

Number Forms Lab

Simplify expressions and identify rational and irrational results.

HIGH SCHOOL • AI-N.RN.3

AI-N.RN.3 "Use properties and operations to understand the different forms of rational and irrational numbers."

NAME _____

DATE _____

OPERATIONS AND NUMBER TYPES

A rational number can be written as a/b , where a and b are integers and b is not 0. Adding a rational number to an irrational number gives an irrational number, and multiplying a nonzero rational number by an irrational number also gives an irrational number. Simplify roots first so you can identify the number type.

WORKED EXAMPLE

Simplify $(4/11)\sqrt{75}$. Then classify the result as rational or irrational.

- $\sqrt{75} = \sqrt{25 \cdot 3} = 5\sqrt{3}$.
- $(4/11) \cdot 5\sqrt{3} = 20\sqrt{3}/11$.
- $20/11$ is a nonzero rational number, and $\sqrt{3}$ is irrational, so the product is irrational.

Answer: $20\sqrt{3}/11$, irrational

PRACTICE 6 problems

- 1** Is $-7/12$ rational or irrational?

ANSWER _____

- 2** Simplify $\sqrt{81}$. Then state whether the result is rational or irrational.

ANSWER _____

- 3** Simplify $\sqrt{98}$. Then state whether the result is rational or irrational.

ANSWER _____

- 4** Is $8 + \sqrt{17}$ rational or irrational?

ANSWER _____

- 5** Simplify $\sqrt{72}/6$. Then state whether the result is rational or irrational.

ANSWER _____

- 6** Simplify $\sqrt{19} + \sqrt{19}$. Then state whether the result is rational or irrational.

ANSWER _____

APPLY IT Show your work

- 1** A student is designing a square mural with an area of 50 square feet. The side length is $\sqrt{50}$ feet. A $\frac{1}{2}$ -foot border is added to one side length. What is the exact total length, and is it rational or irrational?

WORK SPACE

ANSWER _____

- 2** For a game design project, a route on a draft map is $\sqrt{200}$ cm long. The final display uses a scale of $\frac{7}{10}$ of the draft size. What is the exact route length on the final display, and is it rational or irrational?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let r be a rational number and let y be an irrational number. Explain why $r + y$ must be irrational.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Is $-7/12$ rational or irrational?	rational
2	Simplify $\sqrt{81}$. Then state whether the result is rational or irrational.	9, rational
3	Simplify $\sqrt{98}$. Then state whether the result is rational or irrational.	$7\sqrt{2}$, irrational
4	Is $8 + \sqrt{17}$ rational or irrational?	irrational
5	Simplify $\sqrt{72}/6$. Then state whether the result is rational or irrational.	$\sqrt{2}$, irrational
6	Simplify $\sqrt{19} + \sqrt{19}$. Then state whether the result is rational or irrational.	$2\sqrt{19}$, irrational

PART 2 • APPLY IT

- $5\sqrt{2} + 1/2$ feet, irrational** Simplify $\sqrt{50}$ to $5\sqrt{2}$, then add $1/2$. A rational number plus an irrational number is irrational.
- $7\sqrt{2}$ cm, irrational** $\sqrt{200} = 10\sqrt{2}$, and $(7/10)(10\sqrt{2}) = 7\sqrt{2}$. A nonzero rational multiple of an irrational number is irrational.

CHALLENGE

If $r + y$ were rational, then $(r + y) - r$ would be rational because rational numbers are closed under subtraction. But $(r + y) - r = y$, which would make y rational, a contradiction. Therefore, $r + y$ is irrational.

Accept equivalent simplified radical forms. For the challenge, accept any valid contradiction argument that uses closure of rational numbers under subtraction.