\( \{1, 2, 3, 4\} \)

Repetition is not allowed and order doesn't matter.

Subsets of 3 elements:
\( \{1, 1, 2\} \times \)
\( \{1, 2, 1\} \equiv \{2, 1, 1\} \)

Equivalent (order doesn't matter)
\[
\binom{n}{r} = \binom{4}{3} = \frac{4!}{3! \cdot 1!} = 4
\]
Find subsets of 3 elements, when order does not matter and repetition is allowed.

\[ \{1, 1, 1\}, \{1, 1, 2\}, \{1, 1, 3\}, \{1, 1, 4\} \]
\[ \{1, 2, 2\}, \{1, 2, 3\}, \{1, 2, 4\} \]
\[ \{1, 3, 3\}, \{1, 3, 4\}, \{1, 4, 4\} \]
\[ \{2, 2, 2\}, \{2, 2, 3\}, \{2, 2, 4\} \]
\[ \{2, 3, 3\}, \{2, 3, 4\}, \{2, 2, 4\} \]
\[ \{3, 3, 3\}, \{3, 3, 4\}, \{3, 4, 4\} \]
\[ \{4, 4, 4\} \]

\[ 20 \]
\[
\begin{align*}
\binom{6}{3} & = \binom{4+3-1}{3-1} \\
& = \binom{4}{2} \\
& = \binom{6}{3}
\end{align*}
\]

\[
\gamma = \text{pick } n + r - 1
\]

\[
\gamma = n - 1 \text{ bars}
\]
\[ n = 4 \]

\[ S \begin{array}{c|c|c}
   \ast & \ast & \ast \\
   \ast & \ast & \\
   \ast & \\
\end{array} \quad M \begin{array}{c|c|c}
   \ast & \\
   \\
   \\
\end{array} \quad K \begin{array}{c|c|c}
   \\
   \\
   \\
\end{array} \]

\[ n = 3 \]

\[
\binom{n + r - 1}{r} = \binom{6}{3} = \binom{6}{3} = 20
\]

\[
\begin{align*}
\frac{6!}{(n-r)!} &= \frac{6!}{(6-3)!} \\
&= \frac{6 \times 5 \times 4}{3 \times 2 \times 1} \\
&= \frac{6 \times 5 \times 4}{2} \\
&= \frac{6 \times 5}{2} \\
&= 15
\end{align*}
\]
\[
\begin{align*}
\eta &= 6 \\
\gamma &= 25 \\
\Rightarrow \binom{30}{25} &= \binom{6+25-1}{25} \\
\eta &= 65 \\
\gamma &= \binom{n + \gamma - 1}{\gamma} \\
\Rightarrow \binom{5+130-1}{130} &= \binom{134}{130} \\
\eta &= 4 \\
\gamma &= 50 \\
\Rightarrow \binom{50+4-1}{50} &= \binom{53}{50}
\end{align*}
\]
The diagram represents the probabilities of getting heads in three consecutive coin flips. The probabilities are calculated as follows:

- 1st flip: 0.5 (H or T)
- 2nd flip: 0.5 (H or T) given the result of the 1st flip
- 3rd flip: 0.5 (H or T) given the result of the 2nd flip

The probability of getting heads in all three flips, P(3 heads), is calculated by multiplying the probabilities of each individual flip:

\[ P(3 \text{ heads}) = 0.5 \times 0.5 \times 0.5 = \frac{1}{8} \]
Sarah wins

\[(0.6 \times 0.7) + (0.6 \times 0.3 \times 0.6)\]

\[+ (0.42 \times 0.5 \times 0.6)\]

\[= 0.42 + 0.108 + 0.12\]

\[= 0.648\]

Tournament ends in two games

\[0.6 \times 0.7 + 0.4 \times 0.5 = 0.42 + 0.2\]

\[= 0.62\]
John wins in 3 games
\[(0.4 \times 0.5 \times 0.4) + (0.6 \times 0.3 \times 0.4)\]

\[
= 0.08 + 0.072 \\
= 0.152
\]
\[ \left\{ 5, 6, 7, 8, 9, 10 \right\} \rightarrow \text{Sum 45} \]

\[ \begin{array}{cc}
\text{Pigeons} & \text{Pigeon holes} \\
700 & 676 \\
\end{array} \]

\[ 26 \times 2.6 \]

\[ 676 < 700 \]

\[ 20 = 104805 \text{ 76 pigeons} \]

\[ \sum_{i=981}^{1000} i - \sum_{i=1}^{980} i \]