Rational Numbers
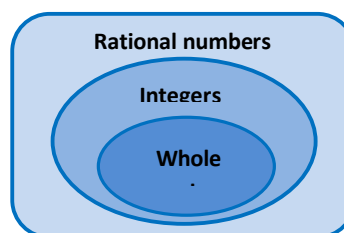
A <mark>rational number</mark> is a number that can be written as a quotient of two integers. Whole numbers and integers are part of the set of rational numbers, as shown in Venn diagram.

Example 1: Show that the number is rational by writing it as a quotient of two integers.

A. 7

7 as $\dfrac{7}{1}$

B. ⁻10

⁻10 as $\dfrac{-10}{1}$ or $\dfrac{10}{-1}$

C. $5\dfrac{3}{4}$

The mixed number $5\dfrac{3}{4}$ as the improper fraction $\dfrac{23}{4}$

D. $^-3\dfrac{1}{2}$

$^-3\dfrac{1}{2}$ as the opposite of $3\dfrac{1}{2}$. First write $3\dfrac{1}{2}$ as $\dfrac{7}{2}$.

Then you can write $^-3\dfrac{1}{2}$ as $-\dfrac{7}{2}$.

To write $-\dfrac{7}{2}$ as a quotient of two integers, you can assign the negative sign to either the numerator or the denominator. You can write $\dfrac{-7}{2}$ or $\dfrac{7}{-2}$.

Terminating and Repeating Decimals: If you take a rational number in the form $\dfrac{a}{b}$ and carry out the division of a by b, the quotient will be either a terminating decimal or a repeating decimal. In a <mark>terminating decimal</mark>, the division ends because you obtain a final remainder of zero.

In a <mark>repeating decimal</mark>, a digit or block of digits in the quotient repeats without end. Example 2, shows how to write both a terminating decimal and a repeating decimal.

Writing Decimals as Fractions: To write a terminating decimal as a fraction or a mixed number, use the place of the last digit to determine the denominator of the fraction, as shown in Example 4. Example 5 shows a method for writing a repeating decimal as a fraction.