Chapter 5: Counting Problems

1. Inclusion-exclusion principle
    1. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
2. De'Morgan's law
    1. $(A \cup B)' = A' \cap B'$
    2. $(A \cap B)' = A' \cup B'$
3. Multiplication principle
    1. and = multiply
    2. or = add
4. Permutations and combinations
    1. $P(n,r) = n! / (n-r)!$
    2. $C(n,r) = n! / [r!(n-r)!$
5. Ordered Partitions = $n! / (n1!\ n2!\ n3!...nm!)$

Chapter 6: Probabilities using counting

1. Experiments, outcomes, sample spaces, events
    1. Sample space = set of all possible outcomes
    2. Event = any subset of the sample space
2. Odd in favor/against
    1. Odds = $Pr / (1-Pr)$
    2. Pr = odds / (odds + 1)
3. Calculating probabilities of events
    1. $Pr(E) = n(E) / n(S)$
4. Conditional probability = Baye's Theorem
    1. $Pr(E|F) = Pr(E \cap F) / Pr(F)$
5. Independent events, if:
    1. $Pr(E \cap F) = Pr(E)Pr(F)$, $P(E) = Pr(E|F)$

Chapter 7: Probability & Statistics

1. Normal distribution and Z-scores
    1. $z = (x-\mu)/\sigma$
    2. Exact values:
        1. $Pr(x \geq a) = 1 - Pr(x \leq a) = 1 - Pr(z \leq [(a-\mu)/\sigma]) = 1 - A(a)$
        2. $Pr(a \leq x \leq b) = Pr(z \leq b) - Pr(z \leq a) = A(b) - A(a)$
    3. Estimations:
        1. $Pr(x = a) = Pr(a-0.5 \leq x \leq a+0.5) = Pr([(a-0.5-\mu)/\sigma] \leq z \leq [(a+0.5-\mu)/\sigma]) = A(z_1) - A(z_2)$
2. Binomial trials
    1. $C(n,r)(p)^r(q)^{n-r}$
3. Approximation of binomial trials by normal distribution
    1. Chebychev's Inequality: $Pr(\mu-c \leq x \leq \mu+c) \geq 1 - (\sigma^2/c^2)$
4. Mean & Standard deviation
    1. Expected value = $E(x) = \mu = np$
    2. SD = $\sigma = \sqrt{(npq)} = \sqrt{([\Sigma(x-\bar{x})^2 f]/(n-1))}$

Chapter 3: Linear programming

1. Graphing the feasible set: drawing lines and shading the right half space
2. Finding the corner/vertex where the objective function is maximized/ minimized

Chapter 2: Matrices

1. Inverses
    1. $A^{-1} = 1/(ad-bc) \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
    2. $AX = B$ $\quad X = A^{-1}B$
2. Input-output analysis
    1. $X = (I-A)^{-1}D$

Chapter 8: Markov processes

1. Transition matrix
    1. $S_n = A^n S_o$
2. Absorbing stochastic matrix
    1. $\begin{bmatrix} I & S \\ o & R \end{bmatrix}$
3. Fundamental matrix
    1. $(I-R)^{-1}$
4. Stable matrix
    1. $\begin{bmatrix} I & S(I-R)\text{^}(-1) \\ o & o \end{bmatrix}$

Chapter 9: Game theory

1. Strictly determined games/saddle points/optimal pure strategies
    1. Saddle point = max of row minimums & min of column maximums
2. Expected value
    1. $E = RAC$
3. Optimal mixed strategies
    1. $r_1 = (d-c)/(a+d-b-c)$ $\quad r_2 = 1 - r_1$
    2. $c_1 = (d-b)/(a+d-b-c)$ $\quad c_2 = 1 - c_1$
    3. $E = (ad-bc)/(a+d-b-c)$