Performance Objective: To Investigate Combinations

Homework #9PR4 – NYA p.709 #1 – 6, 11, 13, 14, 16, 38, 39

Do Now: How many unique meals can be ordered from a menu with 3 beverages, 5 entrees, and 2 desserts. A meal consists of once choice of each category.

A telemarketing company makes calls between 12 pm and 12 am every day.

1. P(12 pm – 1 pm) =	4. P(10 am – 2 pm) =	
2. P(1 pm – 4 pm) =	5. P(3 pm – 9 pm) =	
3. P(6 pm – 9 pm) =	6. P(8 pm – 11 pm) =	

State Test Prep: How many ways can you choose members of a quartet from a group of 16 multi-talented singers?

a) ${}_4P_{16}$ b) ${}_{16}P_4$ c) 4! d) 16!

Remember: When using permutations (${}_nP_r$), order is important.

Combination – A selection of a number of objects that forms a set of objects, without regard to order.

Example

Al, Bob, Carol, Dana, and Ed are on a swim team. Two of them will be picked to go to a competition. What are the different combinations of two swimmers for the competition? Make an organized list.

Symbolically: choosing r people from a group of n people is ${}_nC_r$.

We say n = 5, for the total number of swimmers.
We say r = 2, for the number of selected swimmers.

$$\frac{n!}{r!(n-r)!} = \frac{5!}{2!(5-2)!} = \frac{5!}{2! \bullet 3!} = \frac{5 \bullet 4 \bullet 3 \bullet 2 \bullet 1}{(2 \bullet 1)(3 \bullet 2 \bullet 1)} = \frac{5 \bullet 4}{2} = 5 \bullet 2 = 10$$

Using the TI: In the MATH menu, select the PROB tab and choose nCr. Input your value for n, call the nCr function, then input your value for r.

Side–by–Side Summary

Info	Permutation	Combination
Symbols & Formulas n = total r = selected	${}_nP_r = \frac{n!}{(n-r)!}$	${}_nC_r = \frac{n!}{r!(n-r)!}$
Is order important?	Yes	No

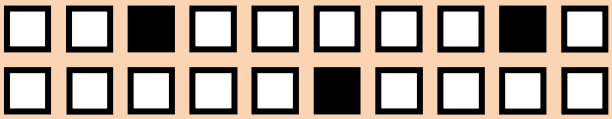
Exploration: Special Relationship

Example 1A: There are 20 paintings in a collection. How many ways can the following groups of paintings be selected?

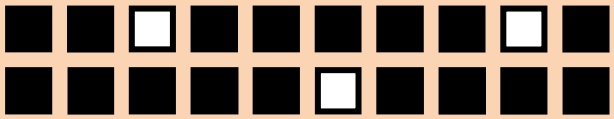
a. 3 paintings? **b. 17 paintings?**

Example 1B: Use the info from Example 1A to explain in your own words why the results of "a" and "b" are the same.

3 Paintings Selected



17 Paintings Selected



As the diagram shows, the same groupings of selected and unselected paintings are in both problems, with the selected group and unselected group reversing positions.

Practice: In which of these situations is order important?

1. **Gold, Silver, and Bronze medals will be given to 3 of 8 competitors.**
2. **Certificates of merit will be given to 5 of 10 entrants.**
3. **At a track meet, 4 of 10 runners will be selected to compete in one event each: 100m, 200m, 500m, and 800m.**
4. **6 of 10 divers will be selected to attend the 2008 Olympics in Beijing.**

Using Permutations and Combinations in Probability

You have 9 new CDs (3 rock, 2 country, 4 jazz) to put on a rack. What is the probability you will choose a jazz CD first, followed by a rock CD?

$$P(\text{first jazz, then rock}) = \frac{\#\text{ of ways to choose jazz, then rock}}{\#\text{ of ways to order all 9 CDs}} = \frac{4 \bullet 3}{{}_9P_2} = \frac{12}{72} = \frac{1}{6}$$

Practice

You have 3 novels and 2 textbooks to read this summer. What is the probability you will choose a novel, then a textbook?

You have 6 quarters and 4 dimes in your pocket. What is the probability you will choose 3 quarters?