

$${}_n P_k = \underbrace{n(n-1)\dots(n-k+1)}_{k \text{ factors}} ; {}_n P_n = n!$$

Combinatorics Checklist:

	Find # of... (ways to)...	... using ...	Formula
☐	PINs, no repeats, length k	n symbols	${}_n P_k$
☐	Subsets, size k	set size n	$\binom{n}{k} = \frac{{}_n P_k}{k!}$
☐	PINs, with repeats, length k	n symbols	$n^k$
☐	DNA strings with repeats, length k.	n symbols	$n^k$
☐	distribute n books on k shelves	n books (unordered)	$k^n$
☐	functions	from $\{1, \dots, n\}$ to $\{1, \dots, k\}$	$k^n$
☐	plans for n books on k shelves 	just plan how many per shelf	$\binom{n+k-1}{k-1}$
☐	purchase n donuts of k types =	Non-negative integer solutions to $x_1 + \dots + x_k = n$	$\binom{n+k-1}{k-1}$
☐	place n books on k shelves in <u>ordered</u> rows	first plan, then place each book	$\binom{n+k-1}{k-1} n!$

☐ For restrictions: use cases and subtraction.

☐ Final Exam: Also see previous checklists