Math 3201 **Chapter 3 - Combination Probability**

1. A jar contains 2 white marbles and 5 green marbles. Three marbles are drawn simultaneously. What is the probability that:

(A) two of the marbles are green?

$$\text{total} = {}_7C_3 = 35$$

$$\text{fav} = {}_5C_2 \times {}_2C_1 = 20$$

$$P_r = \frac{f}{t} = \frac{20}{35} = 0.571 \text{ or } 57.1\%$$

(B) at least two marbles are green?

at least 2 : 2 or 3

2 green and 1 white $= {}_5C_2 \times {}_2C_1 = 20$

or $+$

3 green and 0 white $= {}_5C_3 \times {}_2C_0 = 10$

$C = 30$

$$P_r = \frac{30}{35} = 0.857 \text{ or } 85.7\%$$

(C) no white marbles are drawn?

$f = {}_5C_3 \times {}_2C_0 = 10$

$t = {}_7C_3 = 35$

$P_n = \frac{10}{35} = 0.286 \text{ or } 28.6\%$

2. A school committee of 5 members is to be formed from a selection pool of 9 boys and 7 girls, What is the probability that:

(A) there are 2 boys and 3 girls on the committee?

$\text{tote} = {}_{16}C_5 = 4368$

$f_{2U} = {}_9C_2 \times {}_7C_3 = 1260$

$P_n = \frac{f}{t} = \frac{1260}{4368} = 0.29 = 29\%$

(B) the girls are the majority?

3 or 4 or 5

$fav = ({}_7C_3 \times {}_9C_2) + ({}_7C_4 \times {}_9C_1) + ({}_7C_5 \times {}_9C_0)$

$= 1596$

$total = {}_{16}C_5 = 4368$ $\quad P_r = \frac{1596}{4368} = 0.365$ or 36.5%

(C) Jane is on the committee, and there are no other restrictions?

If Jane is on the committee, there are now only 16 people to choose from and we must select 4 more.

$total = {}_{16}C_5 = 4368$

$fav = {}_{15}C_4 = 1365$

$P = \frac{f}{t} = \frac{1365}{4368} = \frac{5}{6} = 0.313$

or 31.3%

(D) Brian is on the committee, but Nathan is not, and there are no other restrictions?

We have 14 people to choose from now, since Brian is on the committe and Nathan isn't. We still need 4 people besides Brian.

fav: $_{14}C_4 = 1001$ $P = \frac{f}{t} = \frac{1001}{4368} = \frac{11}{48} = 0.229$ or 22.9%

3. Five males and six females are in a selection pool for a committee of 3 people. What is the probability at most 2 males are on the committee?

at most 2: 0 or 1 or 2

$_5C_0 \times {}_6C_3 = 1 \times 20 = 20$

or +

$_5C_1 \times {}_6C_2 = 5 \times 15 = 75$

or +

$_5C_2$ or $_6C_1 = 10 \times 6 = 60$

155

total $= {}_{11}C_3 = 165$

$P = \frac{f}{t}$

$P = \frac{155}{165} = 0.939$ or 93.9%

4. In a sample of households with a vehicle, four owned a truck and five owned a car. If three households were randomly selected from the sample, calculate the probability that two would have a car and one would have a truck.

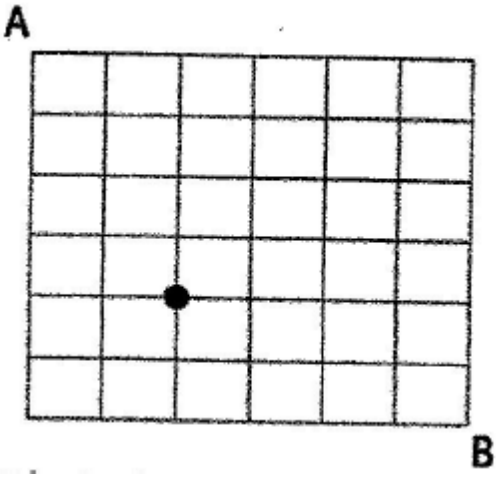
$t = {}_9C_3 = 84$

$f = {}_5C_2 \times {}_4C_1 = 40$

$P = \frac{f}{t} = \frac{40}{84} = \frac{10}{21} = 0.476$ or 47.6%

5. Given the following grid, what is the probability of a path from A to B passing through the dot?

$total = \frac{12!}{6!6!} = 924$



$f_{AD} = \frac{6!}{2!4!} = 15$

$P = \frac{f}{t} = \frac{15}{924} = 0.0162 = 1.6\%$