and \[
|A \cup B \cup C| = |U| - |A| - |B| - |C| + |A \cap B| + |A \cap C| + |B \cap C| - |A \cap B \cap C|
\]
\[= 7 - 6 = 1\]

Example

How many PINs with 5 digits
but:
- no repeated digits
- First digit cannot be 0
- Third digit cannot be 2
- Fifth digit cannot be 5

Idea: let \( U \) be all the 5 digit PINs with no repeated digits
\[|U| = 10^5 = 30,240\]

let \( A \) be PINs with first digit 0.
let \( B \) be PINs with third digit 2.
let \( C \) be PINs with fifth digit 5.

Then legal PINs are \( A \cup B \cup C \).
\[
\begin{align*}
|A| &= |B| = |C| = 3,024 \\
|A \cap B| &= |B \cap C| = |A \cap C| = 336 \\
|A \cap B \cap C| &= 42
\end{align*}
\]
\[|A \cup B \cup C| = 30,240 - 3(3,024) + 3(336) - 42 = 22,134\]

Example: Count 5-digit PINs with no repeated digits, and either start with 7 or end with 8?
let \( A = \) start with 7, \( B = \) end with 8.
\[
|A| + |B| - |A \cap B|
\]
\[= 3,024 + 3,024 - 336 = 5,712\]