

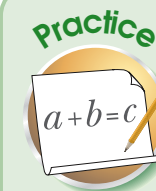
The inverse property outlines the two types of opposites in algebra—the additive inverse and the multiplicative inverse.

The additive inverse property simply states that every number has an inverse number with the opposite sign. For example, the additive inverse of 12 is  $-12$ . When you add two opposites together, the numbers will effectively cancel each other out and bring you to 0.

The multiplicative inverse property states that every number, except for zero, has an opposite reciprocal number. When a number is multiplied by its reciprocal, the answer will always be 1. A reciprocal

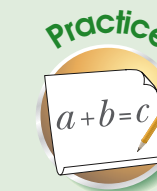
is found by simply flipping a fraction over. For example, to find the reciprocal of 2, rewrite it as the fraction  $\frac{2}{1}$ —keeping in mind that all positive and negative whole numbers have an invisible denominator, or bottom part of the fraction, of 1—and flip the fraction over so that you have  $\frac{1}{2}$ . When you multiply 2 by  $\frac{1}{2}$ , you arrive at 1.

The relationships between numbers and their opposites may not seem like a big deal now, but in algebra you will be constantly unraveling complicated problems. The additive and multiplicative inverse properties will be a couple of your main tools.



Determine the opposite value, or additive inverse, of the following numbers and variables. You can check your answers on page 250.

- 1) 5
- 2) 7
- 3)  $-17$
- 4)  $-a$
- 5)  $\frac{3}{4}$
- 6)  $-1$



Determine the reciprocal, or multiplicative inverse, of the following numbers and variables. You can check your answers on page 250.

- a) 9
- b)  $\frac{5}{4}$
- c)  $x$
- d)  $\frac{a}{b}$
- e)  $-8$
- f)  $-\frac{3}{4}$

## Additive Inverse Property

### Additive Inverse

$$3 + (-3) = 0$$

$$10 + (-10) = 0$$

$$7 + (-7) = 0$$

$$-5 + 5 = 0$$

$$-30 + 30 = 0$$



### Additive Inverse

$$a + (-a) = 0$$

$$b + (-b) = 0$$

$$-b + b = 0$$

$$-x + x = 0$$

$$-y + y = 0$$

## Multiplicative Inverse Property

### Multiplicative Inverse

$$\frac{1}{2} \times \frac{2}{1} = 1$$

$$\frac{3}{4} \times \frac{4}{3} = 1$$

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

$$-8 \times \frac{-1}{8} = 1$$



### Multiplicative Inverse

$$\frac{1}{x} \times \frac{x}{1} = 1$$

$$\frac{3}{x} \times \frac{x}{3} = 1$$

$$x \times \frac{1}{x} = 1$$

$$-x \times \frac{-1}{x} = 1$$

- When you add a number to its opposite, called the additive inverse, the result will be 0.
- The additive inverse of a number is the same number, but with a different sign (+ or -). For example, the additive inverse of 3 is  $-3$ .
- As with numbers, when you add a variable to its opposite, or additive inverse, the result will be 0.
- A variable is a letter, such as  $x$  or  $y$ , which represents an unknown number.
- When you multiply a number by its reciprocal, called the multiplicative inverse, the result will be 1.
- To find the reciprocal of a fraction, switch the top and bottom numbers in the fraction. For example, the reciprocal of  $\frac{1}{2}$  is  $\frac{2}{1}$ .
- To find the reciprocal of an integer, you first need to write the number as a fraction. All integers have an invisible denominator, or bottom part of the fraction, of 1. For example, you can write 4 as  $\frac{4}{1}$ . Then switch the top and bottom numbers in the fraction to determine the reciprocal. Note: An integer is a positive or negative whole number.
- As with numbers, when you multiply a variable by its reciprocal, or multiplicative inverse, the result will be 1.
- Note: If the two variables or numbers you are multiplying have the same sign (+ or -), the result will always be positive. For example,  $-x \times \frac{-1}{x}$  equals 1.