Dear Family,

Your child is learning to classify numbers as rational or irrational.

You may have heard of counting numbers, whole numbers, or integers.
- Whole numbers include the counting numbers and 0: 0, 1, 2, 3, 4, …
- Integers include the counting numbers, the opposites of the counting numbers, and 0: …, −2, −1, 0, 1, 2, 3, …

Numbers that can be written as the ratio of two integers are called rational numbers. All rational numbers can be written as decimals that either terminate (end) or repeat. For example:
- \( \frac{3}{4} = 3 \div 4 = 0.75 \). This is a terminating decimal.
- \( \frac{2}{3} = 2 \div 3 = 0.666\ldots = 0.\overline{6} \). This is a repeating decimal.

Numbers that cannot be written as the ratio of two integers are called irrational numbers. The decimal form of an irrational number never ends and does not repeat.
- \( \sqrt{3} = 1.73205081\ldots \). This decimal doesn’t terminate or repeat.

The set of rational numbers and irrational numbers form the set of real numbers.

Consider the following example:

Classify each number as rational or irrational. Classify each rational number as a terminating or repeating decimal. Then order the numbers from least to greatest.

\( \sqrt{\frac{25}{4}}, \frac{26}{9}, \sqrt{7} \)

On the next page you will see how your child might classify and order the numbers from least to greatest.
Understand Rational and Irrational Numbers: Sample Solution

Classify each number as rational or irrational: $\sqrt{\frac{25}{4}}$, $\frac{26}{9}$, $\sqrt{7}$.

Classify each rational number as a terminating or repeating decimal. Then order the numbers from least to greatest.

You can use a number line to help you order the numbers, but first identify the numbers as rational or irrational. Then write them as decimals.

- $\sqrt{\frac{25}{4}} = \frac{5}{2}$, which is a rational number. It can be written as 2.5, a terminating decimal.
- $\frac{26}{9} = 2.888\ldots = 2.\overline{8}$, which is a rational number. It is a repeating decimal. The bar above the 8 shows that the 8 repeats.
- $\sqrt{7}$ is irrational because you cannot write it as a decimal that either terminates or repeats. However, you can estimate its value. $\sqrt{7}$ is between $\sqrt{4}$ and $\sqrt{9}$. This means that it is between 2 and 3. You can look for a number that is close to 7 when squared. $2.6^2 = 6.25$ and $2.7^2 = 7.29$. Because 7 is between 2.6² and 2.7², you can approximate $\sqrt{7}$ as close to 2.65.

Now you can graph all three numbers on the number line.

Answer: $\sqrt{\frac{25}{4}}$ is a rational number that can be written as a terminating decimal. $\frac{26}{9}$ is a rational number that can be written as a repeating decimal. $\sqrt{7}$ is an irrational number. The numbers in order from least to greatest are $\sqrt{\frac{25}{4}}$, $\sqrt{7}$, $\frac{26}{9}$. 