Introduction to Radicals

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Activity overview

This activity allows students to investigate radicals and the restrictions on radicand.

Concepts

.Even roots require non-negative radicands, odd roots do not.

Teacher preparation

Nice introductory exercise for beginning the discussion of radicals

Classroom management tips

Students should work in pairs or in groups in order to discuss the results as they go along.

TI-Nspire Applications

CAS simplification
Use of notation templates

Step-by-step directions

1) Use CAS to expand the following

$\sqrt{64}$
$-\sqrt{64}$
$\sqrt{-64}$
$\sqrt[3]{64}$
$-\sqrt[3]{64}$
$\sqrt[3]{-64}$

$\sqrt{64}$	8
$-\sqrt{64}$	-8
$\sqrt{-64}$	"Error: Non–real result"
$\sqrt[3]{64}$	4
$-\sqrt[3]{64}$	-4
$\sqrt[3]{-64}$	-4

2) When, if ever, will the square root of a number produce a non-real result?

3) When, if ever, will the cube root of a number produce a non-real result?

4) When, if ever, will the sixth root of a number produce a non-real result?

5) Think about your answers to questions 2,3,and 4 and answer the following:

When, if ever, will the n^{th} root of a number produce a non-real result? Why?

6) Use CAS to compute the following:

$\sqrt{9^2}$	$\sqrt{9^2}$ → 9
$\sqrt{(-9)^2}$	$\sqrt{(-9)^2}$ → 9
$\sqrt{-9^2}$	$\sqrt{-9^2}$ → "Error: Non−real result"
$\sqrt[3]{8^3}$	$\sqrt[3]{8^3}$ → 8
$\sqrt[3]{(-8)^3}$	$\sqrt[3]{(-8)^3}$ → −8
$\sqrt[3]{-8^3}$	$\sqrt[3]{-8^3}$ → −8
$\sqrt{x^2}$	$\sqrt{x^2}$ → $\lvert x \rvert$
$\sqrt[3]{x^3}$	$\sqrt[3]{x^3}$ → x
$\sqrt{64x^4}$	$\sqrt{64 \cdot x^4}$ → $8 \cdot x^2$
$\sqrt{64x^6}$	$\sqrt{64 \cdot x^6}$ → $8 \cdot \lvert x^3 \rvert$

7) One of these produces a non-real result. Is it consistent with your explanation on the prior page? Explain.

8) Some of these results have absolute values in them, some don't. Can you find the pattern? When might a radical expression simplify to something that contains an absolute value?

9) **WHY** do you think some radical expressions simplify to something that contains an absolute value?

- Assessment and evaluation

This is an exploratory exercise. It can be used as an introduction to radicals and prompt a wealthy discussion of why certain results are obtained. It is not an exercise to be assessed.

Activity extensions

Looking at a variety of roots helps students think about and formulate their own rules for simplification. One might have students look at $\sqrt{x^2+9}$ and $\sqrt{x^2+6x+9}$ for a rich discussion.

Student TI-Nspire Document

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1) Use CAS to expand the following:

$\sqrt{64}$ _____

$-\sqrt{64}$ _____

$\sqrt{-64}$ _____

$\sqrt[3]{64}$ _____

$-\sqrt[3]{64}$ _____

$\sqrt[3]{-64}$ _____

2) When, if ever, will the square root of a number produce a non-real result?

3) When, if ever, will the cube root of a number produce a non-real result?

4) When, if ever, will the sixth root of a number produce a non-real result?

5) Think about your answers to questions 2,3,and 4 and answer the following:
When, if ever, will the n^{th} root of a number produce a non-real result? Why?

6) Use CAS to compute the following:

$\sqrt{9^2}$ _____

$\sqrt{(-9)^2}$ _____

$\sqrt{-9^2}$ _____

$\sqrt[3]{8^3}$ _____

$\sqrt[3]{(-8)^3}$ _____

$\sqrt[3]{-8^3}$ _____

$\sqrt{x^2}$ _____

$\sqrt[3]{x^3}$ _____

$\sqrt{64x^4}$ _____

$\sqrt{64x^6}$ _____

7) One of these produces a non-real result. Is it consistent with your explanation on the prior page? Explain.

8) Some of these results have absolute values in them, some don't. Can you find the pattern? When might a radical expression simplify to something that contains an absolute value?

9) **WHY** do you think some radical expressions simplify to something that contains an absolute value?