**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Per.\_\_\_\_\_\_\_**

**U14 CWK #1** *The Rational Number System*

Our number system has evolved over time. On the following pages, you will review the subsets of numbers that are included in the set of **rational numbers**.

A **rational number** is any number that can be expressed as a quotient $\frac{p}{q}$ of two integers where *q* does not equal 0.

Let’s begin to fill out the table below with different subsets, including equivalent forms, of **rational numbers** you know about so far and give a few examples of each.

You will continue to add to this list throughout this section.

|  |  |
| --- | --- |
| **Subsets of the Rational Numbers** | **Examples** |
| Natural Numbers (N) |  |
| Whole Numbers (W) |  |
| Integers Numbers (Z) |  |
| Rational Numbers (Q) |  |

Make a visual representation of all Rational Numbers:

Change the following rational numbers into decimals **without** the use of a calculator.

|  |  |
| --- | --- |
| * 1. $\frac{1}{2}$
 | * 1. $\frac{9}{5}$
 |
| * 1. $\frac{3}{8}$
 | * 1. $\frac{1}{3}$
 |
| * 1. $\frac{4}{15}$
 | * 1. $\frac{1}{7}$
 |

What do you notice about the decimal expansion of any rational number? Why is this true?

So are all numbers rational numbers? Are there numbers that cannot be written as a quotient of two integers?

What about $\sqrt{2 }$? Can you write $\sqrt{2}$ as a fraction? Why or why not?

Numbers like $\sqrt{2}$ and $π $do not have a terminating or repeating decimal expansion and they are called **Irrational numbers (**$Q$**)**. Irrational numbers **cannot** be expressed as a quotient.

Rational and Irrational numbers together form the set of **Real numbers (R)**. Real numbers can be thought of as points on an infinitely long line called the number line.



**Directions:** Classify the following numbers and provide a justification.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number N** | **Whole number** | **Integer** | **Rational number** | **Irrational number** | **Real** | **Justification** |
| 1. $\frac{2}{3}$
 |  |  |  |  |  |  |
| 1. 0.25
 |  |  |  |  |  |  |
| 1. $-2$
 |  |  |  |  |  |  |
| 1. $\sqrt{5}$
 |  |  |  |  |  |  |
| 1. 10
 |  |  |  |  |  |  |
| 1. 0
 |  |  |  |  |  |  |
| 1. $\sqrt{10}$
 |  |  |  |  |  |  |
| 1. $\sqrt{36}$
 |  |  |  |  |  |  |
| **Number N** | **W** | **Z** | **Q** | $$Q$$ | **R** | **Justification** |
| 1. $-\sqrt{121}$
 |  |  |  |  |  |  |
| 1. $2\frac{1}{2}$
 |  |  |  |  |  |  |
| 1. $0.08\overbar{3}$
 |  |  |  |  |  |  |
| 1. $\frac{10}{13}$
 |  |  |  |  |  |  |
| 1. Π
 |  |  |  |  |  |  |
| 1. -3π
 |  |  |  |  |  |  |
| 1. $0.26\overbar{54}$
 |  |  |  |  |  |  |
| 1. $\sqrt[3]{27}$
 |  |  |  |  |  |  |
| 1. 1.2122122212222…
 |  |  |  |  |  |  |
| 1. $\sqrt[3]{30}$
 |  |  |  |  |  |  |
| 1. $\frac{\sqrt{2}}{2}$
 |  |  |  |  |  |  |
| 1. The side length of a square with an area of 2
 |  |  |  |  |  |  |
| 1. The side length of a square with an area of 9
 |  |  |  |  |  |  |
| 1. The number half-way between 3 and 4
 |  |  |  |  |  |  |
| 1. The number that represents a loss of 5 yards
 |  |  |  |  |  |  |