Class Work: Cartesian Products
This is a full-time activity worth 10 points.

Problems of the Day

Let $A = \{1, 2, 3\}$, $T = \{1, 2\}$, $B = \{a, b\}$, and $C = \{a, c\}$. We can then form new sets from all the set operations we've studied. For example, $B \cap C = \{a\}$, so

$$A \times (B \cap C) = \{(1, a), (2, a), (3, a)\}.$$

1. Use the roster method to list all the elements (ordered pairs) in each of the following sets:

   (a) $A \times B$

   (b) $T \times B$

   (c) $A \times C$

   (d) $A \times (B \cap C)$ (We did this above)

   (e) $(A \times B) \cap (A \times C)$

   (f) $A \times (B \cup C)$

   (g) $(A \times B) \cup (A \times C)$

   (h) $A \times (B - C)$

   (i) $(A \times B) - (A \times C)$

   (j) $B \times A$

2. List all the relationships between the sets in the first part above. In particular, if you see two sets that are equal, or if one set is a subset of another, make a note of that.

3. Choose two of the relationships you noted and prove that the relationship holds in general.

Parameters

If your group finishes your work, please hand it in at the end of class. If all groups finish by the end of class, we will take time to debrief the solutions to one or more of these.