A **rational number** is a number that can be expressed as the quotient of two integers. Thus, $\frac{3}{5}$ is a rational number because it is of the form $\frac{n}{d}$, where n and d are integers and d is not zero. A rational number can also be expressed as either a terminating decimal or a nonterminating repeating decimal.

The rational number $\frac{3}{5}$ can be written as 0.6, a terminating decimal, by dividing the denominator into the numerator. The rational number $\frac{25}{99}$ can be written as 0.252525..., a nonterminating repeating decimal. A repeating decimal can be indicated by a bar, $0.\overline{25}$. Other examples of rational numbers are $-\frac{6}{1}$, $\frac{0}{5}$, and $\frac{11}{2}$.

In order to demonstrate that a number is rational, you must show that it can be expressed as the quotient of two integers.

EXAMPLE 1 **Show that the terminating decimal 0.625 is rational by writing it as the quotient of two integers.**

$$0.625 = \frac{625}{1000} = \frac{5}{8}$$

The next example shows how to express a nonterminating repeating decimal as the quotient of two integers.

EXAMPLE 2 **Show that the repeating decimal $0.\overline{63}$ can be written as the quotient of two integers.**

Let $N = 0.636363\ldots$

$100N = 63.636363\ldots$ *Multiply both sides by 100.*

$99N = 63$ *Subtract the first equation from the second.*

$$N = \frac{63}{99} = \frac{7}{11}$$

An **irrational number** is a number that neither repeats nor terminates. Numbers such as 0.212112111211112..., $\sqrt{3}$, and π are irrational numbers. The set of rational numbers and the set of irrational numbers have no elements in common and are said to be *mutually exclusive*.

The rational numbers and the irrational numbers are subsets of the **real numbers.** As shown in the diagram, the set of real numbers is the union of the set of rational numbers and the set of irrational numbers.

The Real Number System