Radical Yet Rational, Part 2

Solving With Rational Exponents and Radicals

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Grade Level	10th – 11th Grade	**Time Frame**	80-90 minutes
Subject	Mathematics	**Duration**	2 class periods
Course	Algebra 2		

Essential Question

How do we use rational exponents and radicals to solve problems?

Summary

In this lesson, students will recall solving quadratic equations and rewriting radical expressions as expressions with rational exponents and vice versa. Students will learn how to solve equations with rational exponents and radicals. Then, students will apply this new knowledge to both mathematical and real-world problems. This is the second lesson of three in the "Radical Yet Rational" lesson series.

Snapshot

Engage

Students recall rewriting and simplifying expressions with rational exponents and radicals.

Explore

Students solve quadratic equations and apply what they know to equations with rational exponents.

Explain

Students complete guided notes with the class and formalize their understanding of how to solve equations with rational exponents using either radicals or rational exponents.

Extend

Students apply what they have learned to solve real-world problems.

Evaluate

Students select three equations from a Choice Board and demonstrate their understanding of how to solve equations with rational exponents using either radicals or rational exponents.

Standards

Oklahoma Academic Standards for Mathematics (Grades 9, 10, 11, 12)

A2.N.1.4: Understand and apply the relationship of rational exponents to integer exponents and radicals to solve problems.
A2.A.2.4: Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Attachments

- Choice Board—Radical Yet Rational Part 2 - Spanish.docx
- Choice Board—Radical Yet Rational Part 2 - Spanish.pdf
- Choice Board—Radical Yet Rational Part 2.docx
- Choice Board—Radical Yet Rational Part 2.pdf
- Guided Notes Teacher Guide and Model Notes—Radical Yet Rational Part 2.docx
- Guided Notes Teacher Guide and Model Notes—Radical Yet Rational Part 2.pdf
- Guided Notes—Radical Yet Rational Part 2.docx
- Guided Notes—Radical Yet Rational Part 2.pdf
- Guided-Notes-Radical-Yet-Rational-Part-2 - Spanish.docx
- Guided-Notes-Radical-Yet-Rational-Part-2 - Spanish.pdf
- Lesson Slides–Radical Yet Rational Part 2.pptx
- Real World Rational Exponents—Radical Yet Rational Part 2.docx
- Real World Rational Exponents—Radical Yet Rational Part 2.pdf
- Real-World-Rational-Exponents-Radical-Yet-Rational-Part-2 - Spanish.docx
- Real-World-Rational-Exponents-Radical-Yet-Rational-Part-2 - Spanish.pdf
- Search and Solve—Radical Yet Rational Part 2.docx
- Search and Solve—Radical Yet Rational Part 2.pdf
- Search-and-Solve-Radical-Yet-Rational-Part-2 - Spanish.docx
- Search-and-Solve-Radical-Yet-Rational-Part-2 - Spanish.pdf

Materials

- Lesson Slides (attached)
- Search and Solve handout (attached; one per pair; printed front only)
- Guided Notes handout (attached; one per student; printed front only)
- Guided Notes (Teacher Guide and Model Notes) (attached; for teacher use)
- Real-World Rational Exponents handout (attached; one per pair; printed front only)
- Choice Board handout (attached; one per student; printed front only)
- Pencils

5 minutes

Engage

Introduce the lesson using the attached **Lesson Slides**. Display **slide 3** to share the lesson's essential question with students. Go to **slide 4** to share the lesson's learning objectives. Review each of these with your class to the extent you feel necessary.

Go to **slide 5** and ask students to find a partner or assign student pairs. Pass out the attached **Search and Solve** handout to each pair of students.

Direct students' attention to the first part of the handout: Find the Mistake. (Students will complete the second part of the handout during the Explore portion of this lesson.) Have students work in pairs to look through the given problem and find the mistake in the simplifying process. On the handout, ask students to describe and correct the error in their own words.

After giving students time to complete the task, ask for volunteers to share their thoughts. Use student responses to see which misconceptions remain from the previous lesson: "Radical Yet Rational, Part 1."

15 minutes

Explore

Display **slide 6**. Direct students' attention to the second part of the Search and Solve handout: Solve. Ask students to work in pairs to solve the given equations.

As students work through these problems at their own pace, slowly transition through **slides 7–8** so students can check their work on the first two questions. Use this time to clear up any misconceptions students still have about solving quadratic equations.

Teacher's Note: Guiding the Lesson

Students are likely to succeed in solving the quadratic equations by using square roots, since that is a topic recently covered in Algebra 2. However, students may struggle with solving the cubic equation and the equation with the rational exponent. On these last two questions, ask students to show all their thinking, written algebraically and/or in words.

To give students a push in the right direction, encourage students to apply what they know about solving quadratics and what they learned in the previous lesson about rewriting rational exponents. *Try not to give students the next steps or the answers.* At this point in the lesson, students should just determine what they already know and try to develop ideas for how this might apply to similar scenarios. These two questions will be worked out in full during the Explain portion of the lesson.

Go to **slide 9** and ask students to share their thinking on how to solve questions 3 and 4—what they know, what they are unsure of, etc. Remind the class it is okay that these problems are not completely solved yet, since this time is for students to determine what they already know.

As students share, take note of which misconceptions exist. Be sure to address these during the Explain portion of the lesson.

25 minutes

Explain

Teacher's Note: Pacing the Lesson

If you have a traditional 45-minute class period, this lesson must be paused and resumed the next day. For a smooth transition, consider pausing and resuming the lesson during the Explain portion. Finish the first class period after completing the first two examples from the Guided Notes handout, and send students home thinking about the third example. You can begin the next class period by having students share their ideas for the third example.

Display **slide 10** and pass out the attached **Guided Notes** handout to each student. Complete the handout as a class. Have students add this handout to their math notebooks if that is a classroom norm.

Teacher Guide and Model Notes

To see guiding questions for each problem and an example of how to fill out the Guided Notes handout, refer to the attached **Guided Notes (Teacher Guide and Model Notes)** document. These notes are intended to show students how to solve equations using more than one method. As you go through the Guided Notes, consider reminding students that they need to write both methods in their notes for later reference. This way, when they are asked to practice on their own, they can choose their preferred method.

Teacher's Note: Communicating Expectations

Decide what you want students' later work to look like and be sure to inform students of your expectations. Do you expect students to demonstrate a specified method on certain problems but otherwise have choice? Do you expect students to have choice on every problem and not need to demonstrate mastery of both methods?

20 minutes

Extend

Inform students it is time for them to apply what they have learned. Display **slide 11** and pass out the attached **Real-World Rational Exponents** handout to each pair of students.

Have students work in pairs to answer the questions in each scenario. As students wrap up the first scenario, slowly transition through **slides 12–13** so students can check their work.

As students wrap up the second scenario, slowly transition through **slides 14–15** so students can check their work.

15 minutes

Evaluate

Use the Choice Board strategy to assess students' ability to solve equations with radicals and rational exponents using either method. Display **slide 16** and pass out the attached **Choice Board** handout to each student.

The handout contains nine questions, which are divided into three columns (A, B, and C) and three rows (1, 2, and 3). Students are to select one question per column and one question per row, completing a total of three questions.

In column A, students must provide a written explanation of how to solve one of the equations containing rational exponents. In column B, students must algebraically solve one equation containing radicals. In column C, students must algebraically solve one equation containing rational exponents.

Teacher's Note: Guiding the Activity

Before beginning this activity, ensure that all students understand the directions. Consider giving students an example. If they choose the first question in column A—let's call it question 1A—they may not choose another question from row 1 or column A for credit. In other words, if they pick question 1A, they may not do question 1B, 1C, 2A, or 3A for credit. Then, let's say they choose the third question in column B—in this case, they *must* complete the second question in column C. In other words, they would complete questions 1A, 2C, and 3B.

Possible combinations are as follows:

1A–2B–3C 1B–2A–3C 1C–2A–3B

1A–2C–3B 1B–2C–3A 1C–2B–3A

Use student responses to see which misconceptions persist before moving on to the next lesson: "Radical Yet Rational, Part 3."

Resources

- ElisaRiva. (2017, February 13). Brain, mind, psychology [Illustration]. Pixabay. https://pixabay.com/illustrations/brain-mind-psychology-idea-drawing-2062057/
- K20 Center. (n.d.). Choice Boards. Strategies. https://learn.k20center.ou.edu/strategy/73
- K20 Center. (n.d.). Desmos Classroom. Tech tools. https://learn.k20center.ou.edu/tech-tool/1081