• Picking the **first** of three elements from a pool of four elements:

![Diagram](image1)

• Picking the **second** of three elements from a pool of four elements:

![Diagram](image2)
• Picking the **third** of three elements from a pool of four elements, giving us 24 permutations:
- Using color to group permutations that have the same elements:
- **Permutations** that map to the same **combination** (set) of \{b, c, d\}: 

![Diagram showing permutations that map to the same combination \{b, c, d\}]

\[
\begin{align*}
\text{ab} & \quad \text{abc} \\
\text{ac} & \quad \text{abd} \\
\text{ad} & \quad \text{abf} \\
\text{b} & \quad \text{bac} \\
\text{bc} & \quad \text{bad} \\
\text{bd} & \quad \text{bcd} \\
\text{ca} & \quad \text{cab} \\
\text{cb} & \quad \text{cad} \\
\text{cd} & \quad \text{ca}d \\
\text{d} & \quad \text{dbc} \\
\end{align*}
\]
• **Permutations** that map to the same combination (set) of \{a, d, c\}:
• Permutations that map to the same combination (set) of \{a, d, b\}:
• **Permutations** that map to the same **combination** (set) of \{a, b, c\}:
**Permutations**

\[ P(N, M) = \frac{N!}{(N-M)!} \]

\[ P(4, 3) = \frac{4!}{(4-3)!} = \frac{4!}{1!} = 24 \text{ colorless ovals on the right} \]

**Combinations**

\[ \binom{N}{M} = \frac{N!}{(N-M)!M!} \]

\[ \binom{4}{3} = \frac{4!}{(4-3)!3!} = \frac{4 \times 3!}{3!} = 4 \text{ colored ovals on the right} \]