

## Notes 11.5

### Probability with the Fundamental Counting Principle, Permutations, and Combinations

1. Seven different colored flags are randomly put on a flag pole. The colors of the flags are pink, red, blue, green, yellow, white, and tan. What's the probability that the pink one will be in the middle, and that the green and yellow ones will be on the ends?

a. In how many ways can the flags be put on the flag pole?

$$7! = \boxed{5040}$$

b. In how many ways can the flags be put on the flag pole if the pink one is in the middle, and the green and yellow ones are on the either end?

$$\begin{array}{ccccccc} \underline{2} & \underline{4} & \underline{3} & \underline{P} & \underline{2} & \underline{1} & \underline{1} \\ \boxed{48} & & & & & & \end{array}$$

c. Find the probability that when the 7 flags are randomly put on the flag pole, the pink flag will be in the middle, and that the green and yellow flags will be on the ends.

$$\frac{48}{5040} = \boxed{\frac{1}{105}}$$

2. A group consists of seven men and six women. Four people are selected to attend a meeting. Find the probability that the selected group will consist of all women.

a. In how many ways can four people be selected from this group of 13?

$${}_{13}C_4 = \boxed{715}$$

b. In how many ways can four women be selected?

$${}_{6}C_4 = \boxed{15}$$

c. Find the probability that the selected group will consist of all women.

$$\frac{{}_6C_4}{{}_{13}C_4} = \frac{15}{715} = \boxed{\frac{3}{143}}$$

3. A state lottery is designed so that a player chooses five numbers from 1 to 45 on one lottery ticket. The order in which the numbers are selected is not important.

a. What is the probability that a player with one lottery ticket will win?

$$\frac{1}{45 C 5} = \boxed{\frac{1}{1,221,759}}$$

$$P(\text{winning w/ 1 ticket}) =$$

b. What is the probability of winning if 200 different lottery tickets are purchased?

$$\boxed{\frac{200}{1,221,759}}$$

$$P(\text{winning w/ 200 tickets}) =$$

4. Five people are selected randomly to be on a committee from a group of six juniors and eight seniors.

a. Find the probability that the 5 people selected are all seniors.

$$P(\text{all 5 seniors}) =$$

$$\frac{\# \text{ ways all Sr}}{\# \text{ ways pick 5}} = \frac{8 C 5}{14 C 5} = \frac{56}{2002} = \frac{28}{1001} = \boxed{\frac{4}{143}}$$

b. Find the probability that the committee consists of 2 juniors and 3 seniors.

$$P(2 Jr + 3 Sr)$$

$$\frac{\# \text{ ways 2 Jr 3 Sr}}{2002} = \frac{6 C 2 \cdot 8 C 3}{2002} = \frac{15 \cdot 56}{2002}$$

$$= \frac{840}{2002} = \boxed{\frac{60}{143}}$$