Precalculus
Section 10.1 Notes – Day 2

More Probability? Probably!

Warm-up: ① 5 girls + 5 boys: How many ways can you arrange them so that it alternates genders?

$$\frac{5}{G} \cdot \frac{5}{B} \cdot \frac{4}{G} \cdot \frac{4}{B} \cdot \frac{3}{G} \cdot \frac{3}{B} \cdot \frac{2}{G} \cdot \frac{2}{B} \cdot \frac{1}{G} \cdot \frac{1}{B} = 14,400$$

$$\text{OR} \quad \underset{B}{} \underset{G}{} \underset{B}{} \underset{G}{} \underset{B}{} \underset{G}{} \underset{B}{} \underset{G}{} \underset{B}{} \underset{G}{} = 14,400$$

$$\overline{ 28,800}$$

② How likely is this to happen if group is randomly arranged?

$$P(B|G) = \frac{28,800}{10!} \approx .0079$$

$$\approx .8\%$$

Probabilities with Permutations and Combinations:

① License plate with 5 letters, no repeats. What is probability that plate has A, B, and C?

$$P(ABC) = \frac{1 \cdot 1 \cdot 1 \cdot 23 \cdot 22 \cdot 5!}{26 \cdot 25 \cdot 24 \cdot 23 \cdot 22} = \frac{23 \cdot 22 \cdot 5!}{_{26}P_5} = \qquad \frac{1}{A} \cdot \frac{1}{B} \cdot \frac{1}{C} \cdot \frac{23 \cdot 22 \cdot 5!}{}$$

$$\underset{}{3 \quad 2 \quad 1 \quad 23 \quad 22}$$

② In a 5 card hand, what's probability of getting 3 of a kind?

$$P(3 \text{ of a kind}) = \frac{_4C_3 \cdot _{48}C_2 \cdot 13}{_{52}C_5} = \frac{4 \cdot 1128 \cdot 13}{2,598,960} \approx .022$$

$$\approx 2.2\%$$

Examples:

1. During the summer, you work 4 days a week at the local ice cream shop, assigned randomly from the 7 possibilities. What is the probability that your schedule for a given week does <u>not</u> assign you to work on the weekend?

$$P\genfrac(){0pt}{0}{\text{Not weekend}}{\text{(all weekdays)}} = \frac{_5C_4}{_7C_4} = \frac{5}{35} \approx \frac{1}{7}$$

2. A class of Hinsdale Central students includes 1 sophomore, 5 juniors, and 6 seniors. If a group of 5 students is randomly selected, what is the probability the group includes 2 juniors and 3 seniors?

$$P(2 JR, 3 Sr) = \frac{_5C_2 \cdot _6C_3}{_{12}C_5}$$

3. Find the probability of winning a lottery in which you must correctly choose all 4 numbers from a selection of lottery numbers with integers 0 to 29. (Order is not important, numbers do not repeat)

$$P(win) = \frac{1}{_{30}C_4} \approx .000036 \approx .0036\%$$

4. Find the probability of winning the "Pick 4" lottery in which you must correctly select all 4 numbers from a selection of lottery numbers with integers 0 to 9. (Order is important, numbers can repeat)

$$P(win) = \frac{1}{10 \cdot 10 \cdot 10 \cdot 10} = \frac{1}{10,000}$$

5. A committee of 3 people is to be randomly selected from the six people Archibald, Beatrice, Charlene, Denise, Eloise, and Fernando. Find the probability that:

a. Eloise is on the committee.

$$P(E) = \frac{_1C_1 \cdot _5C_2}{_6C_3} = \frac{1 \cdot 10}{20} = \frac{1}{2}$$

b. Eloise and Fernando are on the committee.

$$\frac{_2C_2 \cdot _4C_1}{_6C_3} = \frac{1 \cdot 4}{20} = \frac{1}{5}$$

c. either Eloise or Fernando is on the committee. (NOT BOTH)

$$\frac{_2C_1 \cdot _4C_2}{_6C_3} = \frac{2 \cdot 6}{20} = .6 = \frac{3}{5}$$

d. Neither Eloise nor Fernando is on the committee.

$$\frac{_4C_3}{_6C_3} = \frac{4}{20} = \frac{1}{5}$$

e. Archibald is on the committee and Beatrice is not.

$$\frac{_1C_1 \cdot _4C_2}{_6C_3} = \frac{1 \cdot 6}{20} = .3$$

f. Archibald and Beatrice are on the committee but Charlene is not.

$$\frac{_2C_2 \cdot _3C_1}{_6C_3} = \frac{1 \cdot 3}{20} = .15$$