Statistics
Chapter 4
Note Sheet

Probability

When outcomes are equally likely:

P(event A)= $\frac{\text{\# of outcomes favorable to A}}{\text{Total no. of outcomes}}$

P(not A)= 1- P(A)

The sum of the probabilities of outcomes in a sample space is 1.

The probability of an event is a number between 0 and 1.

The probability that an event will occur plus the probability that it will not, is equal to 1.

Compound Events

Independent events- $P(A \cap B) = P(A) \cdot P(B)$

Dependent events- $P(A \cap B) = P(A) \cdot P(B, \text{given that A has occurred})$
$P(A \cap B) = P(B) \cdot P(A, \text{given that B has occurred})$

Mutually exclusive events - $P(A \cup B) = P(A) + P(B)$

For Any events… - $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Combinations and Trees

Multiplication Rule of counting – If there are *n* possible outcomes for an **event A**, and *m* possible outcomes for and event B, then there are a total of *n x m* possible outcomes for the series of events, A followed by B.

Permutations – arrange items (without replacement) – order is important

$P_{n,r} = \frac{n!}{(n-r)!}$ also written as ${}_nP_r$

Combinations – possibilities of multiple groupings (with replacement)

$C_{n,r} = \frac{n!}{r!(n-r)!}$ also written as ${}_nC_r$ or $\binom{n}{r}$

Probability Distributions

Discrete random variable – a variable that can take on only a finite number of values

Continuous random variable – a variable that can take on any of the countless number of values in a line interval

Probability distribution – an assignment of probabilities to the specific values of the random variable, or a range of values of the random variable

Mean of a discrete population – $\mu = \sum x \bullet P(x)$, x = value of variable, P(x) = probability

Standard deviation - $\sigma = \sqrt{\sum (x-\mu)^2 \bullet P(x)}$

Example Table-

Table 4-9, Job changes During a Working Career (Age 25-65)

x (No. of Job Changes)	P(x)	xP(x)	$x-\mu$	$(x-\mu)^2$	$(x-\mu)^2 P(x)$
0	0.01	0	-5.6	31.36	0.314
1	0.02	0.02	-4.6	21.16	0.423
2	0.04	0.08	-3.6	12.96	0.518
3	0.08	0.24	-2.6	6.76	0.541
4	0.11	0.44	-1.6	2.56	0.282
5	0.15	0.73	-0.6	0.36	0.054
6	0.25	1.50	0.4	1.06	0.040
7	0.20	1.40	1.4	1.96	0.392
8	0.09	0.72	2.4	5.76	0.518
9	0.05	0.45	3.4	11.56	0.578
		$\mu = \sum x \bullet P(x)$=5.6			$\sum (x-\mu)^2 \bullet P(x)$=3.660