Review:
Basic Counting Principles:
1. Addition Rule
2. Product Rule
3. Double Counting
4. Counting Lists ... with or without repetition \((n)_k\) and \(n^k\)
5. Counting subsets \(\binom{n}{k}\)
6. Counting multisets \(\binom{n}{k} = \binom{k+n-1}{k}\)
7. Counting complements 3 of a kind poker hands \((54,912)\)
8. Using bijections to count \(\binom{n}{k} = \binom{n}{n-k}\)
9. Using equivalence relations to count \(\binom{n}{k} = \frac{(n)_k}{k!}\)

Sets and Multisets

Subsets and Multisets as distributions -
Subsets: \(k\) identical objects into \(n\) distinct boxes each getting at most one.
Multisets: \(k\) identical objects into \(n\) distinct boxes with no restrictions.

Fill in second line of distribution table.

Prove Pascal's identity.
\[\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1}\]

Discuss corresponding proof of
\[\binom{n}{k} = \binom{n-1}{k} + \binom{n}{k-1}\]

Non-negative integer solutions:
\(\binom{n}{k}\) is the number of solutions in non-negative integers of \(x_1 + x_2 + \cdots + x_n = k\).

Binomial Theorem (Combinatorial Proof)