Name: _____ **Instructor:** Heide Gluesing-Luerssen

Math 214: Introduction to Statistics
Spring Semester 1999
Exam 2
March 17, 1999

This Examination consists of 12 multiple choice problems and 4 problems for which you have to write the answer on this cover sheet. Each problem is worth 6 points and no partial credit will be given. You start with 4 points. Record your answers by placing an $\times$ through one letter for each of the multiple choice problems and by writing the numerical answer of the problems $2, 3, 14$, and 16 on this answer sheet.
This booklet consists of 7 sheets of paper including the front cover and one blank page at the end. You are also provided with 3 tables. Calculators, books, and notes are not allowed.

Answers to Multiple Choice Problems

1.	(a)	(b)	(c)	(d)	(e)	**9.**	(a)	(b)	(c)	(d)	(e)
2.						**10.**	(a)	(b)	(c)	(d)	(e)
3.						**11.**	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)	**12.**	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)	**13.**	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)	**14.**					
7.	(a)	(b)	(c)	(d)	(e)	**15.**	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)	**16.**					

I have not violated the Honor Code in this examination.

Signature: _____

Score: _____

1. According to a study published by a group of sociologists at the University of Massachusetts, approximately 49% of the Valium users in the state of Massachusetts are white-collar workers. What is the probability that 4 of the next 10 randomly selected Valium users from this state would be white-collar workers?

(a) $\binom{9}{3}(0.49)^4(0.51)^6$

(b) $\binom{10}{4}(0.49)^6(0.51)^4$

(c) $P_4^{10}(0.49)^4(0.51)^6$

(d) $\binom{9}{3}(0.49)^6(0.51)^4$

(e) $\binom{10}{4}(0.49)^4(0.51)^6$

2. Let X denote a random variable having a binomial distribution with $n = 15$ and $p = 0.4$. Find $P(3 \leq X \leq 9)$. **Write your answer on the cover sheet!**

3. Let Y be a random variable having a Poisson distribution with mean $\lambda = 1.5$. Find $P(Y \geq 4)$. **Write your answer on the cover sheet!**

4. The number of disputes between Groucho and his mother (because of his messy bedroom) follows a Poisson distribution with a mean of 5 per month. What is the probability that they have at least two disputes within a one-month period?

(a) $1 - 5e^{-5}$

(b) $1 - e^{-5} - 5e^{-5}$

(c) $e^{-5} + 5e^{-5}$

(d) $1 - e^{-5}$

(e) $1 - e^{-5} - 5e^{-5} - \frac{25}{2}e^{-5}$

5. The probability that a student pilot passes the written test for a private pilot's license is 0.7. Find the probability that the student will pass the test on the third try.

(a) $(0.3)^2 0.7$

(b) $(0.7)^2 0.3$

(c) $\binom{2}{1}(0.3)^2 0.7$

(d) $\binom{3}{1}(0.3)^2 0.7$

(e) $\binom{2}{1} 0.3(0.7)^2$

6. The probability that a person, living in a certain city, owns a dog is estimated to be 0.3. Find the probability that the tenth person randomly interviewed in that city is the third one to own a dog.

(a) $\binom{10}{2}(0.3)^3(0.7)^7$

(b) $P_3^{10}(0.3)^3(0.7)^7$

(c) $\binom{10}{3}(0.3)^3(0.7)^7$

(d) $\binom{9}{2}(0.3)^3(0.7)^7$

(e) $\binom{9}{3}(0.3)^3(0.7)^7$

7. Arrivals of customers at a certain checkout counter follow a Poisson distribution. It is known that during a given 20-minute period one customer arrived at the counter. What is the probability that she arrived during the last 5 minutes?

(a) $\frac{1}{5}$

(b) $\frac{1}{4}$

(c) $1 - e^{-\frac{1}{4}}$

(d) $\frac{3}{4}$

(e) $e^{-\frac{1}{4}}$

8. The daily amount of coffee, in liters, dispensed by a machine located in an airport lobby is a random variable X having a continuous uniform distribution with density function

$$f(x) = \begin{cases} \frac{1}{3} & 7 \leq x \leq 10 \\ 0 & \text{elsewhere} \end{cases}$$

Find the probability that on a given day the amount of coffee dispensed by this machine will be more than 7.4 liters but less than 9.5 liters.

(a) 0.3

(b) 0.9

(c) 0.7

(d) 0.4

(e) 0.5

9. Let the random variable X have the probability density function

$$f(x) = \begin{cases} cx - 3x^2 & 0 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$

Find the value for the constant c.

(a) 1

(b) 2

(c) 3

(d) 4

(e) 5

10. Let Y be a random variable with probability density function

$$f(y) = \begin{cases} \frac{1}{2}y & 0 \leq y \leq 2 \\ 0 & \text{elsewhere} \end{cases}$$

Find the expected value of Y.

(a) $\frac{4}{3}$

(b) 1

(c) $\frac{3}{2}$

(d) 2

(e) $\frac{3}{4}$

11. For the same random variable Y as in problem 10 find $P(1 \leq Y \leq 2)$.

(a) $\frac{1}{2}$

(b) 0

(c) $\frac{3}{4}$

(d) $\frac{1}{4}$

(e) 1

12. The length of time for one individual to be served at a cafeteria is a random variable having an exponential distribution with a mean of 4 minutes. What is the probability that the service time for the next person is longer than 2 minutes?

(a) $e^{-\frac{1}{2}}$

(b) $1 - e^{-\frac{1}{2}}$

(c) e^{-2}

(d) $1 - e^{-2}$

(e) $\frac{1}{2}$

13. Suppose that the service-life, in years, of a hearing-aid battery is a random variable X with exponential distribution and mean $\theta = 4$. Find the probability $P(3 \leq X \leq 5)$.

(a) $\frac{5}{3}e^{-\frac{1}{4}}$

(b) $e^{-\frac{1}{2}}$

(c) $e^{-\frac{5}{4}} - e^{-\frac{3}{4}}$

(d) $2e^{-\frac{1}{4}}$

(e) $e^{-\frac{3}{4}} - e^{-\frac{5}{4}}$

14. Given a standard normal distribution, find $P(Z \geq -1.04)$. **Write your answer on the cover sheet!**

15. The weights of a large number of miniature poodles are approximately normally distributed with a mean of 8 kilograms and a standard deviation of 0.75. Find the fraction of these poodles with weights over 9.5 kilograms.

(a) 0.0228

(b) 0.5228

(c) 0.4772

(d) 0.9772

(e) 0.4332

16. Let Z be a random variable having standard normal distribution. Find the value z_0 such that $P(Z \leq z_0) = 0.9761$. **Write your answer on the cover sheet!**