CENGAGE | WEBASSIGN

kam5691@rit.edu
(sign out)

Home My Assignments Grades
Communication Calendar
My eBooks

MATH 251 - Spring 2020, section 11, Spring 2020

Chapter 5 - Homework Spring 2020 (Homework)

INSTRUCTOR
Mihail Barbosu
Rochester Institute of Technology

Current Score

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
POINTS	**6/6**	**2/2**	–/5	**4/4**	0/5	1/2	–/1	–/1	–/2	–/2	–/2	–/1	–/2	–/3	–/1	–/1	–/1

TOTAL SCORE

13/41	31.7%

Due Date

TUE, APR 14, 2020
11:00 AM EDT

Request Extension

Assignment Submission & Scoring

Assignment Submission

For this assignment, you submit answers by questions. You are required to use a new randomization after every 5 question submissions.

Assignment Scoring

Your best submission for each question part is used for your score.

---

1. 6/6 POINTS | PREVIOUS ANSWERS | 2/20 Submissions Used | MY NOTES | ASK YOUR TEACHER

A certain market has both an express checkout line and a superexpress checkout line. Let X_1 denote the number of customers in line at the express checkout at a particular time of day, and let X_2 denote the number of customers in line at the superexpress checkout at the same time. Suppose the joint pmf of X_1 and X_2 is as given in the accompanying table.

		x_2 = 0	1	2	3
	0	0.09	0.07	0.04	0.00
	1	0.05	0.15	0.05	0.04
x_1	2	0.05	0.04	0.10	0.06
	3	0.01	0.04	0.04	0.07
	4	0.00	0.01	0.05	0.04

(a) What is $P(X_1 = 1, X_2 = 1)$, that is, the probability that there is exactly one customer in each line?

$P(X_1 = 1, X_2 = 1) =$ 0.15 ✔

(b) What is $P(X_1 = X_2)$, that is, the probability that the numbers of customers in the two lines are identical?

$P(X_1 = X_2) =$ 0.41 ✔

(c) Let A denote the event that there are at least two more customers in one line than in the other line. Express A in terms of X_1 and X_2.

- ○ $A = \{X_1 \geq 2 + X_2 \cup X_2 \leq 2 + X_1\}$
- ○ $A = \{X_1 \leq 2 + X_2 \cup X_2 \geq 2 + X_1\}$
- ◉ $A = \{X_1 \geq 2 + X_2 \cup X_2 \geq 2 + X_1\}$
- ○ $A = \{X_1 \leq 2 + X_2 \cup X_2 \leq 2 + X_1\}$

✔

Calculate the probability of this event.

$P(A) =$ 0.24 ✔

(d) What is the probability that the total number of customers in the two lines is exactly four? At least four?

$P(\text{exactly four}) =$ 0.18 ✔

$P(\text{at least four}) =$ 0.45 ✔

Need Help? Read It | Talk to a Tutor

2. 2/2 POINTS PREVIOUS ANSWERS 6/20 Submissions Used MY NOTES ASK YOUR TEACHER

The number of customers waiting for gift-wrap service at a department store is an rv X with possible values 0, 1, 2, 3, 4 and corresponding probabilities 0.1, 0.2, 0.3, 0.25, 0.15. A randomly selected customer will have 1, 2, or 3 packages for wrapping with probabilities 0.5, 0.25, and 0.25, respectively. Let Y = the total number of packages to be wrapped for the customers waiting in line (assume that the number of packages submitted by one customer is independent of the number submitted by any other customer).

(a) Determine $P(X = 3, Y = 3)$, i.e., $p(3,3)$. (Round your answer to four decimal places.)

$P(X = 3, Y = 3) =$ 0.0313

(b) Determine $p(4,11)$. (Round your answer to four decimal places.)

$p(4,11) =$ 0.0023

Need Help? Read It Watch It Talk to a Tutor

3. –/5 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Each front tire on a particular type of vehicle is supposed to be filled to a pressure of 25 psi. Suppose the actual air pressure in each tire is a random variable—X for the right tire and Y for the left tire, with joint pdf

$$f(x,y) = \begin{cases} K(x^2 + y^2) & 20 \le x \le 30,\ 20 \le y \le 30 \\ 0 & \text{otherwise} \end{cases}$$

(a) What is the value of K? (Enter your answer as a fraction.)

K = 3/380000

(b) What is the probability that both tires are underfilled? (Round your answer to four decimal places.)

0.4013

(c) What is the probability that the difference in air pressure between the two tires is at most 2 psi? (Round your answer to four decimal places.)

(d) Determine the (marginal) distribution of air pressure in the right tire alone.

for $20 \le x \le 30$

(e) Are X and Y independent rv's?

- Yes, $f(x,y) = f_X(x) \cdot f_Y(y)$, so X and Y are independent.
- Yes, $f(x,y) \ne f_X(x) \cdot f_Y(y)$, so X and Y are independent.
- No, $f(x,y) = f_X(x) \cdot f_Y(y)$, so X and Y are not independent.
- No, $f(x,y) \ne f_X(x) \cdot f_Y(y)$, so X and Y are not independent.

Need Help? Read It Talk to a Tutor

4. 4/4 POINTS | PREVIOUS ANSWERS | 3/20 Submissions Used | MY NOTES | ASK YOUR TEACHER

Annie and Alvie have agreed to meet between 5:00 P.M. and 6:00 P.M. for dinner at a local health-food restaurant. Let X = Annie's arrival time and Y = Alvie's arrival time. Suppose X and Y are independent with each uniformly distributed on the interval [5, 6].

(a) What is the joint pdf of X and Y?

$$f(x,y) = \begin{cases} 1 & 5 \le x \le 6,\ 5 \le y \le 6 \\ 0 & \text{otherwise} \end{cases}$$

(b) What is the probability that they both arrive between 5:30 and 5:45?

0.0625

(c) If the first one to arrive will wait only 15 min before leaving to eat elsewhere, what is the probability that they have dinner at the health-food restaurant? [*Hint*: The event of interest is $A = \left\{(x, y): |x - y| \le 1/4\right\}$.]

(Round your answer to three decimal places.)

0.438

Need Help? Read It | Talk to a Tutor

5. 0/5 POINTS PREVIOUS ANSWERS 2/20 Submissions Used MY NOTES ASK YOUR TEACHER

Two components of a minicomputer have the following joint pdf for their useful lifetimes X and Y:

$$f(x, y) = \begin{cases} xe^{-x(1 + y)} & x \geq 0 \text{ and } y \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

(a) What is the probability that the lifetime X of the first component exceeds 2? (Round your answer to three decimal places.)

.406 ✗

(b) What is the marginal pdf of X?

- (selected) $\int_0^\infty xe^{-x(1+y)}\,dx = \frac{1}{(1+y)^2}$ for $y \geq 0$
- $\int_0^\infty xe^{-x(1+y)}\,dy = e^{-x}$ for $x \geq 0$
- $\int_0^\infty xe^{-x(1+y)}\,dx = e^{-y}$ for $y \geq 0$
- $\int_0^\infty xe^{-x(1+y)}\,dx = \frac{1}{(1+x)^2}$ for $x \geq 0$
- $\int_0^\infty ye^{-y(1+x)}\,dy = e^{-y}$ for $y \geq 0$
- $\int_0^\infty ye^{-x(1+y)}\,dx = e^{-x}$ for $x \geq 0$

✗

What is the marginal pdf of Y?

- $\int_0^\infty ye^{-y(1+x)}\,dx = \frac{1}{(1+x)^2}$ for $x \geq 0$
- $\int_0^\infty xe^{-x(1+y)}\,dx = \frac{1}{(1+y)^2}$ for $y \geq 0$
- $\int_0^\infty ye^{-x(1+y)}\,dx = e^{-y}$ for $y \geq 0$
- $\int_0^\infty xe^{-x(1+y)}\,dy = e^{-x}$ for $x \geq 0$
- $\int_0^\infty ye^{-y(1+x)}\,dx = \frac{1}{(1+y)^2}$ for $x \geq 0$
- (selected) $\int_0^\infty xe^{-x(1+y)}\,dx = \frac{1}{(1+x)^2}$ for $y \geq 0$

✗

Are the two lifetimes independent? Explain.

- Yes, $f(x, y)$ is the product of the marginal pdfs. The two lifetimes are independent.
- Yes, $f(x, y)$ is not the product of the marginal pdfs. The two lifetimes are independent.
- No, $f(x, y)$ is the product of the marginal pdfs. The two lifetimes are not independent.
- No, $f(x, y)$ is not the product of the marginal pdfs. The two lifetimes are not independent.

(c) What is the probability that the lifetime of at least one component exceeds 2? (Do not round intermediate values. Round your answer to three decimal places.)

Need Help? Read It Talk to a Tutor

---

6. 1/2 POINTS PREVIOUS ANSWERS 1/20 Submissions Used MY NOTES ASK YOUR TEACHER

An instructor has given a short quiz consisting of two parts. For a randomly selected student, let X = the number of points earned on the first part and Y = the number of points earned on the second part. Suppose that the joint pmf of X and Y is given in the accompanying table.

		y			
$p(x, y)$		0	5	10	15
	0	0.01	0.06	0.02	0.10
x	5	0.04	0.17	0.20	0.10
	10	0.01	0.15	0.13	0.01

(a) If the score recorded in the grade book is the total number of points earned on the two parts, what is the expected recorded score $E(X + Y)$? (Enter your answer to one decimal place.)

14.1

(b) If the maximum of the two scores is recorded, what is the expected recorded score? (Enter your answer to two decimal places.)

8.55

Need Help? Read It Watch It Talk to a Tutor

7. –/1 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Consider a small ferry that can accommodate cars and buses. The toll for cars is \$3, and the toll for buses is \$10. Let X and Y denote the number of cars and buses, respectively, carried on a single trip. Suppose the joint distribution of X and Y is as given in the table below.

$p(x,y)$		y = 0	1	2
x	0	0.025	0.015	0.010
	1	0.050	0.030	0.020
	2	0.110	0.075	0.050
	3	0.150	0.090	0.060
	4	0.100	0.060	0.040
	5	0.050	0.030	0.035

Compute the expected revenue from a single trip. (Round your answer to two decimal places.)
\$

Need Help? Read It Talk to a Tutor

8. –/1 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

The joint and marginal pdf's of X = amount of almonds and Y = amount of cashews are

$$f(x, y) = \begin{cases} 24xy & 0 \le x \le 1,\ 0 \le y \le 1,\ x + y \le 1 \\ 0 & \text{otherwise} \end{cases}$$

$$f_X(x) = \begin{cases} 12x(1 - x)^2 & 0 \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$$

with $f_Y(y)$ obtained by replacing x by y in $f_X(x)$. It is easily verified that $\mu_X = \mu_Y = \frac{2}{5}$, and $E(XY) = \frac{2}{15}$. Thus $\text{Cov}(X, Y) = -\frac{2}{75}$.

Compute the correlation coefficient ρ for X and Y.

ρ =

Need Help? Read It Talk to a Tutor

9. –/2 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Each front tire on a particular type of vehicle is supposed to be filled to a pressure of 26 psi. Suppose the actual air pressure in each tire is a random variable—X for the right tire and Y for the left tire, with joint pdf given below.

$$f(x, y) = \begin{cases} K(x^2 + y^2) & 22 \le x \le 32,\ 22 \le y \le 32 \\ 0 & \text{otherwise} \end{cases}$$

(a) Compute the covariance between X and Y. (Round your answer to four decimal places.)

Cov(X, Y) =

(b) Compute the correlation coefficient ρ for this X and Y. (Round your answer to four decimal places.)

ρ =

Need Help? Read It Watch It Talk to a Tutor

10. –/2 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Young's modulus is a quantitative measure of stiffness of an elastic material. Suppose that for metal sheets of a particular type, its mean value and standard deviation are 85 GPa and 2.2 GPa, respectively. Suppose the distribution is normal. (Round your answers to four decimal places.)

(a) Calculate $P(84 \le \overline{X} \le 86)$ when $n = 25$.

(b) How likely is it that the sample mean diameter exceeds 86 when $n = 49$?

You may need to use the appropriate table in the Appendix of Tables to answer this question.

Need Help? Read It Talk to a Tutor

11. –/2 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

There are 45 students in an elementary statistics class. On the basis of years of experience, the instructor knows that the time needed to grade a randomly chosen first examination paper is a random variable with an expected value of 5 min and a standard deviation of 4 min. (Round your answers to four decimal places.)

(a) If grading times are independent and the instructor begins grading at 6:50 P.M. and grades continuously, what is the (approximate) probability that he is through grading before the 11:00 P.M. TV news begins?

(b) If the sports report begins at 11:10, what is the probability that he misses part of the report if he waits until grading is done before turning on the TV?

You may need to use the appropriate table in the Appendix of Tables to answer this question.

Need Help? Read It Watch It Talk to a Tutor

12. –/1 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Time taken by a randomly selected applicant for a mortgage to fill out a certain form has a normal distribution with mean value 10 min and standard deviation 3 min. If five individuals fill out a form on one day and six on another, what is the probability that the sample average amount of time taken on each day is at most 11 min? (Round your answer to four decimal places.)

You may need to use the appropriate table in the Appendix of Tables to answer this question.

Need Help? Read It Talk to a Tutor

13. –/2 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Rockwell hardness of pins of a certain type is known to have a mean value of 50 and a standard deviation of 1.3. (Round your answers to four decimal places.)

(a) If the distribution is normal, what is the probability that the sample mean hardness for a random sample of 8 pins is at least 51?

(b) What is the (approximate) probability that the sample mean hardness for a random sample of 42 pins is at least 51?

You may need to use the appropriate table in the Appendix of Tables to answer this question.

Need Help? Read It Talk to a Tutor

14. –/3 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Suppose the sediment density (g/cm) of a randomly selected specimen from a certain region is normally distributed with mean 2.63 and standard deviation 0.71.

(a) If a random sample of 25 specimens is selected, what is the probability that the sample average sediment density is at most 3.00? Between 2.63 and 3.00? (Round your answers to four decimal places.)

at most 3.00

between 2.63 and 3.00

(b) How large a sample size would be required to ensure that the probability in part (a) is at least 0.99? (Round your answer up to the nearest whole number.)

specimens

You may need to use the appropriate table in the Appendix of Tables to answer this question.

Need Help? Read It Watch It Talk to a Tutor

15. –/1 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Suppose the distribution of the time X (in hours) spent by students at a certain university on a particular project is gamma with parameters $\alpha = 40$ and $\beta = 3$. Because α is large, it can be shown that X has approximately a normal distribution. Use this fact to compute the approximate probability that a randomly selected student spends at most 135 hours on the project. (Round your answer to four decimal places.)

Need Help? Read It Talk to a Tutor

16. –/1 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

Manufacture of a certain component requires three different machining operations. Machining time for each operation has a normal distribution, and the three times are independent of one another. The mean values are 20, 30, and 15 min, respectively, and the standard deviations are 1, 2, and 1.4 min, respectively. What is the probability that it takes at most 1 hour of machining time to produce a randomly selected component? (Round your answer to four decimal places.)

You may need to use the appropriate table in the Appendix of Tables to answer this question.

Need Help? Read It Talk to a Tutor

17. –/1 POINTS 0/20 Submissions Used MY NOTES ASK YOUR TEACHER

In an area having sandy soil, 60 small trees of a certain type were planted, and another 60 trees were planted in an area having clay soil. Let X = the number of trees planted in sandy soil that survive 1 year and Y = the number of trees planted in clay soil that survive 1 year. If the probability that a tree planted in sandy soil will survive 1 year is 0.6 and the probability of 1-year survival in clay soil is 0.5, compute an approximation to $P(-6 \le X - Y \le 6)$ (do not bother with the continuity correction). (Round your answer to four decimal places.)

Need Help? Read It Talk to a Tutor

Submit Assignment Save Assignment Progress

Home My Assignments Request Extension