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Mathematics 214: Introduction to Statistics
Review for Exam 3, April 1999

The following table is to be used for the questions 1) – 4).

		X_1			
		0	1	2	
	-1	0.2	0.15	0.1	
X_2	0	0.1	0.05	0.05	
	1	0.2	0.1	0	
	2	0.05	0	0	

1. Find $P(X_1 \geq 1)$.

a) 0.55 **b)** 0.35 **c)** 0.45 **d)** 0.25 **e)** 0.3

2. Find $E(X_2)$.

a) 1 **b)** -0.05 **c)** 0.6 **d)** -0.1 **e)** .15

3. Find $E(X_1X_2)$.

a) 0 **b)** 1 **c)** -0.25 **d)** -0.15 **e)** 0.6

4. Find $P(X_1 = 2 \,|\, X_2 = 0)$.

a) 0.03 **b)** 0.05 **c)** $\frac{1}{3}$ **d)** $\frac{1}{11}$ **e)** $\frac{1}{4}$

5. The fracture strengths of a certain type of glass average 14 (in thousands of pounds per square inch) and have a standard deviation of 2. What is the probability that the average fracture strength for 100 pieces of this glass exceeds 14.5?

a) 0.0202 **b)** 0.4938 **c)** 0.9938 **d)** 0.0062 **e)** 0.4013

6. A fair die is tossed 600 times. What is the approximate probability that at most 90 times a “six” comes up? (You may use a calculator.)

a) $\frac{9}{60}$ **b)** 0.3508 **c)** 0.1492 **d)** $\frac{9}{10}$ **e)** 0.8508

7. Let X and Y be random variables with variances $V(X) = 1$ and $V(Y) = 9$ respectively. Assume $\mathrm{Cov}(X,Y)$, the covariance of X and Y, is 2. Then the correlation coefficient ρ between X and Y is

a) $\frac{2}{3}$ **b)** $\frac{4}{3}$ **c)** $\frac{2}{9}$ **d)** $\frac{4}{9}$ **e)** $\frac{2}{\sqrt{3}}$

8. Let X and Y be random variables with

$$E(X) = 3,\ E(Y) = 6,\ V(X) = 9,\ V(Y) = 1,\ E(XY) = 20.$$

Then the covariance $\mathrm{Cov}(X,Y)$ of X and Y is

a) 2 **b)** -2 **c)** $\frac{2}{3}$ **d)** 11 **e)** $-\frac{2}{3}$

9. The times to failure of four turbine blades in jet engines, in 10^3 hours, were as follows:

$$3.2,\ 1.8,\ 2.6,\ 4.4$$

The sample mean of these data is

a) $\frac{3}{4}$ **b)** 3 **c)** 12 **d)** 4 **e)** $\frac{11}{4}$

10. The times in minutes between eruptions for three of the eruptions of the geyser *Old Faithful* on August 1, 1985 were 77, 80, 80. The sample mean of these data is 79. Find the sample variance.

a) 3 **b)** 2 **c)** 6 **d)** 6244 **e)** 3123.5

11. The diameter measurements of an electric cable, taken at 100 points along the cable, yield a sample mean of 2.1 centimeters and a sample standard deviation of 0.3 centimeter. Construct a 90% confidence interval for the average diameter of the cable.

a) $0.3 \pm 1.645\frac{2.1}{10}$ **b)** $2.1 \pm 1.96\frac{0.09}{10}$ **c)** $2.1 \pm 1.645\frac{0.3}{100}$

d) $2.1 \pm 1.645\frac{0.3}{10}$ **e)** $2.1 \pm 1.96\frac{0.3}{10}$

12. Suppose that a random sample of only 15 black cherry trees has been taken to estimate the average volume of a black cherry tree in the Allegheny National Forest. Assume that the sample mean for the volumes (in cubic feet) of the 15 trees is $\bar{x} = 30.2$ and the sample variance is $s^2 = 268.96\ (= 16.4^2)$. If we assume further that the distribution of the volumes of all the black cherry trees is normal, then a confidence interval for the average volume of a tree in this forest with confidence coefficient 0.98 is:

a) $30.2 \pm 1.345\frac{16.4}{\sqrt{15}}$ **b)** $30.2 \pm 2.33\frac{16.4}{\sqrt{15}}$ **c)** $30.2 \pm 29.1413\frac{16.4}{\sqrt{15}}$

d) $30.2 \pm 2.624\frac{16.4}{\sqrt{14}}$ **e)** $30.2 \pm 2.624\frac{16.4}{\sqrt{15}}$

13. Suppose $n = 13$ observations are taken on normally distributed measurements. The sample variance is $s^2 = 5$. A confidence interval for the variance σ^2 with confidence coefficient 0.99 is approximately given by

a) $\left(\frac{60}{21.03}, \frac{60}{5.23}\right)$ **b)** $\left(\frac{60}{28.3}, \frac{60}{3.07}\right)$ **c)** $\left(-\frac{60}{28.3}, \frac{60}{28.3}\right)$

d) $\left(\frac{60}{29.82}, \frac{60}{3.57}\right)$ **e)** $\left(-\frac{60}{3.07}, \frac{60}{28.3}\right)$

14. Let X, Y be independent random variables with $E(X) = 3$, $E(Y) = 4$ and $V(X) = 9$, $V(Y) = 25$. Then the covariance $\text{Cov}(X, Y)$ is

a) 3 **b)** -3 **c)** 0 **d)** 27 **e)** 15

15. For an aptitude test for a certain job history shows scores to be normally distributed with a variance of 225. 20 applicants are to take the test. Find the approximate probability that the sample variance of the test scores will be less than 138. (You may use a calculator.)

a) 0.1 **b)** 0.9 **c)** 0.975 **d)** 0.025 **e)** 0.05

16. One-hour carbon monoxide concentrations in air samples from a large city average 10 ppm, with a standard deviation of 9 ppm. Find the probability that the average concentration in 100 samples selected randomly will exceed 12 ppm.

a) 0.4129 **b)** 0.0132 **c)** 0.4868 **d)** 0.0871 **e)** 0.2514

1.	(a)	(b)	(c)	(d)	(e)	**9.**	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)	**10.**	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)	**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.**	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)	**15.**	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)	**16.**	(a)	(b)	(c)	(d)	(e)