1. Multiply values of $\binom{n}{r}$ to calculate the number of possible outcomes for each of the following. Do not use permutations or exponents.

a) Roll 3 twelve-sided dice.

Each die has 12 possible outcomes, 1 of which that will be chosen.

b) Rank 5 books from best to worst.

There are 5 possible books from which to choose the 1 worst book.

c) Choose 3 people from a class of 21.

This is a group of 3 people that are not distinguished from each other.

d) Flip a coin, roll a 10-sided die, and draw a card.

A coin has 2 sides, and a deck has 52 cards.

e) Arrange the letters of the word PEPPERS in any order.

There are 7 spots to choose from fro the 3 Ps, etc.

f) Choose 3 cards from one deck and 2 cards from another deck.

This is two separate choose problems.

g) Choose your favorite, second favorite, and third favorite movie from a list of 55 movies.

This is three separate choose problems.

h) Select a president, a vice president, a treasurer, and a secretary from a class of 210 students.

This is three separate choose problems.

2. Rewrite your work for problems b, g, and h, above, using permutations instead of combinations.

Write nPr, showing that you are choosing r of the n items and uniquely identifying each chosen item.

b)   g)   h)

3. There are 23 honors freshman math students. Make up a word problem for each of the following answers.

a) $_{23}C_2$

For combinations, it does not matter which freshman is which.

b) $_{23}P_2$

For permutations, it matters which freshman is which.

c) $_{23}P_2 \cdot {}_{21}C_2$