Mathematics Station Activities

for Common Core State Standards

Grade 8

WALCH EDUCATION®

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Standards Correlations

The standards correlations below support the implementation of the Common Core Standards. This book includes station activity sets for the Common Core domains of The Number System; Expressions and Equations; Functions; Geometry; and Statistics and Probability. The following table provides a listing of the available station activities organized by Common Core standard.

The left column lists the standard codes. The first number of the code represents the grade level. The grade number is followed by the initials of the Common Core domain name, which is then followed by the standard number. The middle column of the table lists the title of the station activity set that corresponds to the standard(s), and the right column lists the page number where the station activity set can be found.

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Standards Correlations

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The Number System

Set 1: Radicals and Irrational Numbers

Instruction

Goal: To provide opportunities for students to develop concepts and skills related to simplifying radicals, performing operations with radicals, and classifying and comparing rational versus irrational numbers

Common Core Standards

The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers.

8.NS.1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion, which repeats eventually into a rational number.

Student Activities Overview and Answer Key

Station 1

Students are given 18 small, equal-sized algebra square tiles. Students work together to simplify radicals by factoring out a perfect square, using the algebra tiles as a visual reference. Students show two different ways to simplify a given radical by factoring out perfect squares.

Answers

1. $\sqrt{4}$; 4; $\sqrt{4 \bullet 2}$; $2\sqrt{2}$
2. $\sqrt{12}$; 4; $\sqrt{4 \bullet 3}$; $2\sqrt{3}$
3. $\sqrt{18}$; 9; $\sqrt{9 \bullet 2}$; $3\sqrt{2}$
4. $\sqrt{48} = \sqrt{16 \bullet 3} = 4\sqrt{3}$ and $\sqrt{48} = \sqrt{12 \bullet 4} = 2\sqrt{12} = 2\sqrt{4 \bullet 3} = 4\sqrt{3}$

Station 2

Students are given 12 index cards with the following numbers written on them:

$-25\sqrt{12}$, $3\sqrt{12}$, $-8\sqrt{3}$, $\sqrt{3}$, $10\sqrt{7}$, $12\sqrt{10}$, $-4\sqrt{10}$, $100\sqrt{10}$,
$12\sqrt{15}$, $-20\sqrt{15}$, $15\sqrt{21}$, $21\sqrt{21}$

The index cards will be shuffled. One student will deal each student an equal number of cards (i.e., if there are four students, then each student will receive three cards). Each student will place one of their cards in the center of the table. Students will work together to determine which radicals can be added together or subtracted.

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Answers

1. Answers will vary. Possible answers:
   $-25\sqrt{12} + 3\sqrt{12} = -22\sqrt{12}$ and $-25\sqrt{12} - 3\sqrt{12} = -28\sqrt{12}$ OR
   $3\sqrt{12} - (-25\sqrt{12}) = 28\sqrt{12}$
2. Answers will vary. Possible answers:
   $12\sqrt{10} + 100\sqrt{10} = 112\sqrt{10}$ and $12\sqrt{10} - 100\sqrt{10} = -88\sqrt{10}$ OR
   $100\sqrt{10} - 12\sqrt{10} = 88\sqrt{10}$
3. Answers will vary. Possible answers:
   $15\sqrt{21} + 21\sqrt{21} = 36\sqrt{21}$ and $15\sqrt{21} - 21\sqrt{21} = -6\sqrt{21}$ OR
   $21\sqrt{21} - 6\sqrt{21} = 15\sqrt{21}$
4. The radicands have to be equal.

Station 3

Students are given 12 index cards with the following numbers written on them:

$$5\sqrt{12},\ 3\sqrt{4},\ -8\sqrt{15},\ 6\sqrt{6},\ 12\sqrt{10},\ -4\sqrt{10},\ 7\sqrt{2},\ 8\sqrt{20},\ 12\sqrt{10},\ 15\sqrt{20},\ 3\sqrt{5},\ \sqrt{30}$$

Students will draw two cards at a time from the pile of index cards. They will work together to multiply and divide the radicals on the index cards and record their answers in a table.

Answers

Answers will vary. Possible answers:

Index card #1	Index card #2	Multiplication	Division
$5\sqrt{12}$	$3\sqrt{4}$	$15\sqrt{48} = 60\sqrt{3}$	$\frac{5\sqrt{12}}{3\sqrt{4}} = \frac{5\sqrt{3}}{3}$
$6\sqrt{6}$	$-4\sqrt{10}$	$-24\sqrt{60} = -48\sqrt{15}$	$\frac{6\sqrt{6}}{-4\sqrt{10}} = \frac{3\sqrt{3}}{-2\sqrt{5}}$

Instruction

Station 4

Students use two number cubes to generate two numbers. They work together to arrange the two numbers as a rational number and an irrational number. Students give their reasoning behind creating rational and irrational numbers for the same two numbers.

Answers

1–4. Answers will vary.

Materials List/Setup

Station 1 18 small, equal-sized algebra square tiles

Station 2 12 index cards with the following numbers written on them:

$-25\sqrt{12}$, $3\sqrt{12}$, $-8\sqrt{3}$, $\sqrt{3}$, $10\sqrt{7}$, $12\sqrt{10}$, $-4\sqrt{10}$,
$100\sqrt{10}$, $12\sqrt{15}$, $-20\sqrt{15}$, $15\sqrt{21}$, $21\sqrt{21}$

Station 3 12 index cards with the following numbers written on them:

$5\sqrt{12}$, $3\sqrt{4}$, $-8\sqrt{15}$, $6\sqrt{6}$, $12\sqrt{10}$, $-4\sqrt{10}$,
$7\sqrt{2}$, $8\sqrt{20}$, $12\sqrt{10}$, $15\sqrt{20}$, $3\sqrt{5}$, $\sqrt{30}$

Station 4 two number cubes

Instruction

Discussion Guide

To support students in reflecting on the activities and to gather formative information about student learning, use the following prompts to facilitate a class discussion to "debrief" the station activities.

Prompts/Questions

1. How do you simplify radicals using a perfect square?
2. Provide three real-world examples of when you would use and simplify radicals.
3. What has to be equal in order to add and subtract radical numbers? What is this quantity called?
4. How do you add and subtract radical numbers?
5. How do you multiply and divide radical numbers?
6. How can you tell if a number is rational or irrational?

Think, Pair, Share

Have students jot down their own responses to questions, then discuss with a partner (who was not in their station group), and then discuss as a whole class.

Suggested Appropriate Responses

1. Factor out the perfect square and then take the square root of each number.
2. Answers may vary. Possible answers: Construction—using the Pythagorean theorem to construct triangular woodwork; Physics—using radicals in distance and acceleration equations; Finance—using radicals in calculations such as net present value.
3. The quantity under the radical sign is known as the radicand.
4. Add and/or subtract the numbers in front of the radical. Leave the radicand the same.
5. For multiplication, multiply the numbers in front of the radical. Multiply the radicands. For division, divide the numbers in front of the radical. Divide the radicands.
6. A rational number can be expressed exactly by a ratio of two integers. An irrational number cannot be expressed exactly by a ratio of two integers.

Possible Misunderstandings/Mistakes

- When a perfect square is identified, not taking the square root of the number before placing it in front of the radical
- Adding or subtracting radicals that do not have the same radicand
- Adding or subtracting the radicands
- Not multiplying or dividing the radicands in addition to multiplying and dividing the numbers in front of the radical

NAME:

The Number System

Set 1: Radicals and Irrational Numbers

Station 1

You will be given 18 square algebra tiles and will need to simplify $\sqrt{8}$, $\sqrt{12}$, and $\sqrt{18}$. Work together to create a group of 8 algebra tiles, factor out a perfect square, and simplify the radical. Repeat this process for a group of 12 algebra tiles and then 18 algebra tiles. Write your answers below.

1. Simplify $\sqrt{8}$.

   What perfect square can you factor out of $\sqrt{8}$? _____

   Rewrite the original radical in factored form: _____

   Find the square root of the perfect square and write your final answer for $\sqrt{8}$.

2. Simplify $\sqrt{12}$.

   What perfect square can you factor out of $\sqrt{12}$? _____

   Rewrite the original radical in factored form: _____

   Find the square root of the perfect square and write your final answer for $\sqrt{12}$.

3. Simplify $\sqrt{18}$.

   What perfect square can you factor out of $\sqrt{18}$? _____

   Rewrite the original radical in factored form: _____

   Find the square root of the perfect square and write your final answer for $\sqrt{18}$.

4. In the space below, show two different ways to simplify $\sqrt{48}$ by factoring out perfect squares.

The Number System

Set 1: Radicals and Irrational Numbers

Station 2

You will be given 12 index cards with the following numbers written on them:

$-25\sqrt{12}$, $3\sqrt{12}$, $-8\sqrt{3}$, $\sqrt{3}$, $10\sqrt{7}$, $12\sqrt{10}$, $-4\sqrt{10}$,
$100\sqrt{10}$, $12\sqrt{15}$, $-20\sqrt{15}$, $15\sqrt{21}$, $21\sqrt{21}$

Shuffle the index cards. Have one group member deal each of you an equal number of cards (i.e., if there are four students, then each one will receive three cards). Have each student place one of their cards in the center of the table. Work together to determine which radicals can be added together or subtracted. If none of the radicals can be added or subtracted, then place a round of new cards on the table. Repeat this process with your remaining cards. If time permits, reshuffle the cards and play again.

1. What radicals could be added and subtracted in round one? _____

   Add and subtract these radicals: _____

2. What radicals could be added and subtracted in round two? _____

   Add and subtract these radicals: _____

3. What radicals could be added and subtracted in round three? _____

   Add and subtract these radicals: _____

4. How did you know which radicals could be added or subtracted?

NAME:

The Number System

Set 1: Radicals and Irrational Numbers

Station 3

You will be given 12 index cards with the following numbers written on them:

$$5\sqrt{12},\ 3\sqrt{4},\ -8\sqrt{15},\ 6\sqrt{6},\ 12\sqrt{10},\ -4\sqrt{10},\ 7\sqrt{2},\ 8\sqrt{20},\ 12\sqrt{10},\ 15\sqrt{20},\ 3\sqrt{5},\ \sqrt{30}$$

Place the index cards in a pile. Have one student draw two index cards. Work together to multiply and divide the radicals on the index cards. Repeat this process with your remaining cards. If time permits, reshuffle the cards and play again.

Record the index cards and your answers in the table below. Remember to simplify your answer.

Index card #1	Index card #2	Multiplication	Division

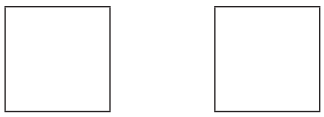
The Number System

Set 1: Radicals and Irrational Numbers

Station 4

Use the two number cubes provided for problems 1–4.

1. Roll each number cube and record the results in the boxes below.



2. Work with other students to arrange these two numbers so they make up a rational number. Write your answer below. Give a reason for your answer.

3. Work with other students to arrange these two numbers so that they are irrational. Write your answer below. Give a reason for your answer.

4. Repeat the process three more times.