STA 250, Summer 2013, HW #1

2.2 a) both occur $A \cap B$; b) at least one occurs $A \cup B$
c) neither occurs $\bar{A} \cap \bar{B}$ (also $\overline{A \cup B}$)
d) exactly one occurs $A \cap \bar{B} \cup \bar{A} \cap B$

2.6 a) $A \rightarrow \{(1,2),(1,4),(1,6),(2,2),(2,4),(2,6),(3,2),(3,4),(3,6)$
$(4,2),(4,4),(4,6),(5,2),(5,4),(5,6),(6,2),(6,4),(6,6)\}$

$B \rightarrow \{(1,1),(1,3),(1,5),(2,2),(2,4),(2,6),(3,1),(3,3),(3,5)$
$(4,2),(4,4),(4,6),(5,1),(5,3),(5,5),(6,2),(6,4),(6,6)\}$

$C \rightarrow \{(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,3),(2,5),$
$(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),(4,1),(4,3),(4,6)$
$(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,3),6,5)\}$

b) $\bar{C} \rightarrow \{(2,2),(2,4),(2,6),(4,2),(4,4),(4,6),(6,2),(6,4),(6,6)\}$

$A \cap B \rightarrow \{(2,2),(2,4),(2,6),(4,2),(4,4),(4,6),(6,2),(6,4),(6,6)\}$

$A \cap \bar{B} \rightarrow (1,2),(1,4),(1,6),(3,2),(3,4),(3,6),(5,2),(5,4),(5,6)\}$

$\bar{A} \cup B \rightarrow \{(1,1),(1,3),(1,5),(2,1),(2,3),(2,5),(3,1),(3,3),(3,5),$
$(4,1),(4,3),(4,5),(5,1),(5,3),(5,5),(6,1),(6,3),(6,5),$
$(2,2),(2,4),(2,6),(4,2),(4,4),(4,6),(6,2),(6,4),(6,6)\}$

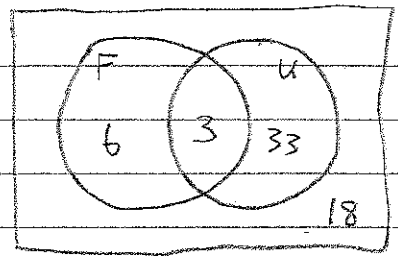
$\bar{A} \cap C \quad \{(1,1),(1,3),(1,5),(2,1),(2,3),(2,5),(3,1),(3,3),(3,5)$
$(4,1),(4,3),(4,5),(5,1),(5,3),(5,5),(6,1),(6,3),(6,5)$

2.7 Candidates M_1, M_2, M_3, F_A, F_B Select two
$S \rightarrow \{(1,2),(1,3),(1,A),(1,B),(2,3),(2,A),(2,B),(3,A),(3,B),(A,B)\}$

$A \rightarrow$ Two men $\{(1,2),(1,3),(2,3)\}$
$B \rightarrow$ at least one woman $\{(1,A),(1,B),(2,A),(2,B),(3,A),(3,B),(A,B)\}$

$\bar{B} \rightarrow \{(1,2),(1,3),(2,3)\} = A$
$A \cup B \rightarrow A \cup \bar{A} \rightarrow S$
$A \cap B \rightarrow A \cap \bar{A} \rightarrow \phi$
$A \cap \bar{B} \rightarrow A \cap A \rightarrow A$

2.8 F → off Campus $n_F = 9$
U → undergrad $n_U = 36$ $n_{F \cap U} = 3$



a) $n_{F \cup U} = 6 + 3 + 33 = 42$
b) $n_{\bar{F} \cap U} = 33$
c) $n_{F \cap \bar{U}} = 18$

2.9 $S \rightarrow \{ A^+, B^+, AB^+, O^+, A^-, B^-, AB^-, O^- \}$

2.12 a) $S = \{ \text{Right, Left, Ahead} \}$
b) $P(\text{Turn}) = \frac{2}{3}$

2.14

Glasses \ Reading	Y	N
Y	.44	.14
N	.02	.40

a) $P(\text{Glasses}) = .58$
b) $P(\text{Glasses not used}) = .14$
c) $P(\text{Reading}) = .46$

2.19 a) $S \rightarrow \{ 11, 12, 13, 21, 22, 23, 31, 32, 33 \}$
b) each has probability $\frac{1}{9}$

c) A: same vendor $P(A) = \frac{3}{9}$ $A \cup B \rightarrow \{ 11, 22, 33, 12, 21, 23, 32 \}$
B: 2 at least once $P(B) = \frac{5}{9}$ $P(A \cup B) = \frac{7}{9}$
$A \cap B \rightarrow \{ 22 \}$ $P(A \cap B) = \frac{1}{9}$

2.27 a) $S \rightarrow \{ LL, LR, LA, RL, RR, RA, AL, AR, AA \}$
$N = 9$
b) $P(\text{at least one L}) = \frac{5}{9}$
c) $P(\text{at most one turn}) = \frac{5}{9}$

2.28 a) $S \rightarrow \{ 12, 13, 23, 1M, 2M, 3M \}$
b) probability $\frac{1}{6}$ each
c) $P(\text{M included}) = \frac{3}{6}$

2.29 ab Women A, B, C, D Men 1, 2

$S \rightarrow \{AB, AC, AD, A1, A2, BC, BD, B1, B2, CD, C1, C2, D1, D2, 12\}$

c) $P(\text{both women}) = \frac{6}{15}$ $N = 15$

2.31 a) defectives 1, 2 working A, B, C, D select 2

$S \rightarrow \{12, 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, AB, AC, AD, BC, BD, CD\}$ $N = 15$

$P(\text{at least one defective}) = \frac{9}{15}$

$P(\text{both defective}) = \frac{1}{15}$

b) defectives 1, 2, 3, 4 working A, B

$S \rightarrow \{12, 13, 14, 1A, 1B, 23, 24, 2A, 2B, 34, 3A, 3B, 4A, 4B, AB\}$

$P(\text{at least one defective}) = \frac{14}{15}$

$P(\text{both defective}) = \frac{6}{15}$

2.32 Two styles 0, 1 Four customers

a) $S \rightarrow \{0000, 0001, 0010, 0100, 1000, 0011, 0101, 0110, 1001, 1010, 1100, 0111, 1011, 1101, 1110, 1111\}$

b) each with probability $\frac{1}{16}$

c) $P(\text{all same}) = \frac{2}{16}$

2.36 $S \rightarrow \{123, 132, 213, 231, 312, 321\}$ $N = 3 \times 2 \times 1 = 3!$

2.37 a) $N = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 6!$

b) possibilities for (D, F)

12, 13, 14, 15, 16, 23, 24, 25, 26, 34, 35, 36, 45, 46, 56 } 15 "versions"

$$P(\text{D before F}) = 15 \times \frac{1 \times 1 \times 4 \times 3 \times 2 \times 1}{6 \times 5 \times 4 \times 3 \times 2 \times 1} = \frac{15}{30} = .5$$

2.38 Number of dinners = $4 \times 3 \times 4 \times 5 = 240$ dinners

2.41 Number of phone numbers $9 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 9{,}000{,}000$

2.42 Number of arrangements $10 \times 9 \times 8 = 720 = P_3^{10}$

2.51 $N = C_3^{50} = 19600$

a) $P(3 \text{ org}) = \frac{C_3^4 \times C_0^{46}}{C_3^{50}} = \frac{4}{19600} = .0002$

b) $P(2 \text{org}, 1 \text{c}) = \frac{C_2^4 \times C_1^{46}}{C_3^{50}} = \frac{16 \times 46}{19600} = .0141$

c) $P(1 \text{org}, 2 \text{c}) = \frac{C_1^4 \times C_2^{46}}{C_3^{50}} = \frac{4 \times 1035}{19600} = .2112$

d) $P(0 \text{org}, 3 \text{c}) = \frac{C_0^4 \times C_3^{46}}{C_3^{50}} = \frac{1 \times 15180}{19600} = .7745$

2.53 $N = 5 \times 4 \times 3 = 60 = P_3^5$

$n_{F_3} = 1 \times 4 \times 3 + 4 \times 1 \times 3 + 4 \times 3 \times 1 = 36$

$P(F_3 \text{ selected}) = \frac{36}{60} = .6$

2.54 $N = C_4^8$ $P(2\text{♣}, 2\text{♠}) = \frac{C_2^3 \times C_2^5}{C_4^8} = \frac{3 \times 10}{70} = .429$

2.57 $N = C_2^{52}$, $P(\text{Ace}, \text{F}) = \frac{C_1^4 \times C_1^{12} \times C_0^{36}}{C_2^{52}} = \frac{4 \times 12 \times 1}{1326} = .0362$

2.64 $N = 6 \times 6 \times 6 \times 6 \times 6 \times 6 = 6^6 = 46656$

orderings of 1,2,3,4,5,6 $= 6! = 720$

$P(\text{one of each}) = \frac{6!}{6^6} = .0154$