NAME: **Econ 410**

Test 1 **Spring 2004**

Directions:

- You are required to show all necessary work on the exam in a clear, concise manner.
- Graphs are mandatory whenever appropriate.
- Partial credit may be awarded where accuracy and clarity of expression warrant.
- Your score is based on (# points earned/100).

Formulae:

1. $\bar{x} = \frac{1}{n}\sum x \;, \sigma^2 = \frac{1}{n}\sum (x\text{-}\mu)^2 \;, s^2 = \frac{1}{n-1}\sum (x\text{-}\mu)^2$
2. $P(A)=\frac{\#\text{ of outcomes yielding event A}}{\text{Total \# of outcomes possible}}$
3. $P(A \cap B) = P(B/A)P(A) \Rightarrow P(B/A) = \frac{P(A\cap B)}{P(A)}$
4. $P(A\cup B)=P(A)+P(B)-P(A\cap B)$
5. $P(A\cap B)=P(A/B)P(B)\Rightarrow P(A/B)=\frac{P(A\cap B)}{P(B)}$
6. $P(\text{not } A)=1-P(A)$
7. $E[aX+bY] = a\,E[X] + bE[Y]$
8. $Var[aX + bY] = a^2\,Var[X] + b^2\,Var[Y] + 2ab\,Cov[X,Y]$
9. $E[x] = \Sigma\; p(x_i)\,x_i$
10. $\sigma^2 = \Sigma\, p(x_i)(x_i - E[x])^2$
11. $z = \frac{x-\mu_x}{\sigma_x}$
12. $t_{n-1} = \frac{x-\mu_x}{s_x}$
13. $z = \frac{\bar{x}-\mu_x}{\frac{\sigma_x}{\sqrt{n}}}$
14. $t_{n-1} = \frac{\bar{x}-\mu_x}{\frac{s_x}{\sqrt{n}}}$
15. $\bar{x} + z_{\alpha/2}\left(\sigma_x/\sqrt{n}\right)$
16. $\bar{x} + t_{\alpha/2}\left(s_x/\sqrt{n}\right)$
17. $P(X)=\left(\frac{n!}{x!(n-x)!}\right)p^x(1-p)^{n-x}$
18. $\mu_x = E[X] = np$
19. $\text{var}[x] = np(1-p)$
20. $z = \frac{x-np}{\sqrt{np(1-p)}}$

Part I: The probability that the New England Patriots will win the Super Bowl next year is 0.2, and the probability that more than half their players suffer some sort of injury during the season is 0.3. Furthermore, the probability that the Patriots will have more than half their players suffer some sort of injury and win the Super Bowl is 0.1. *Use this information to answer the next three questions.*

1) What is the probability that the Patriots will win given that they have half their players hurt? (11 points)

2) What is the probability that the Patriots will have more than half their players suffer some sort of injury or win the Super Bowl? (11 points)

3) Are the two events "win the Super Bowl" and "have more than half the players hurt" independent? Explain. (11 points)

Part III: (20 points each)

1) Brian's books were expensive this spring. The population of the prices of his books (in $) is {40, 86, 126, 100}. (11 points)
Calculate (i) the population variance and (ii) the sample standard deviation.

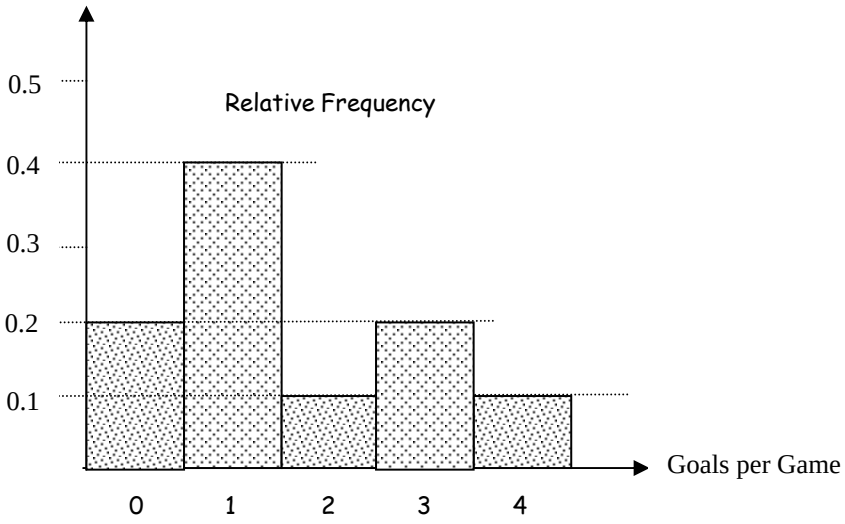
2) Given a normally distributed random variable X with mean = 20 and population standard deviation =2,
i) Find P(17<X<22),
ii) Find b such that P(X < b) = 0.9382. (12 points)

3) An experiment is performed where a weighted coin is flipped 4 times. If the probability of getting a "heads" in one flip is 0.3,
i) calculate the probability of getting at least three heads when this experiment is performed,
ii) calculate the probability of getting at most three heads when this experiment is performed. (10 points)

4) A typical Golden Retriever, eats 300 grams of TCBY Frozen Yogurt in a year with a population standard deviation equal to 24 grams.
Find the probability that a random sample of 16 Golden Retrievers would eat between 292 and 313 grams of TCBY Frozen Yogurt per year. (11 points)

5) Referring to #4, now assume that the population variance is unknown, but that the sample standard deviation is 24 grams. Find the probability that a random sample of 16 Golden Retrievers would eat between 292 and 313 grams of TCBY Frozen Yogurt per year. (11 points)

6) Bruiser Buschmann, an NHL ice hockey star, played in 50 games last year. Over the course of the season he scored as many as 4 goals in a single game. Below is the Relative Frequency distribution for the number of goals per game Bruiser scored last year. (12 points)



i) How many total goals did Bruiser score last season?

ii) Calculate the median number of goals per game.

iii) Calculate the (pop.) standard deviation for goals per game.