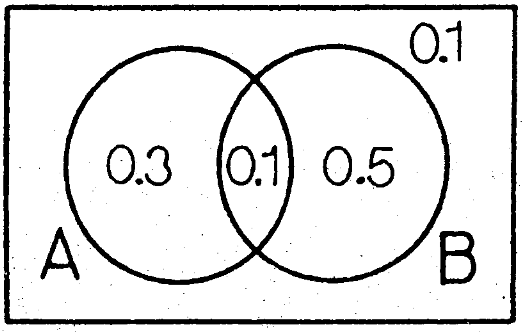
HW #1 Mthsc 400 $\frac{1}{2}$

2.6



Using the above Venn diagram, we have the following:

a. $P(A) = 0.3 + 0.1 = 0.4$

b. $P(A \cup B) = 0.9$

c. $P(\bar{B}) = 0.4$

d. $P(AB) = 0.1$

e. $P(\bar{A} \cup \bar{B}) =$ 0.9

f. $P(\bar{A} \cap \bar{B}) = 0.1$

g. $P(\overline{A \cup B}) = 0.1$

2.13 Denote an outcome as an ordered pair of Roman numerals, where the first Roman numeral of the pair signifies the firm (either I, II, or III) that receives the first contract and the second signifies the firm that receives the second contract.

a. The simple events are (I, I), (I, II), (I, III), (II, I), (II, II), (II, III), (III, I), (III, II), (III, III).

b. $P(\text{both contracts go the same firm}) = P[(\text{I, I})] + P[(\text{II, II})] + P[(\text{III, III})]$

$$= \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{1}{3}$$

c. $P(\text{firm I gets at least one contract}) = P[(\text{I, I})] + P[(\text{I, II})] + P[(\text{I, III})] + P[(\text{II, I})] + P[(\text{III, I})]$

$$= \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{5}{9}$$

2.15 **a.** $P_2^7 = 7(6) = 42$

b. $\binom{7}{2} = \frac{7(6)}{2(1)} = 21$

2.17 $P_4^{10} = 10 \cdot 9 \cdot 8 \cdot 7 = 5{,}040$

2.19

$$\binom{n-1}{r-1} + \binom{n-1}{r} = \frac{(n-1)!}{(r-1)!\,(n-r)!} + \frac{(n-1)!}{r!\,(n-1-r)!}$$

$$= \frac{r\,(n-1)!}{r\,(r-1)!\,(n-r)!} + \frac{(n-r)\,(n-1)!}{(n-r)\,r!\,(n-1-r)!}$$

$$= \frac{r\,(n-1)! + (n-r)\,(n-1)!}{r!\,(n-r)!}$$

$$= \frac{n!}{r!\,(n-r)!} = \binom{n}{r}$$

2.24 **a.** The number of ways of partitioning nine wrenches into three groups, each containing 3 wrenches, is

$$\frac{9!}{3!3!3!} = 1,680.$$

b. Required probability

$$= \frac{\begin{pmatrix}\text{number of ways of partitioning} \\ \text{the seven new wrenches into groups} \\ \text{of } 1, 3, \text{ and } 3 \text{ wrenches}\end{pmatrix}}{\begin{pmatrix}\text{number of ways of partitioning} \\ \text{nine wrenches into three equal groups}\end{pmatrix}}$$

$$= \frac{\left(\frac{7!}{1!3!3!}\right)}{\frac{9!}{3!3!3!}} = \frac{140}{1,680} = 0.0833$$