*Proof.* Let $X$ be the set of all possible ordered choices of $k$ balls out of $n$, and $Y$ be the set of all unordered choices of $k$ balls. There is a map $f\colon X \to Y$ (the "forgetful map") that associates to an ordered collection of $k$ balls the same set of balls, but unordered. (The balls lying in a line are put into another bag.) For $y \in Y$, what is the cardinality of its preimage $f^{-1}(y)$? This is the number of ways to order an unordered set of $k$ balls. An ordering is a bijection to the set $\{1, 2, \ldots, k\}$, and from Corollary **??** we know that there are $k!$ of them. Therefore by the quotient rule we have

$$|Y| = \frac{|X|}{k!} = \frac{n(n-1) \cdot \ldots \cdot (n-k+1)}{k!}.$$

$\square$

As we already said, an unordered choice of $k$ balls out of $n$ is also called a $k$-combination. Yet another name of this is a $k$-*element subset* of a given $n$-element set. (By definition, a set is an unordered collection of elements.)

**Notation.** The number of $k$-element subsets of an $n$-element set is denoted by $\binom{n}{k}$ (pronounced "$n$ choose $k$").