Elementary Statistics for Business
Fall 2003
Name:……
11+10+12+10+6+12+9+10+4+5+4+7

# Show your work!

1 Fill in the following blanks:

(a) Probabilities are real numbers between ____ and ____, inclusive.

(b) $P$ (Sample Space) = _____.

(c) $P$ (Empty Set) = _____.

(d) If two events $A$ and $B$ are mutually exclusive then $P(A \cup B) =$ _____.

(e) In general $P(A \cup B) =$ _____.

(f) $P(A') =$ _____.

(g) Greek letter $m$ is the symbol for _____.

(h) Greek letter $s$ is the symbol for _____.

(i) Symbol for the empty set is _____.

(j) $(A')' =$ _____.

2 Consider the experiment of rolling a balanced six-sided die. Sample space $S = \{1, 2, 3, 4, 5, 6\}$. Let $A = \{1, 3, 5\}$ and $B = \{3, 6\}$. Find

(a) $A \cup B$;

(b) $A \cup B'$;

(c) $A \cap B'$;

(d) $A' \cap B'$;

(g) $A' \cup B'$.

3 Given the mutually exclusive events $Y$ and $Z$, for which $P(Y) = 0.28$, and $P(Z) = 0.47$, find

(a) $P(Y')$;

(b) $P(Y \cap Z)$;

(c) $P(Y \cup Z)$;

(d) $P(Y' \cap Z')$;

(e) $P(Y' \cup Z')$;

(f) $P(Y' \cap Z)$.

4 Let a random variable $X$ have a binomial distribution with n = 8 and p = 0.3. Find the following.

(a) $P$ ( $X = 2$ )

(b) $P$ ( $X$ is at least 5 )

(c) $P$ ( $X$ is less than 2 )

(d) $P$ ( $X$ is more than 4 )

(e) $P$ ( $X$ is at most 2 )

5 A civil service examination is designed so that 80% of all high school graduates can pass. Find the probabilities that among 14 high school graduates

(a) at least 12 will pass the test;

(b) at most 10 will pass the test.

6 Find the **mean**, **variance** and the **standard deviation** of the following distribution.

| $X$ | 0 | 1 | 2 |
|---|---|---|---|
| $f(x)$ | 0.4 | 0.2 | 0.4 |

7 The following table gives the exact breakdown of 400 inmates in a prison according to their sentences and the status as first or multiple offenders.

| | $A$ | $A'$ | Total |
|---|---|---|---|
| $B$ | 120 | 40 | |
| $B'$ | 80 | 160 | |
| Total | | | |

Let $A$ ={Sentences less than five years} and $B$ ={First offenders}. If an inmate is randomly selected, find the following probabilities.

(a) $P(B) = P$ (Being a first time offender).

(b) $P(A \cap B) = P$ (First time offender whose sentence is less than five years).

(c) $P(A \mid B) = P$ (Having a sentence of less than five years given that the inmate is a first time offender).

# Part 2

Name:……

8 Find the following probabilities using the standard normal distribution. **Draw a normal probability graph for each part and shade the area of interest.**

(10 points)

(a) $P(Z \le 0)$.

(b) $P(Z \le 1.58)$.

(c) $P(Z \le -1.58)$.

(d) $P(-1.58 \le Z \le -1.08)$.

(e) $P(-1.58 \le Z \le 1.08)$.

9 Find the points $Z^*$ such that: (4 points)

(a) $P(0 \le Z \le Z^*) = 0.4949$:

(b) $P(Z < Z^*) = 0.0051$.

**Draw a normal probability graph for each part and shade the area of interest and mark the point of interest.**

10 Let the random variable $X$ have a normal distribution with the mean 30 and the standard deviation 4. Find the following: (5 points)
**Draw graphs for parts (d) and (e).**

(a) $Z$ score when $X$ = 35.

(b) $Z$ score when $X$ = 22.

(c) $Z$ score when $X$ = 38.

(d) $P(35 \le X \le 38)$.

(e) $P(22 \le X \le 38)$.

11 If $z_a$ denotes the value of $z$ for which the area under the standard normal curve to its right is equal to $a$, find (4 points)
**Draw graphs.**

(a) $Z_{0.005}$;

(b) $Z_{0.05}$.

12 The lengths of the sardines received by a cannery have a mean of 4.75 inches and a standard deviation of 0.25 inches. If the distribution of these lengths can be approximated closely with a normal distribution, what percentage of all these sardines are (7 points)

(a) longer than 4.25 inches;

(b) from 4.50 to 5.5 inches long? **Draw graphs**.