If You See…	**You Should Think…**
Ordered selection with replacement – multiple sets Examples: 1. Selecting a 3-person band from 3 sets of different size: 5 guitarists, 2 drummers, and 4 singers	**Permutation with replacement: multiplication rule** **Count = $n_1 \bullet n_2 \bullet \ldots \bullet n_k$,** where n_k = the number of items in the k<u>th</u> set. For example, there are 5 • 2 • 4 = 40 different band arrangements
Ordered selection with replacement – single set Examples: 1. Throwing two dice 2. Flipping two coins 3. Selecting 1 item from each of three sets	**Permutation with replacement** **Count = n^k**, where n = the number of items to choose and k = the number of selections of those n items. For example, for two dice there are n = 6 items to choose (the 6 sides) and k = 2 selections (the two dice that are thrown).
Ordered selection without replacement Examples: 1. Possible arrangements of people in a line 2. Selecting 6 numbered balls from a set of 99 balls for the lottery	**Permutation without replacement** **Count = $_nP_k$** = $\frac{n!}{(n-k)!}$ where n = the number of items to choose and k = the number of selections of those n items. For example, when selecting 6 balls (in order) from 99 balls, n = 99 and k = 6, giving $_{99}P_6 = \frac{99!}{(99-6)!} = 806{,}781{,}064{,}320$.
Unordered selection without replacement Examples: 1. Number of games played between 10 teams in a round robin tournament 2. Number of ways 5 cards can be selected from 13 hearts in a card deck	**Combination without replacement** **Count = $_nC_k$** = $\binom{n}{k} = \frac{n!}{(n-k)!k!}$ where n = the number of items to choose and k = the number of selections of those n items. For example, there are $_{13}C_5 = \frac{13!}{(13-5)!5!} = 1287$ ways to pick 5 cards from the 13 hearts in a deck of cards.
Unordered selection without replacement with partitions Examples: 1. Number of 13-card bridge hands possible with 4 players.	**Combination without replacement with partitions** **Count =** $= \frac{n!}{r_1!r_2!\ldots r_i!}$ where n = the number of items to choose and r_i = the number of items in partition i. For example, there are $\frac{52}{13!13!13!13!}$ = 6,227,020,800 ways to deal 4 13-card bridge hands.