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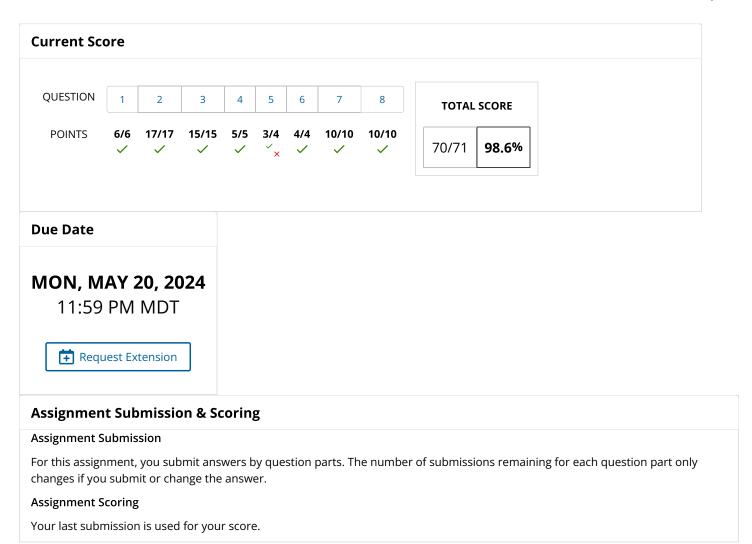
Grades

Communication Calendar

← STAT315, section 001, Summer 1 2024

STAT 315 HW3 (Homework)

► INSTRUCTOR Aaron NielsenColorado State University





Determine whether the following random variables are discrete or continuous and determine the support of random variable (i.e., the possible values for the random variable).

Note: You have one attempt per part.

(a) X = the number of unbroken eggs in a randomly chosen carton of a dozen eggs.

Discrete

○ Continuous ✓
(b) What is the support of X? All integers (0,1,2,3,,12) All real numbers between 0 and 12 All real numbers
(c) Y = the number of manufactured computer chips inspected until a defective chip is found. O Discrete Continuous
(d) What is the support of Y? All positive real numbers {0,1,2,3,} All real numbers {1,2,3,}
(e) Z = the length of a randomly selected snake. ○ Continuous ○ Discrete
 (f) What is the support of Z? ○ {0,1,2,3,} ○ All real numbers ○ {1,2,3,} ○ All positive real numbers
2. [17/17 Points] DETAILS MY NOTES PREVIOUS ANSWERS PRACTICE ANOTHER

Suppose that a telephone call center has six telephone lines. Let X denote the number of lines in use at a specified time. The PMF of X is given in the following table.

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Х	0	1	2	3	4	5	6
p(x)	0.05	0.01	0.8	0.06	0.04	0.02	0.02

Calculate the probability of the following events.

(a) P(at least three lines in use) .14

(b) P(fewer than three lines in use) .86

(c) P(between two and five lines in use, inclusive) 0.92

(d) P(at least three lines **not in use**) 92

Fill in the following table and use it to answer the following questions.

х	0	1	2	3	4	5	6	Row Sum
p(x)	0.05	0.01	0.8	0.06	0.04	0.02	0.02	1
x·p(x)	0	0.01	1.6	.18	.16	.10	.12	2.17
λ'ρ(λ)	4	4	4	4	✓	✓	4	✓.
v2 m(v)	0	0.01	3.2	0.54	0.64	0.5	0.72	5.61
x ² ·p(x)	4	4	~	~	✓	✓	✓	✓

(e) What is the expected value of X? 2.17

(f) What is E[X²]? 5.61

(g) What is Var(X)? 0.901

(h) What is the standard deviation of X? .949

3. [15/15 Points] DETAILS MY NOTES PREVIOUS ANSWERS

Suppose that you read through this year's issues of the New York Times and record the number that appears in a news article (e.g., income of a CEO, number of casualties in a battle, the national debt, etc). Now suppose that you only look at the leading digit of each number which could be 1, 2, 3, 4, 5, 6, 7, 8, or 9. Your first thought might be that the leading digit X of a randomly selected number would be equally likely to be one of nine possibilities (i.e., a discrete uniform distribution).

(a) Fill in the following PMF if all number are equally likely. Round these numbers to three decimal places.

PMF assuming uniform distribution

х	1	2	3	4	5	6	7	8	9
p(x	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
μ(^	/	4	✓	~	4	4	~	~	✓

(b) What is the expected value of X given that all numbers are equally likely? 5

(c) What is the variance of X given that all numbers are equally likely? 6.667

It turns out that all leading numbers are not equally likely to occur. According to Benford's Law, $p(x) = log_{10}[(x+1)/x]$. Fill in the following PMF using Benford's Law. Round these numbers to three decimal places.

PMF assuming Benford's distribution

х	1	2	3	4	5	6	7	8	9
n(v)		0.176	0.125	0.097	0.079	0.067	0.058	0.051	0.046
p(x)	4	4	4	/	4	4	/	4	4

(d) What is the expected value of X given that the numbers are distributed according to Benford's Law? 3.441

(e) What is the variance of X given that the numbers are distributed according to Benford's Law? 6.061

4. [5/5 Points]

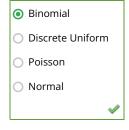
DETAILS

MY NOTES

PREVIOUS ANSWERS

Suppose you test ten batteries to see how many of them work. The probability that a given battery works is 0.73. Let X be the number of working batteries.

(a) What is an appropriate random variable to model X? You have one attempt on this part.



(b) What is the expected value of X? 7.3

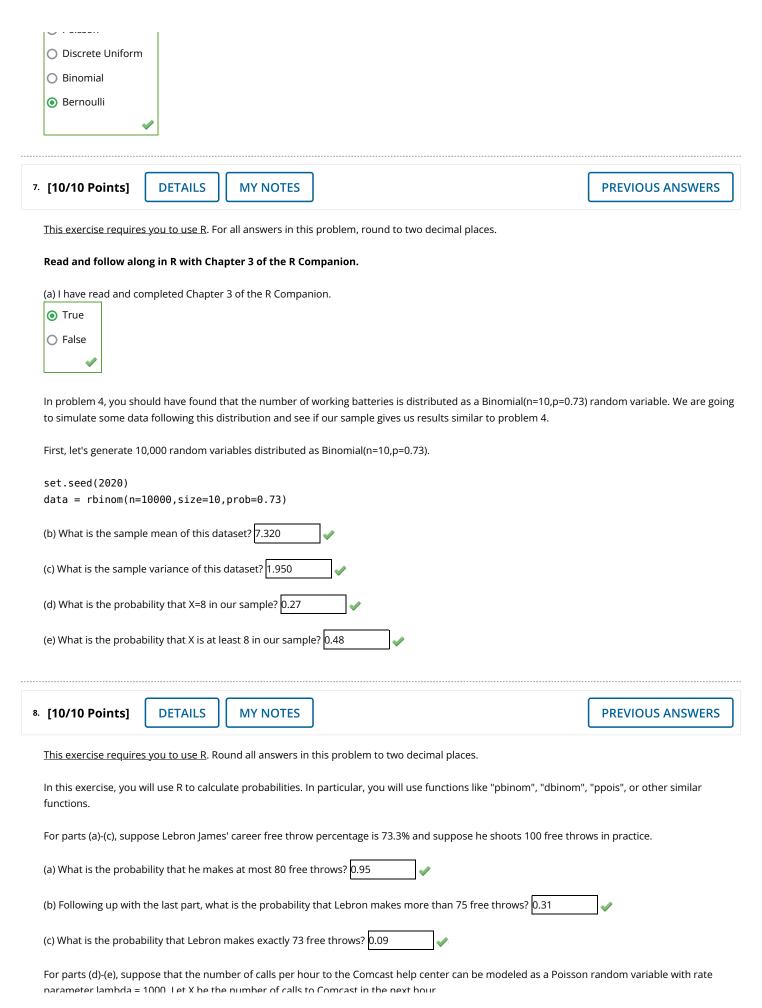
(c) What is the standard deviation of X? 1.404

(d) What is the probability that exactly 8 batteries work? 0.265

(e) What is the probability that at least 8 batteries work? 0.466

Poisson

[3/4 Points]	DETAILS	MY NOTES		PREVIOUS ANSWERS
Suppose that the	number of studen	nts that skip class is	distributed as a Poisson random variable with lambda = 5.	
(a) What is the exp	pected number of	absent students?	5	
(b) What is the var	riance of the numb	ber of absent stude	ents? 5	
(c) What is the pro	shahility that no st	rudent is absent on	a given day? 0.007 ★	
(d) What is the pro	obability that two	or more students a	re absent on a given day? 0.960	
[4/4 Points]	DETAILS	MY NOTES		PREVIOUS ANSWERS
)	
Determine the ap	propriate random	variable to model	the following applications. You have one attempt on each pa	art.
			y and have a probability 0.83 of producing a toxic gas. Let $\!$	pe the number of times that toxi
gas was produced Binomial	I from the 12 expe	eriments.		
Birioinidi				
Bernoulli				
O Bernoulli O Poisson				
	orm			
O Poisson	orm •			
O Poisson O Discrete Unifo	✓			
O Poisson O Discrete Unifo	✓	າ 1 to 55, are mixed	d for a lottery. Let Y be the number of the first ball drawn.	
O Poisson O Discrete Unifo (b) 55 numbered B O Poisson	✓	n 1 to 55, are mixed	d for a lottery. Let Y be the number of the first ball drawn.	
O Poisson O Discrete Unifo (b) 55 numbered I O Poisson O Binomial	✓	n 1 to 55, are mixed	d for a lottery. Let Y be the number of the first ball drawn.	
O Poisson O Discrete Unifo (b) 55 numbered B O Poisson	palls, marked from	າ 1 to 55, are mixed	d for a lottery. Let Y be the number of the first ball drawn.	
O Poisson O Discrete Unifo (b) 55 numbered B O Poisson O Binomial O Bernoulli	palls, marked from	າ 1 to 55, are mixed	d for a lottery. Let Y be the number of the first ball drawn.	
O Poisson O Discrete Unifo (b) 55 numbered B O Poisson O Binomial O Bernoulli O Discrete Unifo	palls, marked from			
O Poisson O Discrete Unifo (b) 55 numbered b O Poisson O Binomial O Bernoulli O Discrete Unifo (c) Customers sho	palls, marked from		d for a lottery. Let Y be the number of the first ball drawn. Hently with rate of 5 customers per hour. Let Z be the numbe	er of customers that show up to
O Poisson O Discrete Unifo (b) 55 numbered B O Poisson O Binomial O Bernoulli O Discrete Unifo	orm w up at a local coluthe next hour.			r of customers that show up to
O Poisson O Discrete Unifo (b) 55 numbered B O Poisson O Binomial O Bernoulli O Discrete Unifo (c) Customers sho the coffee shop in	orm w up at a local coluthe next hour.			r of customers that show up to
O Poisson O Discrete Unifo (b) 55 numbered I O Poisson O Binomial O Bernoulli O Discrete Unifo (c) Customers sho the coffee shop in	orm w up at a local coluthe next hour.			er of customers that show up to
O Poisson O Discrete Unifo (b) 55 numbered I O Poisson O Binomial O Bernoulli O Discrete Unifo (c) Customers sho the coffee shop in O Discrete Unifo O Poisson	orm w up at a local coluthe next hour.			r of customers that show up to



(d) What is the probability that X is less than or equal to 1000? 0.51

(e) What is the probability that X is more than 950? 0.94

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