

NAME: _____

THE NUMBER SYSTEM

CCSS 8.NS.1

Irrational Numbers

Use the information below and what you know about irrational numbers to answer the question that follows.

An irrational number is a number that cannot be expressed as a fraction. Any decimals that are not terminating and do not repeat are irrational numbers. More technically, a rational number is a number that can be expressed in the form $\frac{x}{y}$, where x and y are integers and y is not 0.

Is $\sqrt{2}$ an irrational number? Why or why not? Explain your thinking.

Name: _____

Class: _____

AU8: Notes #2 – Square Roots

Date: _____

Warm-up:

Mr. Freeman's farm has a square cornfield. It has an area of 36 square yards. What is the length of the cornfield?

Vocabulary:

When you use a number as a factor two times, you are squaring that number or raising it to the second power. For example: $4^2 = 16$.

Numbers whose square roots are integers or quotients of integers are called perfect squares.

Let's list some other perfect squares that you know.

x	1	2	3	4	5	6	7	8	9	10
x^2										

x	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10
x^2										

Let's look at the inverse of squaring:

n	1	4	9	16	25	36	49	64	81	100
\sqrt{n}										
$-\sqrt{n}$										
$\pm\sqrt{n}$										

List some other perfect squares that you know.

x											
x^2											

Example A: Evaluate the following radicals or solve the equations.

1. $\sqrt{64}$

2. $-\sqrt{36}$

3. $\sqrt{0}$

4. $x^2 = 0.25$

5. $\pm\sqrt{.0009}$

6. $-\sqrt{\frac{81}{100}}$

7. $\sqrt{0.49}$

8. $\sqrt{4}$

9. $y^2 = 1$

10. $-\sqrt{144}$

Special Cases:

$$r^2 = -25$$

$$\sqrt{-100}$$

Example B:

Solve the following equation:

$$x^2 = 10$$

Numbers with non-terminating and non-repeating decimal representations are called irrational numbers. They cannot be expressed as ratios of integers; can't be written as fractions.

The number $\sqrt{10}$ is an irrational number. You had trouble finding an exact terminating or repeating decimal representation for $\sqrt{10}$ because such a representation does not exist. Other irrational numbers are $\sqrt{2}$, and $\sqrt{3}$, and $\sqrt{5}$. In fact, \sqrt{n} is an irrational number for any value of n that is not a perfect square number.

Example C: Estimating the Value of a Square Root and Place it on a Number Line:

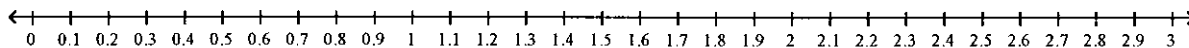
Which two whole numbers is \sqrt{n} between?

Which whole number is closer to the \sqrt{n} ?

Without using the square root key on your calculator, estimate the value of \sqrt{n} to two decimal places.

a. $\sqrt{8}$

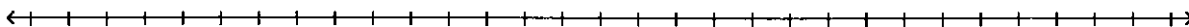
b. $\sqrt{3}$



Try It!

a. $\sqrt{28}$

b. $\sqrt{38}$



Practice: identify the following as rational or irrational.

- | | |
|---------------------------|------------------|
| 1. π | 2. $\frac{2}{9}$ |
| 3. $\sqrt{\frac{14}{99}}$ | 4. $-\sqrt{121}$ |
| 5. $\sqrt{16}$ | 6. $\sqrt{0.25}$ |
| 7. $\sqrt{2}$ | |

MULTIPLE CHOICE:

8. Which number on this list is rational?

$\sqrt{12}, \sqrt{14}, 0.76, \pi$

- | | |
|----------------|----------------|
| A. $\sqrt{12}$ | B. $\sqrt{14}$ |
| C. 0.76 | D. π |

9. Which number on this list is rational?

$-5\pi, \sqrt{25}, \sqrt{75}, \sqrt{18}$

- | | |
|----------------|----------------|
| A. -5π | B. $\sqrt{25}$ |
| C. $\sqrt{75}$ | D. $\sqrt{18}$ |

10. Which number on this list is irrational?

$-0.88, 2\frac{9}{11}, \sqrt{36}, \sqrt{40}$

- | | |
|----------------|--------------------|
| A. -0.88 | B. $2\frac{9}{11}$ |
| C. $\sqrt{36}$ | D. $\sqrt{40}$ |

11. When is a number irrational?

- | | |
|----|-------------------------------------------------|
| A. | When it can be written as a simple fraction. |
| B. | When it cannot be written as a simple fraction. |
| C. | When a decimal is repeating. |
| D. | When a decimal is terminating. |