

## Constant of Proportionality

Let's explore the given problem situation: Karen sells homemade bread for \$2.50 a loaf.

This point represents one loaf of homemade bread for a cost of \$2.50. Notice the plotted point on the coordinate plane. It is located at (1, 2.5). We see these values represented in the table as well, where  $x$  represents the number of loaves of bread, and  $y$  represents the total cost of  $x$  number of loaves of bread.

The additional point represents two loaves of homemade bread for a total cost of \$5.00. Notice the plotted point on the coordinate plane. It is located at (2, 5). Again, we see these values represented in the table as well, where  $x$  represents the number of loaves of bread, and  $y$  represents the total cost of  $x$  number of loaves of bread.

The third point represents three loaves of homemade bread for a cost of \$7.50.

The fourth point represents four loaves of homemade bread for a cost of \$10.00. What expression best represents the total cost in terms of  $x$ , the number of loaves of bread?

The equation “ $y$  is equal to two and one-half times the value of  $x$ ” best represents this situation.  $x$  represents the number of loaves of bread, and  $y$  represents the total cost of  $x$  loaves of bread.

Let's look at the ratio  $y/x$  for each set of values in the table.

Five divided by two equals two and one-half.

Seven and one-half divided by three equals two and one-half.

Ten divided by four equals two and one-half.

Notice the expression “two and one-half times the value of  $x$  divided by  $x$ ” simplifies to two and one-half as well.

The ratio of  $y$  to  $x$  is the same for each pair of  $x$  and  $y$  values in the table, therefore this problem situation illustrates a **proportional relationship**.

The constant of proportionality, also called  $k$ , for this problem situation is two and a half, and the problem situation can be represented by the equation “ $y$  is equal to two and one-half times the value of  $x$ .”