Password: Tornado
1. \( 100 \choose 6 = \frac{100!}{(100-6)!} = (100)(99)(98)(97)(96)(95) \)

2. \( n(E) = 60 \choose 6 = \frac{60!}{(60-6)!} = (60)(59)(58)(57)(56)(55) \)

\[
P(E) = \frac{(60)(59)(58)(57)(56)(55)}{(100)(99)(98)(97)(96)(95)} \approx 0.042
\]

3. Step 1: position you and friend: 6 ways
   Step 2: position others: 98 ways

\[
n(E) = 6(98)(97)(96)(95)
\]

\[
P(E) = \frac{6(98)(97)(96)(95)}{(100)(99)(98)(97)(96)} = \frac{6}{9900} = 0.00060606
\]
1. Multisets... $n = 5$
   $r = 4$

   \[ \binom{n+r-1}{r} = \binom{8}{4} = \frac{8!}{4!4!} = \frac{8 \cdot 7 \cdot 6 \cdot 5}{4 \cdot 3 \cdot 2 \cdot 1} = 70 \]

2. Treat each skittle as unique.

   \[ n(S) = \binom{32}{4} = \frac{32!}{4!(28)!} = \frac{(32)(31)(30)(29)}{4 \cdot 3 \cdot 2 \cdot 1} = 35960 \]

3. $n(E) = \binom{7}{4} = \frac{7!}{3!4!} = \frac{7 \cdot 6 \cdot 5}{6} = 35$

   \[ P(E) = \frac{35}{35960} \]

4. Step 1: select 2 green $\binom{7}{2}$ ways

   Step 2: select 2 yellow $\binom{5}{2}$ ways

   \[ n(E) = \binom{7}{2} \binom{5}{2} = \binom{7!}{2!5!} \binom{5!}{3!2!} = \binom{7 \cdot 6}{2} \binom{5 \cdot 4}{2} = 210 \]

   \[ P(E) = \frac{210}{35960} \]
String Question

1. \(26^8\)

2. \(n(E) = 21^8\)
   \[\Pr(E) = 21^8 / 26^8 = \left(\frac{21}{26}\right)^8\]

3. Step 1: choose left word: 5454 choices
   Step 2: choose right word: 5454 choices
   \[n(E) = (5454)^2\]
   \[\Pr(E) = (5454)^2 / 26^8\]

4. Let \(A = \) "begins with 4-letter word"
   \(\beta = \) "ends with 4-letter word"
   \[\Pr(A \cup \beta) = \Pr(A) + \Pr(\beta) - \Pr(A \cap \beta)\]
   \(\Pr(A):\) step 1: pick word: 5454 choices
   step 2: fill in the rest: 26^4
   \[n(A) = (5454)(26^4)\]
   \[\Pr(A) = (5454)(26^4) / 26^8\]
   \(\Pr(\beta)\) is the same as \(\Pr(A)\)
   \[\Pr(A \cup \beta) = \frac{(5454)(26^4) + (5454)(26^4) - (5454)^2}{26^8}\]