Generalization

- In general, if you randomly choose k objects out of n objects without replacement ($k \le n$), the total number of outcomes (regardless of order) is given by:

$$\binom{n}{k} = \frac{n!}{(n-k)! \cdot k!} = \frac{n \cdot (n-1) \cdot (n-2) \cdots (n-k+1)}{k!}$$

where

→ $k! = k \cdot (k-1) \cdot (k-2) \cdots 3 \cdot 2 \cdot 1$ - is called "k-factorial"

→ $\binom{n}{k}$ - is called "n choose k"

Example 6 → There are 7 girls and 3 boys in a classroom. A teacher needs 3 volunteers. He randomly selects 3 students from the class. What is the probability that he gets 3 girls?

- Random Experiment: Select 3 students from the class.
- Sample Space: $S = \{$(any 3 students of the class)$\}$
- Event: $A = \{$get 3 girls$\}$

$$P(A) = n(A)/n(S) = \binom{7}{3} / \binom{10}{3} = \frac{35}{120} \approx 29,2\%$$