

Squares, Square Roots and Exponential Expressions

Summary

Identify the inverse of a square or square root. Write expressions in exponential form. Evaluate exponential expressions

Main Core Tie

Mathematics Grade 8

[Strand: EXPRESSIONS AND EQUATIONS \(8.EE\) Standard 8.EE.1](#)

Additional Core Ties

Mathematics Grade 6

[Strand: EXPRESSIONS AND EQUATIONS \(6.EE\) Standard 6.EE.1](#)

Mathematics Grade 8

[Strand: EXPRESSIONS AND EQUATIONS \(8.EE\) Standard 8.EE.2](#)

Materials

- Color Tiles (25 for each team)
- [Foldable Perfect Square and Square Roots](#)
(two sided)
- Linker Cubes (100 for each team)
- " [Operations and Exponents](#)", " [Exponential Expressions](#)"
- TI-73 graphing calculators

Background for Teachers

Enduring Understanding (Big Ideas):

Exponential expressions model real world situations

Essential Questions:

How is n^2 different from $2n$, n^3 different from $3n$?

How is n^2 related to n^2

How can I simplify exponential expressions

Skill Focus:

writing and evaluating exponential expressions

Vocabulary Focus:

base, power, exponent, square number, square root, cube, exponential form, exponential expression

Instructional Procedures

Starter: Find the answers

Circle the expression(s) or model with the greatest value in each problem below.

$$2 \cdot 19 \quad 19 + 19 \quad 19^2$$

$$7 + 7 \quad 7^2 \quad 7 \cdot 7$$

$$5 + 5 \quad 5 \cdot 5 \quad 5^2$$

$$3 \times 3 \quad 3 + 3$$

Lesson Segment 1: How is n^2 related to n^2 ? How is n^2 different from $2n$? How is n^3 different from $3n$?

Use "Building A Square Patio" (attached), an investigation with Color Tiles to help students visualize the inverse relationship between squaring a number and taking the square root of that perfect square. Student pairs or teams can build each patio using the Color Tiles. Discuss each step as a class focusing on the relationship between the side length and the root, between the square and total tiles,

and between the root and the square.

Briefly review with students how to write a base number and an exponent. Students have used this notation since 5th grade. Show students how to use the 6 or 7 keys on a TI-73 to write exponential expressions. Have them use the calculator and the attached Foldable Perfect Squares and Square Roots to build a table of values. Copy the foldable to make two sided page that will be folded in thirds on the dotted line.

Have students work with partners to complete the investigation, "Operations and Exponents". Discuss possible answers to question # 4 and 5 on the investigation. Handout the journal page for exponents (attached).

Lesson Segment 2: What are some real-world applications for exponential notation? How is n^2 related to n^2 ?

Follow the instructions on the attached activity "Building Exponential Expressions With Color Tiles and Linker Cubes" to help students broaden their understanding and see real-world application.

Complete the Journal Page.

Lesson Segment 3: Practice and application

Journal: Do Mix-Freeze-Pair where students mix around the room until you say freeze. They find the person closest to them to be their partner. If no partner is immediately available, they raise their hand high and look for someone else with hand raise high. During this activity, you will model an example or two for each of the vocabulary words on the journal page and for items 1-4. Use the graphing calculator to show examples. Then you will have the students use their TI-73's to give an example to their partner, or you will give them an example and they will supply the vocabulary word for it.

Students should mix and find a new partner for each of the words.

The links on the District Math Page have some great examples of where exponents are used in the real world. Area, Volume, Scientific Notation, Biology, Astronomy, earthquake (Richter Scale). You may want to assign students to find a real world example to bring to class.

Game: Playing With Powers

Two players take turns rolling two dice and deciding which to use as a base and which to use as an exponent. After five turns, the players find the sum of the five exponential expressions they created. Player with the greatest sum, wins.

Assign students the attached Exponential Expressions practice attached, or appropriate text items.

Assessment Plan

performance task, writing

Bibliography

This lesson plan was created by Linda Bolin.

Authors

[Utah LessonPlans](#)