

## Cartesian Cross Products

Another operation we can do with sets involves **Cartesian cross products**.

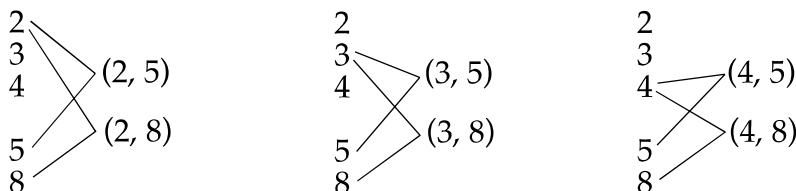
A *Cartesian cross product* is a set of **ordered pairs** found by taking the ***x*-coordinate** from one set and the ***y*-coordinate** from the second set.

The Cartesian coordinate system is named after the mathematician René Descartes (1596-1650). We use his work every time we graph on a **coordinate grid** or **plane**. Keeping that in mind, you will find it no surprise that Cartesian cross products have something to do with graphing.

To find a Cartesian cross product we must have two sets.

Let's let  $A = \{2, 3, 4\}$  and  $B = \{5, 8\}$ .

The **expression** in symbols looks like  $A \times B$ . The  $\times$  almost looks like a large multiplication sign. However, don't be fooled. We are not going to multiply. We are going to create a **relation**, which is another name for a set of *ordered pairs*.



So,  $A \times B = \{(2, 5), (2, 8), (3, 5), (3, 8), (4, 5), (4, 8)\}$

Notice that in the newly created set, every element is an ordered pair  $(x, y)$ . Also see that each number in the  $x$  position came from set A and each number in the  $y$  position came from set B.

Let's look at another one.

$$\{3, 5\} \times \{1, 2, 3\} = \{(3, 1), (3, 2), (3, 3), (5, 1), (5, 2), (5, 3)\}$$

Notice that the resulting set is a *relation* because every element is an ordered pair.

It's time for you to try.