10 students (7 men, 3 women) - form a 5 person team

George hates Chris

how many 5 person teams don't have both?

= # teams w/neither + # teams w/1 + # teams w/2

\[
\binom{8}{5} + \binom{8}{4} + \binom{8}{3}
\]

= # teams total - # teams that have both

\[
\binom{10}{5} - \binom{8}{3}
\]

how many teams have 3 men, 2 women?

\( \binom{3}{3}\binom{3}{2} \)

1) pick 3 men \( \binom{3}{3} \)

2) pick 2 women \( \binom{3}{2} \)

how many teams have 21 woman?

= # teams w/1 woman + # teams w/2 woman + # teams w/3 w

\[
\binom{7}{1}\binom{3}{3} + \binom{7}{2}\binom{3}{2} + \binom{7}{3}\binom{3}{3}
\]

= # teams total - # teams w/0 women

\[
\binom{10}{5} - \binom{7}{5}
\]

# poker hands = \( \binom{52}{5} \)

\[
P(\text{dealt two pair}) = \frac{\# 2\text{-pair hands}}{\# \text{total hands}}
\]

\( \binom{13}{2} \) 1) pick 2 ranks

\( \binom{4}{2} \) 2) pick suits for high rank

\( \binom{4}{2} \) 3) pick suits low

\( \binom{4}{1} \) 4) choose last card

1) pick 3rd rank

2) pick 2 cards of that rank

3) pick 2nd rank

4) pick 2 cards of 2nd rank

5) choose last card

Double counted: \( \binom{5}{2} \)
# Full house hands

1) pick rank w/ 3            13
   = 13 \cdot 12 \cdot \binom{4}{3} \cdot \binom{4}{2}

2) pick rank w/ 2            12

3) pick suits for 3          \binom{4}{3}

4) pick suits for 2          \binom{4}{2}

# 3 of a kind hands

1) pick rank for triple       13

2) pick suits                 \binom{4}{3}

3a) pick 2 ranks             \binom{4}{2}

3b) pick suit

4) pick suit for other        \binom{4}{3} \text{ (this card full house too)}

13 \cdot \binom{4}{3} \binom{4}{2} - 13 \cdot 12 \cdot \binom{4}{3} \binom{4}{2}

= 54912

# Straights

1) pick low rank             10

2) pick suits for each      \binom{4}{5} \text{ (then no straight flushes)}

Yakhtee: \( P(\text{rolling 3 6's + 2 1's}) = ? \)

\[
= \frac{\text{# rolls w/ 3 6's, 2 1's}}{\text{# rolls total}}
\]

roll = string of 5 digits chosen from 1...6

\[
= \frac{\binom{5}{2} \binom{3}{3}}{6^5}
\]

\[
= \frac{5!}{2!(5-2)!} \cdot 1
\]

\[
= \frac{10}{6^5}
\]

\[
\# \text{ full house rolls} = \{16661, 16661, 16661, 16661, 16661, 16661, 16166, 16166, 16166, 16166, 16166, 16166, 16166, \}
\]

1) choose w/ 3 6's 6

2) choose w/ 92 5

3) choose arrangement 10

= 300
# large straight rolls = # large straight 1-5 + # large straight 2-6

\[
\{\begin{array}{c}
12345, \\
21345, \\
\vdots \\
54321, \\
23456, \\
\vdots \\
65432 \end{array}\} \cdot 5! = 240
\]