## # Counting by Complement ##

**Counting by complement**

counting the # of elements in a set S that have a property by counting the total # of elements in set S and subtracting the # of elements that don't have that property.

ex: want to count # of redheads but only know # that do not have red hair (12 people) in a group of 20
⇒ # redheads = 20 − (# non-redheads)

**Counting by complement in set notation:**

$$|P| = |S| - |\overline{P}|$$

$P$ = subset of elements w/ property
$S$ = the set
$\overline{P}$ = subset of elements from $S$ not in $P$

* Good for counting which elements have at least one of something

ex: How many 8-bit (binary) strings have at least one 0?

⇒ equal to the # of 8-bit strings with no 0's

Total # of possible 8-bit strings = $2^8 = 256$
Total # of 8-bit strings w/ no 0's = 1
⇒ Total 8-bit strings w/ at least one 0 = $256 - 1 = 255$