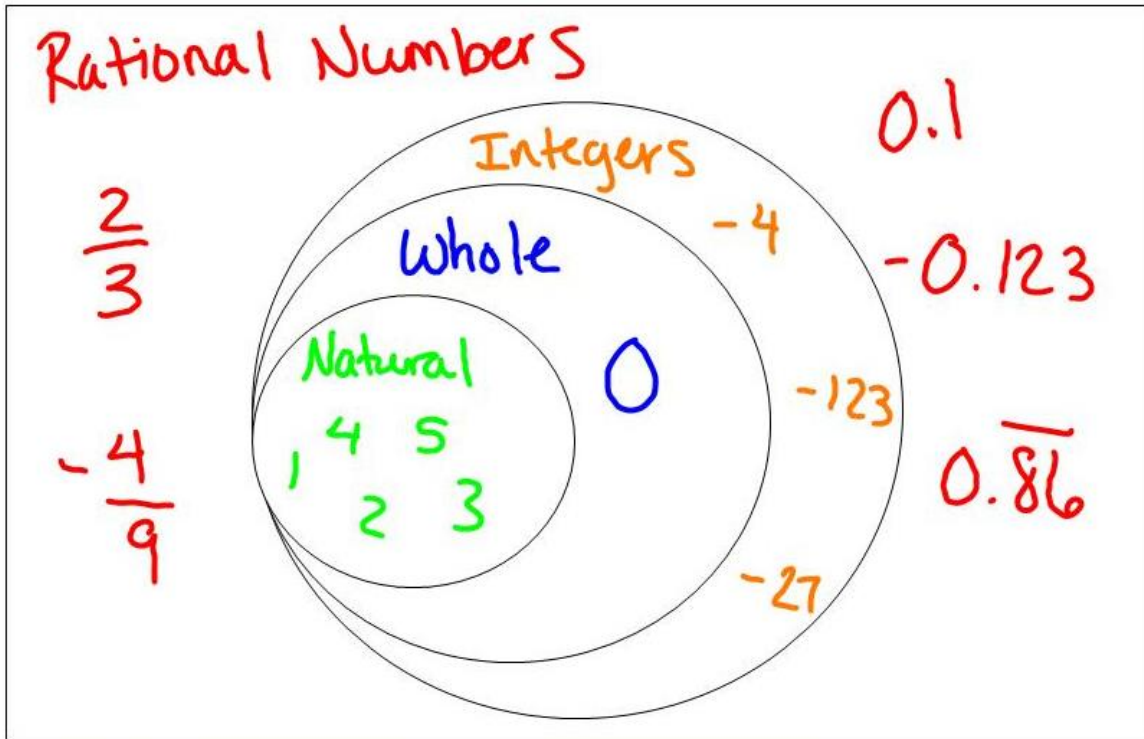


Rational Numbers

How do we classify numbers?



Numbers that can be written as a comparison of two integers, expressed as a fraction, are called **rational numbers**.

Every rational number can be expressed as a decimal by dividing the numerator by the denominator. The decimal form of a rational number is called a **repeating decimal**. If the repeating digit is zero, then the decimal is a **terminating decimal**.

Rational Number	Repeating Decimal	Terminating Decimal
$\frac{1}{2}$	0.5000...	0.5
$\frac{2}{5}$	0.400...	0.4
$\frac{5}{6}$	0.833...	does not terminate

Bar Notation

Bar notation is often used to indicate that a digit or group of digits repeats. The bar is placed above the repeating part. To write 8.636363... in bar notation, write $8.\overline{63}$, not $8.\overline{6}$ or $8\overline{636}$. To write 0.3444... in bar notation, write $0.3\overline{4}$, not $0.\overline{34}$.

Helpful Decimal and Fraction Conversions:

$$\frac{1}{4} = 0.25$$

$$\frac{1}{5} = 0.2$$

$$\frac{1}{3} = 0.\overline{3}$$

$$\frac{1}{9} = 0.\overline{1}$$

$$\frac{3}{4} = 0.75$$

$$\frac{2}{5} = 0.4$$

$$\frac{2}{3} = 0.\overline{6}$$

$$\frac{2}{9} = 0.\overline{2}$$

$$\frac{3}{5} = 0.6$$

$$\frac{4}{9} = 0.\overline{4}$$

$$\frac{4}{5} = 0.8$$

What if we have a repeating decimal that isn't one of these easy conversions?

5. Write $0.\overline{5}$ as a fraction in simplest form.

Assign a variable to the value $0.\overline{5}$. Let $N = 0.555\dots$. Then perform operations on N to determine its fractional value.

$$\begin{aligned}
 (10) N &= 0.555\dots (10) & 5 + 0.555\dots \\
 10N &= 5.55555 & 5 + N \\
 10N &= 5 + N \\
 \underline{-N} & \quad \underline{-N} \\
 9N &= 5 & \boxed{N = \frac{5}{9}}
 \end{aligned}$$

6. Write $2.\overline{18}$ as a mixed number in simplest form.

$$\text{Let } N = 2.\overline{181818\dots}$$

$$N = 0.181818\dots$$

$$(100) N = 2.\overline{181818\dots} (100)$$

$$100N = 218.\overline{181818\dots}$$

$$\underline{-N} = \underline{-2.181818\dots}$$

$$99N = 216 \quad N = \frac{216}{99} = 2 \frac{18 \div 9}{99 \div 9} = \boxed{2 \frac{2}{11}}$$

OR

$$(100) N = 0.181818\dots (100)$$

$$100N = 18.\overline{181818\dots}$$

$$\underline{-N} = \underline{-.181818\dots}$$

$$\frac{99N}{99} = \frac{18}{99}$$

$$N = 2 \frac{18}{99}$$

Got It? Do these problems to find out.

Write each decimal as a fraction or mixed number in simplest form.

$$\begin{aligned}
 \text{f. } -0.14 &= -\frac{14}{100} = \boxed{-\frac{7}{50}} & \text{g. } 0.\overline{27} &= \frac{27}{99} = \boxed{\frac{3}{11}}
 \end{aligned}$$