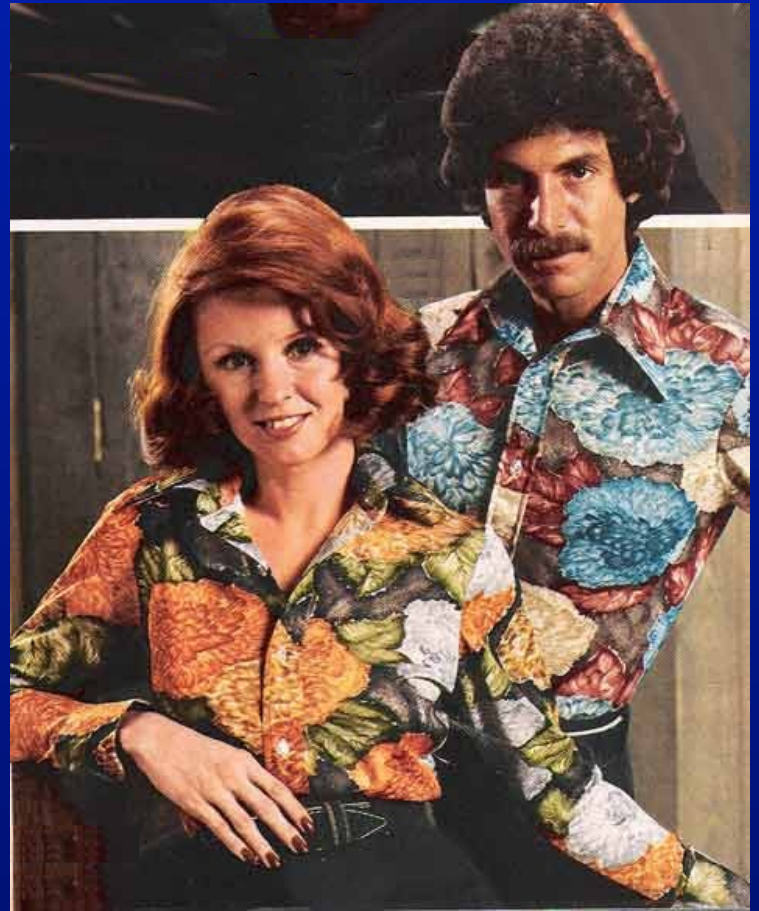


# **MathsJam Gets Deranged**



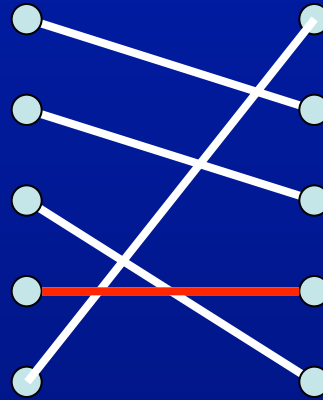
# The Hat Problem





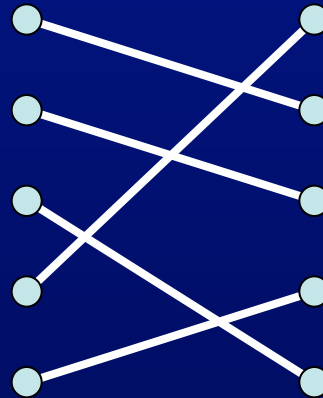
**What's the probability a couple goes home disappointed?**

**arrangement**



**$n!$**

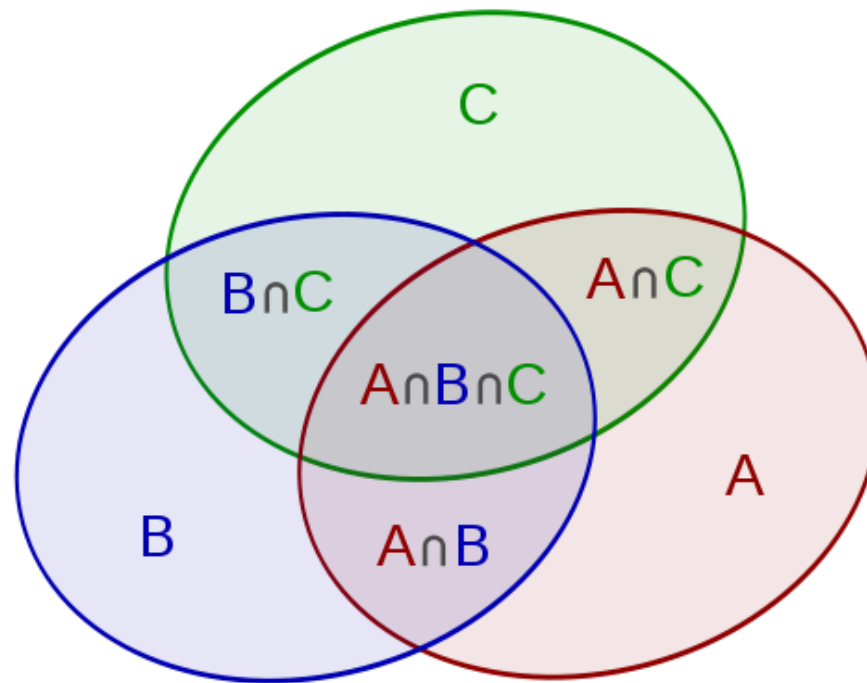
**derangement**



**$!n$**

# The Number of Derangements

## The Inclusion-Exclusion Principle



$$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|.$$

**In general...**

**The number of derangements  
is the nearest integer to...  $n!/e$**

$$!n = [n!/e]$$

# The probability of no matches

$$= \frac{!n}{n!}$$

$$\approx \frac{1}{e} \approx 37\%$$











**What's the probability someone goes home disappointed?**