PRACTICE MIDTERM 1 (not graded) - Attempt only when you have studied and prepared your cheat sheet for the exam

Started: Apr 25 at 11:05am

Quiz Instructions

- **This is just a practice midterm for you to practice. It will not be graded.**
- **Your midterm in Spring 22 will be a Cognella quiz, which works like the ones you have been doing, and will be different from this one. Questions in your actual exam will contain work questions where you must show detailed work, multiple choice and other types of questions, on all course content found in our Bruinlearn course web site.**
- **You must attempt the exam if you want to see the correct answers.**
- **There is no point in you just looking at the answers. For the practice exam to be helpful you should do it after you have prepared your cheat sheets and have studied for the exam as if it was an in-person exam.**
- **Remember, the actual midterm's questions will be different from the ones here and will be on any aspect of what was required for you to watch, read or do this quarter. Prepare a nice summary of your own, to save times. Read the instructions for the exam.**

Try to see if you can do this practice exam in less than 3 hours (the practice exam is an exam that can be done in less than 3 hours).

REQUIRED: Please, read the page in the Midterm Spring 2022 module with instructions for you actual exam in Winter 2022. Reading the instructions is required. Your midterm in Spring 2022 is going to be done in Cognella and all those instructions must be followed.

Failure to read the instructions and ask about what you don't understand in those instructions will result in point deductions from your exam grade. It is in your interest to read those instructions first and ask before Friday 4/29/2022, 11 AM any question you may have.

Email Dr. Sanchez if any of the instructions is not clear (email before 4/29/2022, 11 AM).

Question 1	1 pts

A Z generation student has 3000 songs in their playlist. 15% of these songs are classic rock. The student selects their songs at random. What is the probability that in the next 100 songs chosen, the number of classic rock songs is larger than 70? Show work and justify your answer.

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Question 2

1 pts

Imagine that you conducted a survey of randomly chosen foreign exchange students to get data to answer the question: "are you from a European country or not"? You collected recently a random sample of 3000 foreign exchange students from among the very large population of all foreign exchange students in the United States. The goal was to estimate the parameter "p" (the probability that a randomly chosen foreign exchange student in the United States is from Europe).

Your estimate of p, based on that random sample was 0.3. If this 0.3 was indeed the true proportion of foreign exchange students in the United States that are from Europe, what is the probability that a randomly chosen sample of 10 foreign exchange students taken

today from the population of foreign exchange students in the United States without replacement contains some from Europe?

○ 0.9717525

○ Approximately 0

○ 0.02824752

○ 0.1210608

Question 3   1 pts

There are 30 students enrolled in the "Sports fans club" in a University. In this club, 13 of the members have had a relative infected with COVID-19 in the last year and 17 of them have not. We would like to sample 6 students at random without replacement in order to interview them for the College magazine. What is the probability that we would get 3 students with a previously infected family member?

○ 0.3275315

○ 0.2961279

○ approximately 0

○ approximately 1

Question 4   1 pts

Match the following

A geometric random variable with parameter p

[Choose]   ⌄

A model for the number of amber alerts per week   [Choose]   ⌄

Question 5   1 pts

During several randomly chosen days, a data scientist enters an amusement park as soon as it opens and stands near the shown Hammer game in the amusement park. Each day, the data scientist observes individuals that try the game to see whether they hit the 100 strength. The data scientist leaves the park as soon as a person hits the 100 strength mark. On average, the number of people observed is 10. The data scientist then publishes in the park's annual bulletin the estimated probability that a random player of this game hits the 100 mark strength in this game. Which value should the data scientist publish for that probability, based on the evidence?

○ 0.1

○ 0.9

○ 0.3

○ 0.01

Question 6   1 pts

Students applying to graduate schools usually try the GRE exams several times until they get a score that they are satisfied with. That costs money, say $200. The random variable X measures the number of attempts until satisfied with the score. Assuming that

money is not a limitation for how many attempts a student can make, and that p represents the probability that a student is satisfied by an attempt, what is the variance of the cost?

○ $\dfrac{400-400p}{p^2}$

○ $200\left(np\left(1-p\right)\right)$, where n is the number of attempts.

○ 400p(1-p)

○ 200p(1-p)

Question 7   1 pts

$$P(X \le x) = P(X = 1) + P(X = 2) \cdots P(X = x)$$
$$= p + qp + q^2 p \cdots + q^{x-1}p$$
$$= p[1 - q^x]/(1 - q)$$
$$= 1 - q^x$$

If X is a geometric random variable with parameter p and q=1-p, and the above results is correct, what is the following probability equal to?

$$P(X > 10|X > 6)$$

☐ q^4

☐ P(X>4)

☐ q^6

☐ $\left(1 - q^6\right)$

Question 8   1 pts

Is the die fair? Watch the video in this link.

You can type math by going to insert - equation in the editor

If you can not see the video in this question, you can answer the question that is asking anyway.

Question:

A friend tells me that a six-sided die that we are using for a game is fair.
You roll the die 100 times and find 75 numbers that are even.
 Is the die fair or not?

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Question 9   1 pts

We have talked in several lectures about modeling data. Some data follow the geometric, other the negative binomial, for other we could use the binomial, for other the log normal distribution... Think about the radon data in Minnesota. Suppose we fit to it a

Normal model with mean the mean of the radon data and standard deviation of the radon data. If we did that, which of the following would be true?

○ The probability of small values of radon would be underestimated

○ The probability of high values of radon would be underestimated

○ The probability of low values of radon would be overestimated

○ The normal would be a very good, almost perfect fit to the radon data

Question 10

1 pts

The random variable "Netflix subscriber status" can take two possible values: 1 if the person is a Netflix subscriber and 0 otherwise. Let's denote that random variable X. We are interested in $E\left(X^2\right)$. Find it. You may use LOTUS to answer this question.

○ p

○ np

○ p^2

○ p(1-p)

Question 11

1 pts

Summary Song #2 ...

This song is forgetting to sing about the (choose all that applied)

☐ the negative binomial pmf

☐ the geometric pmf

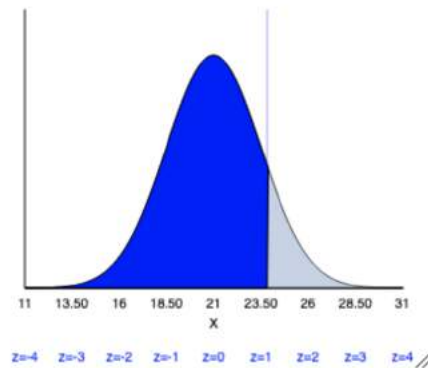☐ Benford's law's pmf

☐ the Poisson pmf

Question 12   1 pts

Normal Probability Calculator

Describe distribution

Variable: x

Mean: 21   SD: 2.5

☐ Mean: 0   SD: 2

[Scale to Fit]

Check the box to activate a row.
Specify one value (and direction) to find the other two values.

	x	z	Probability
☑ <	23.816	1.126	0.8700
☐ <			

The image is showing what the Rossman-Chance applet produces when we enter information in it. According to the results, which of the following statements are correct?

☐ 23.816 is the 87th percentile.

☐ 87 is the 23.816th percentile.

☐ 1.126 is the 87th percentile of the standard normal random variable.

☐ 23.816 is 1.126 standard deviations below the mean.

Question 13   **1 pts**

Thanks to LOTUS we know that

☐ The expectation operator is a linear operator

☐ The expectation operator is not a linear operator

☐ If we apply the definition of expectation of a function of a random variable X, say the expectation of g(X)=a+bX, we will discover that E(a+bX) = bX, where a, b are constants

☐ The variance of g(X) where $g(x) = a^2 X$

is equal to $a^2 \, Var(X)$

Question 14   1 pts

Two factories are used to produce the microchips sold by the Microchipsellers company. Factory A produces 60% of the microchips and its microchips have, on average, 2 defects per microchip. Factory B produces the remaining 40% of the microchips and its microchips have, on average, 1 defect per microchip.

If we buy a microchip sold by Microchipsellers, what is the probability that it has 1 error? Show work and provide a final answer.

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Question 15   1 pts

What is

$$\sum_x \left[\left(x^2 + \mu_x^2 - 2x\mu_x\right) P(x)\right]$$ equal to, according to the law of the unconscious statistician?

☐ σ_X^2

☐ $E(X^2) - \mu_X^2$

☐ $\mu_x + E(X^2)$

☐ $E[(X - \mu_X^2)]$

Question 16   1 pts

For each of the following types of random variables, provide the expected value of the following function: $g(x) = 20 + 30X^2 - 5X$

(a) X ~ Binomial (n=20, p=0.3)

(b) X~ Poisson (λ=5)

(c) X~ Negative Binomial (p=0.2, r=5)

(d) X~ Exponential(λ=5)

(e) X~ Gaussian($\mu = 100$, σ=5)

Show work and make sure you separate the questions using (a), (b), (c), etc.

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Question 17   1 pts

Throughout the course we have been talking about models and cases of actual data that they fit well. Match the models and the data that we have seen.

Covid-19 amount of cases

[Choose] ⌄

Amount of radon per household

[Choose] ⌄

Birth data per hour in a hospital (thorughout 24 hours)

[Choose] ⌄

Number of deaths by horse kick per week

[Choose] ⌄

Question 18   1 pts

Suppose we roll two fair six-sided dice, one red and one blue. Showing work, answer the following question. You may submit a file for this question with your hand-written or typed answer.

(a) Construct the probability mass function of the random variable

Y=(a-b),

where "a" is the value obtained with the red one and "b" the value obtained with the blue one.

(b) Calculate the probability that Y is less than or equal to 1.

Calculate the expected value and standard deviation of Y.

(c) Characterize the distribution of Y as skewed right, skewed left or symmetric.

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Question 19   **1 pts**

The length of time that it takes to process the grocery shopping at a checkout counter in a store with only one checkout counter is exponentially distributed with parameter $\lambda = \frac{1}{7}$. If someone arrives immediately ahead of you to the checkout counter, what is the probability that you will have to wait 3 minutes?

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Question 20   1 pts

Earlier in the quarter, you were asked to provide an answer to the taxicab problem involving a hit and run accident, where blue and green cab companies serve the city. Find the exercise in the earlier lectures, and, showing work, provide an answer here.

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Question 21   1 pts

If the probability that a randomly chosen person in the United States is poor is 12.3%, but the probability that a United States 16 year old person is poor is 16.8%, this is an indication that

○ The events being poor and age of a person are not independent.

○ The events being poor and age of a person are mutually exclusive

○ The events being poor and age of a person are complement of each other

○ The events being poor and age of a person are empty

Question 22   1 pts

Suppose that C and D are mutually exclusive events. Then the joint probability of C and D is equal to

☐ 0

☐ P(C)P(D)

☐ P(C) + P(D)

☐ P(C|D)P(D)

Question 23   1 pts

The probability that a defective part is from factory A is 0.4, the probability that a defective part is from factory B is 0.5 and the probability that a defective part is from factory C is 0.3. The probabilities given here are

○ conditional probabilities

○ joint probabilities

○ total or marginal probabilities

○ enough to calculate the probability of defectives in factory A

Question 24   1 pts

Suppose we have two events C and D. If the events are not independent, which would be the correct way to calculate the joint probability of C and D?

☐ P(C)P(D|C)

☐ P(D)P(C|D)

☐ P(C)P(D)

☐ P(C)+P(D)

Question 25   1 pts

The probability that a defective part is from factory A is 0.4, the probability that a defective part is from factory B is 0.5 and the probability that a defective part is from factory C is 0.3. If you are given a defective part, observe that it is defective, and must decide where the part came from, what would you conclude if you use probabilistic decision making?

○ Factory B

○ Factory A

○ Factory C

○ We would not be able to tell

Question 26   1 pts

List three random variables, X, Y, T that apply to this scene and indicate whether they are discrete or continuous and what could be a possible model for them.

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p   ⌨   ⓣ | 0 words   </> ↗ ⦂

Question 27   1 pts

When sampling 3 balls from an urn with 20 balls numbered 1 to 20, without replacement, which of the following is true?

☐ the probability of getting the numbers 1, 2, 3, will be the same whether you use the number of corresponding sets in the numerator and denominator or you use the number of corresponding samples in the numerator and denominator.

☐ the probability of getting the numbers 1, 2, 3, will not be the same using the number of corresponding sets in the numerator and denominator as using the number of corresponding samples in the numerator and denominator.

☐ No answer text provided.

☐ No answer text provided.

Question 28   1 pts
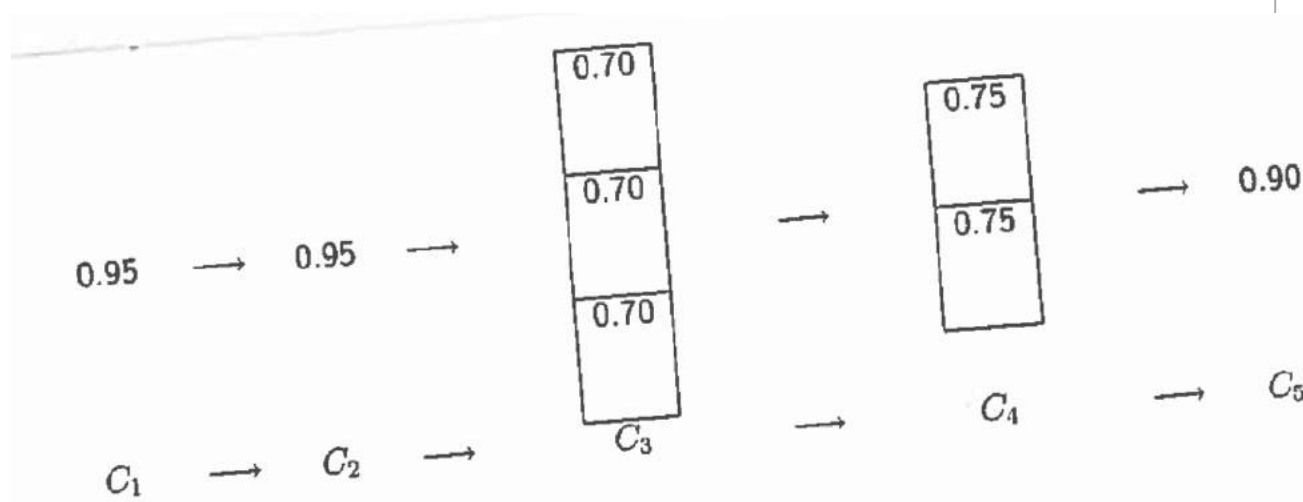
This system has 8 components. The reliability of each component is given as indicated. We have, for convenience, split the system into 5 subcomponents that we label as C_1 to C_5 . Showing work calculate the reliability of the whole system.

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Here is a statement. For your exam to be graded, you must write your name in the space indicated and then write your hand-written signature. You may write the statement by hand and upload it, completed, or you can just complete it in a tablet with a pen and upload. You decide that. The statement must be complete and be exactly like the following. Upload the statement in a question that is just dedicated to upload it. If you do not see that question, make sure that you include the statement in one of the Midterm's essay questions after you answer the question. This statement must stay with the midterm. I will not accept pdf files sent by email. Thank you.

Statement:

I, _____**Write you full name, printed, where the bold letters are**____sign below to confirm that this exam reflects my work and only my work, that I have not consulted with anyone or anything except the class material posted in CCLE, the textbook, and Cognella active learning and that I have taken the time specified in the instructions of very close to that time to complete the exam from the moment that I first flicked on the exam file until it was submitted. I also confirm that I have adhered to the UCLA Student Code of Conduct at **https://deanofstudents.ucla.edu/individual-student-code**   **(https://deanofstudents.ucla.edu/individual-student-code)** and that I have not shared or will share this exam with anyone or anything. I also confirm that I have not spoken and will not speark to anyone about this exam, even if I submitted it, until after the submission deadline.

YOUR SIGNATURE (In English, and hand-written). Typed signatures not allowed. You must sign by hand, a real signature.

Notice that the signature must go at the end, and your full name typed at the top. Do not change this pattern. There is no creativity requested in this. This is an honesty statement, and has legal binding, and must be exactly as indicated.

Question 29   1 pts

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