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

Math 214: Introduction to Statistics
Spring Semester 1999
Exam 3
April 21, 1999

This Examination consists of 14 multiple choice problems worth 7 points each. No partial credit will be given. You start with 2 points. Record your answers by placing an × through one letter for each problem. 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)	**8.**	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)	**9.**	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)	**10.**	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)	**11.**	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)	**12.**	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)	**13.**	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)	**14.**	(a)	(b)	(c)	(d)	(e)

I have not violated the Honor Code in this examination.

Signature: ______________________________

Score: __________

The following table is to be used for the questions 1) – 6).

		X_1			
		1	2	3	
	0	0	0.05	0.1	
X_2	2	0.02	0.05	0.2	
	4	0.08	0.1	0.4	

1. Find $E(X_1)$.

(a) 2 **(b)** 2.86 **(c)** 0.4 **(d)** 1 **(e)** 2.6

2. Find $P(X_2 = 2)$.

(a) 0.2 **(b)** 0.05 **(c)** 0.27 **(d)** 0.02 **(e)** 0.1

3. Find $P(X_1 = 2 \,|\, X_2 = 2)$.

(a) $\frac{1}{4}$ **(b)** $\frac{5}{27}$ **(c)** $\frac{2}{27}$ **(d)** $\frac{1}{20}$ **(e)** $\frac{10}{27}$

4. Find $P(X_2 = 4 \,|\, X_1 \geq 2)$.

(a) $\frac{0.58}{0.9}$ **(b)** $\frac{5}{9}$ **(c)** $\frac{0.5}{0.58}$ **(d)** $\frac{1}{2}$ **(e)** $\frac{0.58}{0.2}$

This is the same table again.

		X_1			
		1	2	3	
	0	0	0.05	0.1	
X_2	2	0.02	0.05	0.2	
	4	0.08	0.1	0.4	

5. Find $E(X_1X_2)$.

(a) 7.36 **(b)** 7.1 **(c)** 7.54 **(d)** 5.45 **(e)** 6.2

6. Find $P(X_1 + X_2 = 5)$.

(a) 0.4 **(b)** 0.15 **(c)** 0.25 **(d)** 0.18 **(e)** 0.28

7. Let X, Y be random variables with variances $V(X) = 4$, $V(Y) = 9$, and covariance $\mathrm{Cov(X,Y)} = -2$. Then the correlation coefficient ρ between X and Y is

(a) $-\frac{1}{18}$

(b) $-\frac{2}{\sqrt{3}}$

(c) $-\frac{2}{\sqrt{13}}$

(d) $-\frac{2}{13}$

(e) $-\frac{1}{3}$

8. Assume X and Y are independent discrete random variables with $P(X = 5) = 0.3$ and $P(Y = 3) = 0.5$. What is $P(X = 5 \,|\, Y = 3)$?

(a) 0.6

(b) 0.5

(c) 0.3

(d) 0.8

(e) 0.2

9. The weights of 4 miniature poodles (in kilograms) were found to be 7, 10, 9, and 6. The sample mean of these data is 8. Find the sample variance.

(a) $\sqrt{\frac{10}{3}}$

(b) 10

(c) $\frac{\sqrt{266}}{3}$

(d) $\frac{10}{3}$

(e) $\frac{266}{3}$

10. Statistics released by the National Highway Traffic Safety Administration show that on an average weekend night, 1 out of every 10 drivers on the road is drunk. If 400 are randomly checked next Saturday night, what is the approximate probability that the number of drunk drivers will be at most 50.

(a) 0.4599

(b) 0.4525

(c) 0.0475

(d) 0.0401

(e) 0.9599

11. Find the probability that a random sample of 15 observations, taken from a normal population with variance $\sigma^2 = 2$, will have sample variance greater than 3. That is, find $P(S^2 \geq 3)$.

(a) 0.99

(b) 0.01

(c) 0.05

(d) 0.1

(e) 0.9

12. A random sample of 8 cereal bars of a certain brand was tested for their saturated fat content. The sample mean was found to be 0.5 gram and the sample variance was 0.04 gram. Give a confidence interval for the population mean μ with confidence coefficient 0.9.

(a) $\left(0.5 \pm 1.86 \cdot \frac{0.2}{\sqrt{8}}\right)$

(b) $\left(0.5 \pm 1.645 \cdot \frac{0.2}{\sqrt{8}}\right)$

(c) $\left(0.5 \pm 1.895 \cdot \frac{0.2}{\sqrt{8}}\right)$

(d) $\left(0.5 \pm 0.9 \cdot \frac{0.04}{\sqrt{8}}\right)$

(e) $\left(0.5 \pm 1.895 \cdot \frac{0.04}{8}\right)$

13. A random sample of 100 chocolate energy bars of a certain brand has, on average, 230 calories with a standard deviation of 15 calories. Construct a confidence interval for the true mean calorie content with confidence coefficient 0.95.

(a) $\left(230 \pm 1.96 \cdot \frac{3}{2}\right)$

(b) $\left(230 \pm 0.06 \cdot \frac{3}{2}\right)$

(c) $\left(230 \pm 1.96 \cdot \frac{3}{20}\right)$

(d) $\left(230 \pm 0.13 \cdot \frac{3}{2}\right)$

(e) $\left(230 \pm 0.95 \cdot \frac{3}{2}\right)$

14. The scores on a placement test given to college freshmen for the past five years are approximately normally distributed with a mean $\mu = 74$ and a variance $\sigma^2 = 36$. Find the probability that the sample mean of a random sample of 16 freshmen is at most 77.

(a) 0.4772

(b) 0.9772

(c) 0.0228

(d) 1

(e) 0.1915