Counting: Draw 5 cards without replacement from a 52 card deck, keep track of the order of selection of the cards.

$$\underset{\text{Card 1}}{\underline{52 \text{ ways}}} \quad \underset{\text{card 2}}{\underline{51 \text{ ways}}} \quad \underset{\text{Card 3}}{\underline{50 \text{ ways}}} \quad \underset{\text{card 4}}{\underline{49 \text{ ways}}} \quad \underset{\text{card 5}}{\underline{48 \text{ ways}}}$$

altogether # of ways (without replacement, keeping track of the order) to deal 5 cards out of 52 is $(52)(51)(50)(49)(48)$

$$= \frac{(52)(51)(50)(49)(48)(47)(46)\cdots\cdots(1)}{(47)(46)\cdots\cdots(1)}$$

$$= \frac{52!}{47!}$$

In general, if there are n items and we want to pick r of them without replacement, but keeping track of the order of selection, there are

$$\underset{\text{item 1}}{\underline{n}} \quad \underset{\text{item 2}}{\underline{n-1}} \quad \underset{\text{item 3}}{\underline{n-2}} \quad \cdots\cdots \quad \underset{\text{item r}}{\underline{n-(r-1)=n-r+1}}$$

altogether there are

$$(n)(n-1)(n-2)\cdots(n-r+1) = \frac{(n)(n-1)(n-2)\cdots\cdots(n-r+1)(n-r)\cdots\cdots(1)}{(n-r)\cdots\cdots(1)}$$

ways

$$= \boxed{\frac{n!}{(n-r)!}} \quad \text{ways to pick } r \text{ out of } n \text{ items without replacement, keeping track of the order of selection.}$$