

MATH 210 **PRACTICE EXAM 2**
Semester I, 2007-2008 Lecture 1

Unless you are instructed otherwise, your answer should be computed completely (e.g., as a whole number, or a simple fraction, or a decimal).

1. (10 points) A fair die is rolled 9 times. Assume that the results of the rolls are independent. Find the probability that your sequence of 9 rolls contains an even number of ones. For example, 3, 2, 1, 5, 6, 6, 1, 2, 3 has 2 ones; 6, 2, 4, 5, 6, 6, 4, 2, 3 has 0 ones. You may leave your answer as an arithmetical expression, without evaluating it.

2. (15 points) Consider the following experiment: You start with a deck of 4 cards, $\{\diamond 3, \diamond 4, \diamond 5, \diamond 6\}$. Now, shuffle the deck and deal them out on the table, one at a time; STOP when the sum of the numbers is 8 or greater. Find the probability that the last card dealt is the $\diamond 5$. Assume that the deal is a fair deal.

3. (10 points) A random variable X has the density function shown below. Find the expected value, $E(X)$.

Value of X	Probability
-20	0.05
-10	0.2
0	0.3
10	0.1
20	0.15
30	0.2

4. (15 points) Consider the following experiment: You start with a deck of 5 cards, $\{\diamond 2, \diamond 3, \diamond 4, \diamond 5, \diamond 6\}$. Now, shuffle the deck and deal out exactly two. Let X be the sum of the two numbers you get. Find the expected value, variance, and standard deviation of X . Assume that the deal is a fair deal. You may leave the result for $\sigma(X)$ in terms of a $\sqrt{\quad}$.

5. (12 points) Let X be a normal random variable with $\mu = E(X) = 73$ and $\sigma(X) = 10$. Find $\Pr[70 \leq X \leq 80]$.

6. (15 points) An unfair coin is tossed 625 times. The coin has probability $\frac{1}{5}$ of coming up heads. Use the normal approximation to the binomial to estimate the probabilities of the following happening:

- a. You get between 120 and 140 heads
- b. You get 135 or fewer heads.

7. (13 points) Let X be a random variable with probability density function f , where

$$f(x) = \begin{cases} 0 & \text{if } x < -2 \\ 0.3 & \text{if } -2 \leq x < 0 \\ 0.1 & \text{if } 0 \leq x < 4 \\ 0 & \text{if } 4 \leq x \end{cases}$$

Find $\Pr[X \geq -1 \mid X \leq 3]$ and $\Pr[X \leq 3 \mid X \geq -1]$.

8. (10 points) Solve the system of equations:

$$6x + 5y = 3 \qquad 2x + 3y = 5$$

There is a unique solution here.