the greatest perfect cube factor of x^8y^{10} ?
    A. x^8y^8 B. x^6y^6 C. x^6y^8 D. x^8y^6
14. What is the simplified form of $\sqrt{32}$?
    A. $2\sqrt{8}$ B. $4\sqrt{8}$ C. $4\sqrt{2}$ D. $8\sqrt{2}$
15. What is the result of $\sqrt{\frac{3}{5}}$ when we rationalize the denominator?
    A. $\frac{\sqrt{3}}{5}$ B. $\frac{\sqrt{5}}{3}$ C. $\frac{\sqrt{5}}{15}$ D. $\frac{\sqrt{15}}{5}$

How was your performance in the pre-assessment? Were you able to answer all the questions? Did you find difficulties in answering them? Are there questions familiar to you? Keep yourself on track as we learn new concepts in this module.

Jumpstart

Let's do it. Have fun learning!

What is the connection between expressions with rational exponents and radicals? Why do we need to know how to simplify radicals? Are radicals really needed in life outside math studies? How do we derive the laws of radicals? How do we simplify radicals using the different laws?

In this lesson we will address these questions and look at some important real-life applications of radicals.

Activity 1: Who Am I?

The First Man In The Universe

In 1961, this Russian cosmonaut orbited the earth in a spaceship. Who was he?
Directions: To find the answer to the question, evaluate the radical expressions. Write the letter of the correct answer on your answer sheets to spell out the name of the Russian cosmonaut. Have fun!

____	____	____	____		____	____	____	____	____	____	____
1	2	3	4		5	6	7	8	9	10	11

1. $\sqrt{3} \bullet \sqrt{4}$	Y. $\sqrt{12}$	Z. $\sqrt{3}$
2. $\sqrt{\sqrt[3]{8}}$	O. $\sqrt{7}$	U. $\sqrt{2}$
3. $-(7^2)^{\frac{1}{2}}$	Q. 25	B. -5
4. $\sqrt[3]{216}$	E. 16	I. 6
5. $\sqrt[4]{5^4}$	G. 5	H. 14
6. $\sqrt{5} \bullet \sqrt{2}$	A. $\sqrt{10}$	M. -9
7. $\sqrt[3]{125}$	F. -4	X. 4
8. $\sqrt{\frac{20}{2}}$	S. 81	J. -81
9. $\sqrt[3]{-7^3}$	R. -7	S. 7
10. $\sqrt{36}$	L. -16	D. 16
11. $\frac{\sqrt{24}}{\sqrt{2}}$	N. $2\sqrt{3}$	P. $\sqrt[3]{5}$

Source (Modified) : EASE Modules, Year 2- Module 2 Radical Expressions, page 9-10

Process Questions:

a. How did you solved the given activity?
b. What mathematical concepts are important in simplifying expressions with rational exponents?
c. Did you encounter any difficulties while solving? If yes, what are your plans to overcome those difficulties?

Now that you have applied the general rule;

If $\sqrt[n]{a}$ is a real number, then $a^{\frac{1}{n}} = \sqrt[n]{a}$.

You are now capable of writing expressions with rational exponents to radicals which is very useful as we now learn how to simplify radical expressions using the laws of radicals.

Activity 2: Complete Me

Directions: Carefully analyze the first two examples below then fill in the rest of the exercises with the correct answer. Write your answer on your answer sheets.

$3^{2/4}$	$\sqrt[4]{3^2}$	$\sqrt[4]{9}$
$4^{2/3}$	$\sqrt[3]{4^2}$	$\sqrt[3]{16} = \sqrt[3]{8 \bullet 2} = 2\sqrt[3]{2}$
$5^{3/4}$	1.	2.
$3b^{1/2}$	3.	4.
$(2x)^{2/5}$	5.	6.

You have learned in the previous lessons on how to write expressions with rational exponents to radicals and vice versa and you will need these skills to succeed in the next activities as we apply the different laws in simplifying radicals.

Discover

Laws of Radicals

The laws for radicals are obtained directly from the laws of exponents by means of the definition $\sqrt[n]{a^m} = a^{\frac{m}{n}}$. If n is even, assume a, b ≥ 0.

1. Product Rule for Radicals

$$\sqrt[n]{ab} = \sqrt[n]{a} \bullet \sqrt[n]{b}$$

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$are real numbers and n is a natural number, then $\sqrt[n]{ab} = \sqrt[n]{a} \bullet \sqrt[n]{b}$ (Remember that the product rule can only be used when the indexes are the same).

Examples:

1. $\sqrt{5} \cdot \sqrt{7} = \sqrt{35}$
2. $\sqrt[3]{3} \cdot \sqrt[3]{12} = \sqrt[3]{36}$
3. $\sqrt[6]{10m^4} \cdot \sqrt[6]{5m} = \sqrt[6]{50m^5}$
4. $\sqrt[4]{2} \cdot \sqrt[5]{2}$ cannot be simplified, different indexes

2. Quotient Rule for Radicals

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$are real numbers and n is a natural number, then $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$ *Examples:*

1. $\sqrt{\frac{16}{25}} = \frac{\sqrt{16}}{\sqrt{25}} = \frac{4}{5}$
2. $\sqrt[3]{-\frac{8}{125}} = \sqrt[3]{\frac{-8}{125}} = \frac{\sqrt[3]{-8}}{\sqrt[3]{125}} = \frac{-2}{5} = -\frac{2}{5}$
3. $\sqrt[3]{\frac{m^6}{125}} = \frac{\sqrt[3]{m^6}}{\sqrt[3]{125}} = \frac{m^2}{5}$

3. $\left(\sqrt[n]{a}\right)^n = a$

Examples:

1. $\left(\sqrt[3]{9}\right)^3 = 9$
2. $\left(\sqrt[3]{27}\right)^3 = 27$
3. $\sqrt{81} = \sqrt{9^2} = 9$

4. $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a} = \sqrt[n]{\sqrt[m]{a}}$

Examples:

1. $\sqrt[6]{9} = \sqrt[3]{\sqrt{3^2}} = \sqrt[3]{3}$
2. $\sqrt[3]{\sqrt{8}} = \sqrt{\sqrt[3]{8}} = \sqrt{\sqrt[3]{2^3}} = \sqrt{2}$

Were you able to analyze each example? If YES, then you are ready perform the next activity.

Simplifying Radical Expressions

When is a radical expression considered simplified?
The following are the three conditions:

1. The radicand has no factor raised to a power greater than or equal to the index.
2. The radical does not contain a fraction or the denominator of the expression does not contain a fraction.
3. The index of the radical is in the lowest possible form

Let us illustrate each condition as we show how it is simplified by applying the laws of radicals.

CONDITION 1: The radicand has no factor raised to a power greater than or equal to the index.

Example 1: Simplify $\sqrt{24}$

To simplify $\sqrt{24}$, first check to see if the radicand is divisible by a perfect square (the square of a natural number) such as 4, 9, …. Choose the largest perfect square that divides in to 24, which is 4. Write 24 as the product of 4 and 6, then use the product rule.

$$\sqrt{24} = \sqrt{4 \cdot 6} = \sqrt{4} \cdot \sqrt{6} = 2\sqrt{6}$$

Example 2: Simplify $\sqrt{108}$

It may not be obvious that 108 is divisible by the perfect square 36. In such a case, factor the radicand into its prime factors to aid in identifying perfect squares.

$$\sqrt{108} = \sqrt{2^2 \cdot 3^3} = \sqrt{2^2 \cdot 3^2 \cdot 3} = \sqrt{2^2} \cdot \sqrt{3^2} \cdot \sqrt{3} = 2 \cdot 3 \cdot \sqrt{3} = 6\sqrt{3}$$

Example 3: Simplify $\sqrt[3]{16}$

Look for the largest perfect cube root that divides into 16.

$$\sqrt[3]{16} = \sqrt[3]{8 \cdot 2} = \sqrt[3]{8} \cdot \sqrt[3]{2} = 2\sqrt[3]{2}$$

Examples using radicals with variables:

Example 4: Simplify $\sqrt{16x^3} = \sqrt{16x^2} \cdot \sqrt{x}$ factor(square root; look for ways to factor squares)

$= 4x\sqrt{x}$

Example 5: Simplify $\sqrt{200x^7q^8}$

$= \sqrt{200} \cdot \sqrt{x^7} \cdot \sqrt{q^8}$ separate the individual elements

$= \sqrt{100 \cdot 2} \cdot x \cdot \sqrt{(q^4)^2}$ factor (square root; look for ways to factor squares)

$=10 \cdot \sqrt{2} \cdot x^3 \cdot \sqrt{x} \cdot$ take the perfect squares "outside" the radical sign
$= 10x^3q^4\sqrt{2x}$ commutative property

CONDITION 2: The radical does not contain a fraction or the denominator of the expression does not contain a fraction.

Example 6: Simplify $\sqrt{\frac{1}{2}}$

Multiply the radicand by $\frac{2}{2}$ to make the denominator a perfect square

$$\sqrt{\frac{1}{2} \cdot \frac{2}{2}} = \sqrt{\frac{2}{4}} = \frac{\sqrt{2}}{2}$$

Another solution is $\sqrt{\frac{1}{2}} \bullet \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{\sqrt{4}} = \frac{\sqrt{2}}{2}$

Example 7: Simplify $\frac{2}{\sqrt[3]{4}}$

Multiply the radicand by $\frac{\sqrt[3]{4^2}}{\sqrt[3]{4^2}}$ to make the denominator a perfect square

$\frac{2}{\sqrt[3]{4}} \bullet \frac{\sqrt[3]{4^2}}{\sqrt[3]{4^2}} = \frac{2\sqrt[3]{16}}{\sqrt[3]{4^3}}$ apply the law of radicals $\left(\sqrt[n]{a}\right)^n = a$

$$\frac{2\sqrt[3]{16}}{\sqrt[3]{4^3}} = \frac{2\sqrt[3]{16}}{4} = \frac{\sqrt[3]{16}}{2}$$

Example 8: Simplify $\sqrt[3]{\frac{4}{x}}$

Multiply the radicand by $\frac{\sqrt[3]{x^2}}{\sqrt[3]{x^2}}$ to make the denominator a perfect square

$$\sqrt[3]{\frac{4}{x}} \bullet \frac{\sqrt[3]{x^2}}{\sqrt[3]{x^2}} = \frac{\sqrt[3]{4x^2}}{\sqrt[3]{x^3}} = \frac{\sqrt[3]{4x^2}}{x}$$

The process of eliminating the radicals in the denominator of a fraction is called ***rationalization***

CONDITION 3: The index of the radical is in the lowest possible form

Simplify Radicals by Using Smaller Indexes

Sometimes we can write a radical using rational exponents and then simplify the rational exponent to lowest terms. Then we write the answer as a radical.

Example 9: Simplify $\sqrt[9]{5^6} = 5^{\frac{6}{9}} = 5^{\frac{2}{3}} = \sqrt[3]{5^2} = \sqrt[3]{25}$

Transform the radical into rational expressions then reduce the exponent to lowest term

Example 10: Simplify $\sqrt[4]{25} = (25)^{\frac{1}{4}} = (5^2)^{\frac{1}{4}} = 5^{\frac{2}{4}} = 5^{\frac{1}{2}} = \sqrt{5}$

Example 11: Simplify $\sqrt[3]{24x^4y^8} = \sqrt[3]{24x^4y^8} = \sqrt[3]{8 \bullet 3x^3xy^5y^3}$

$$= \sqrt[3]{2^3 \bullet 3x^3xy^6y^2}$$
$$= (2^3x^3y^6 \bullet 3xy^2)^{\frac{1}{3}}$$
$$= 2^{\frac{3}{3}}x^{\frac{3}{3}}y^{\frac{6}{3}} \bullet 3^{\frac{1}{3}}x^{\frac{1}{3}}y^{\frac{2}{3}}$$
$$= 2xy^2\sqrt[3]{3xy^2}$$

Explore

You have learned how to simplify radicals by applying the laws of radicals and now let us put those skills in higher level through the different activities.

Activity 3: Try this out!

Directions: Use the laws of radicals to answer the following problems. Write your answer on your answer sheets.

1. $\sqrt{18} =$ ______________
2. $\sqrt{12} =$ ______________
3. $\sqrt[3]{16} =$ ______________
4. $\sqrt{\frac{2}{3}} =$ ______________
5. $\sqrt[6]{64} =$ ______________

Activity 4: Who Am I?

Directions: Use the laws of radicals to answer the following problems. Write your answer on your answer sheets.

WHO IS THIS MATHEMATICIAN

This Polish mathematician was the first to use the symbol $\sqrt{}$ for square root. Born in 1499, he studied algebra at the University of Vienna between 1517 and 1521. He was a German mathematician whose book *Coss* is the first German Algebra book in 1525. He introduced the radical symbol (√) for the square root. It is believed that this was because it resembled a lowercase "r" (for "radix").

To find out:

1. Find the answer to each number.
2. Write the letter under its matching number in the DECODER.

$\sqrt[3]{16}$	$\sqrt{80}$	$-\sqrt{28}$	$\sqrt{9x^3}$	$\sqrt{75x^2}$	$\sqrt[3]{\frac{1}{8}}$	$\sqrt{9x^4}$	$-\sqrt{144x}$	$\sqrt[3]{24x^4}$	$\sqrt{50x^{11}}$	$\sqrt{\frac{1}{3}}$
I	**O**	**U**	**C**	**H**	**D**	**S**	**R**	**T**	**F**	**L**

$3x\sqrt{x}$	$5x\sqrt{3}$	$-12\sqrt{x}$	$2\sqrt[3]{2}$	$3x^2$	$2x\sqrt[3]{3x}$	$4\sqrt{5}$	$5x^5\sqrt{2x}$	$5x^5\sqrt{2x}$

$-12\sqrt{x}$	$-2\sqrt{7}$	$\frac{1}{2}$	$4\sqrt{5}$	$\frac{\sqrt{3}}{3}$	$5x^5\sqrt{2x}$	$5x^5\sqrt{2x}$

Deepen

Activity 5: Guess What?

What goes up when the rain comes down?

Directions: Perform and simplify the following radicals. Write the letter of the correct answer on your answer sheets. Keep working and you will discover the answer the questions

$2x$	$\sqrt{5}$		$\sqrt{10x}$	$3\sqrt{2x}$	$\frac{2\sqrt{5}}{5}$	$\frac{10\sqrt{3x}}{3x^3}$	$3x\sqrt{5x}$	$x\sqrt[3]{x}$	$x\sqrt[3]{x}$	$2x$

1. $\sqrt{2x} \bullet \sqrt{5} = U$
2. $\sqrt[3]{x^4} = L$
3. $\frac{10}{\sqrt{3x^5}} = R$
4. $\sqrt{45x^3 = E}$
5. $\frac{\sqrt{4}}{\sqrt{5}} = B$
6. $\sqrt{18x} = M$
7. $\sqrt[4]{16x^4} = A$
8. $\sqrt[4]{25} = N$

Activity 6: Do you know?

Why are Oysters greedy?

Directions: Perform and simplify the following radicals. Copy the table on your answer sheets and write the letter in the box above its correct. Decode the answer to the question.

$\frac{x^2}{3}$	$10\sqrt{x}$	$5\sqrt[3]{x}$	$x\sqrt[3]{x}$		$6\sqrt{6}$	3	$5\sqrt[3]{x}$

$5x\sqrt{3}$	$10\sqrt{x}$	$5\sqrt[3]{x}$	3x	3x	$14\sqrt{x}$	$2\sqrt[3]{6}$	$5x\sqrt{3}$	$10\sqrt{x}$

1. $\sqrt[3]{125x} = E$
2. $\sqrt{75x^2} = S$
3. $\frac{\sqrt{x^4}}{\sqrt{9}} = T$
4. $\sqrt{100x} = H$
5. $\sqrt[5]{243} = R$
6. $\sqrt{216} = A$
7. $2\sqrt{49x^3} = F$
8. $\sqrt[3]{48} = I$
9. $\sqrt[4]{81x^4} = L$
10. $\sqrt[3]{x^4} = Y$

Gauge

Post Assessment

Directions: Choose the letter of the correct answer and write it on your answer sheets.

1. What is the simplified form of $\sqrt{800}$?

   A. $2\sqrt{200}$ B. $4\sqrt{50}$ C. $20\sqrt{2}$ D. $20\sqrt{20}$

2. What is $\sqrt[10]{4^5}$ when expressed to lesser index?

   A. 2 B. 4 C. 6 D. 8

3. What is $\sqrt{\frac{1}{25}}$ when simplified?

   A. $\frac{1}{5}$ B. 25 C. $\frac{1}{25}$ D. 65

4. What is $(\sqrt{5})(\sqrt{3})$?

   A. $\sqrt{8}$ B. $\sqrt{15}$ C. $5\sqrt{3}$ D. $3\sqrt{5}$

5. What is the value of $\sqrt[3]{8} \bullet \sqrt[3]{3}$?

   A. $\sqrt[3]{3}$ B. $2\sqrt[3]{3}$ C. $3\sqrt[3]{3}$ D. $\sqrt[3]{3}$

6. What is the result of $\sqrt{\frac{4}{3}}$ when we rationalized?

   A. $\frac{2}{\sqrt{3}}$ B. $\frac{2\sqrt{3}}{3}$ C. $2\sqrt{3}$ D. $\frac{\sqrt{6}}{3}$

7. What is the simplified form of$\sqrt{50x^2}$?

   A. $x\sqrt{50x}$ B. $5x\sqrt{2}$ C. $25x^2\sqrt{2x^2}$ D. $5\sqrt{2x^2}$

8. Using the laws of radicals, what is the simplified form of $\frac{\sqrt{16}}{\sqrt{36}}$?

   A. $\frac{1}{9}$ B. $\frac{4}{6}$ C. $\frac{4}{\sqrt{6}}$ D. $\frac{2}{3}$

9. Simplify $\sqrt{18x^2y^4}$.

   A. $3xy^2\sqrt{2}$ B. $3xy^2$ C. $\sqrt{3xy}$ D. $9xy^2$

10. What is the value of $-\frac{\sqrt{1}}{\sqrt{49}}$ when simplified?

    A. $-\frac{1}{9}$ B. $\frac{1}{7}$ C. $-\frac{1}{7}$ D. 7

11. Which of the following is not a condition that a radical is simplified?

    A. The radicand can be a fraction.
    B. The index of the radical is in the lowest possible form.
    C. The radical does not contain a fraction in the denominator.
    D. The radicand has no factor raised to a power greater than or equal to the index.

12. Which of the following is the definition of rationalizing the denominator?

    A. The process of simplifying radicals.
    B. The process of multiplying radicals.
    C. The process of moving out the radicals in the denominator.
    D. The process of eliminating the radicals in the denominator of a fraction.

13. What is the first step in simplifying $\sqrt[4]{\sqrt{3}}$ to an expression with only one radical symbol?
    A. Write the expression into exponential form.
    B. Write the expression into lowest term.
    C. Write the expression into radical form.
    D. Write the expression into simplified form.
14. What is $\sqrt{x} \bullet \sqrt[5]{x}$?
    A. $\sqrt[7]{x^{10}}$ B. $\sqrt[10]{x^7}$ C. $\sqrt[10]{x}$ D. $\sqrt[7]{x}$
15. How do we write $\sqrt[3]{\sqrt{7}}$using only one radical symbol?
    A. $\sqrt{7}$ B. $\sqrt[3]{7}$ C. $\sqrt[5]{7}$ D. $\sqrt[6]{7}$

Great job! You made it. Congratulations!

References

Books:

Bryant, Merden L., Leonides E Bulalayao, Melvin M. Callanta, Jerry D Cruz Richard F. De Vera, Gilda T. Garcia, Sonia E Javier, Roselle A. Lazaro, Bernadeth J. Mesterio Rommel Hero A Saladino, *Mathematics Grade 9 Learner's Module* First Edition 2014, Reprinted 2016, Sunshine Interlinks Publishing House, Inc. pages 251-260.

Department of Education (2014), Mathematics Grade 9 Teacher's Guide, Module 4: Zero Exponents, Negative Integral Exponents, Rational Exponents, ands Radicals, First Edition

EASE Modules, Year 2 – Module 1 Radical Expressions, pages 11-12

Oronce, Orlando A.,Marilyn O. Mendoza, *Exploring Mathematics: Intermediate Algebra II* , RBS Mathematics Series, First Edition 2003, Rex Bookstore Incorporation, pages 141- 150

Oronce, Orlando A.,Marilyn O. Mendoza, *E-Math 9 Worktext,* Revised Edition 2015, Reprinted 2016, Rex Bookstore Incorporation, pages 33-48

Websites:

Pinterest-Simplifying Radicals (Modified): EASE Modules, Year 2- Module 2 Radical Expressions, page 9-10

"Math Open Resources" accessed August 10, 2020https://www.mathopenref.com/radical.html

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