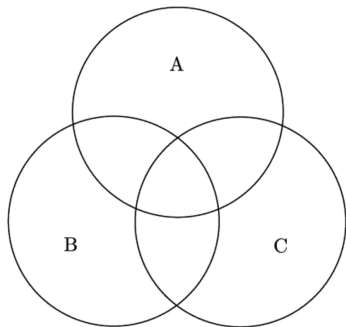# A puzzler about Inclusion-Exclusion

The inclusion-exclusion formula is
$n(A \cup B) = n(A) + n(B) - n(A \cap B).$

What would it become if we had *three* sets?

I.e., $n(A \cup B \cup C) = \ldots?$

Answer

$$n(A \cup B \cup C)$$
$$=$$
$$n(A) + n(B) + n(C)$$
$$-n(A \cap B) - n(A \cap C) - n(B \cap C)$$
$$+n(A \cap B \cap C)$$

In general, to find the number of elements in the union of n sets,

- add up the sizes of the sets
- subtract off the sizes of intersections, taken two at a time
- add back the sizes of intersections, taken three at a time
- etc.