Topic: Systematic Listing

Topic/Skill	Definition/Tips	Example
1.	A collection of things, where the order	How many combinations of two
Combination	does not matter.	ingredients can you make with apple,
		banana and cherry?
		Apple, Banana
		Apple, Cherry
		Banana, Cherry
2.7	A 11 (Cal 1 1 1 1	3 combinations
2. Permutation	A collection of things, where the order	You want to visit the homes of three
	does matter.	friends, Alex (A), Betty (B) and
		Chandra (C) but haven't decided the
		order. What choices do you have?
		ABC
		ACB
		BAC
		BCA
		CAB
		CBA
3.	When something has <i>n</i> different types,	How many permutations are there for a
Permutations	there are n choices each time.	three-number combination lock?
with		
Repetition	Choosing r of something that has n	10 numbers to choose from {1, 2,10}
	different types, the permutations are:	and we choose 3 of them \rightarrow
		$10 \times 10 \times 10 = 10^3 = 1000$
	$n \times n \times \dots (r \ times) = n^r$	permutations.
4.	We have to reduce the number of	How many ways can you order 4
Permutations	available choices each time.	numbered balls?
without		
Repetition	One you have chosen something, you	$4 \times 3 \times 2 \times 1 = 24$
1	cannot choose it again.	
5. Factorial	The factorial symbol '!' means to multiply	$4! = 4 \times 3 \times 2 \times 1 = 24$
	a series of descending integers to 1.	
	Note: 0! = 1	
6. Product	If there are x ways of doing something and	To choose one of $\{A, B, C\}$ and one of
Rule for	y ways of doing something else, then there	$\{X,Y\}$ means to choose one of
Counting	are xy ways of performing both.	$\{AX, AY, BX, BY, CX, CY\}$
		The mile cover that them are 2 × 2 - (
		The rule says that there are $3 \times 2 = 6$ choices.
		choices.