

Practice final exam

1. You are allowed unlimited attempts for the exam.
2. You will have 2 hours to take this exam in any given attempt.
3. This is only a practice exam, and your score from this exam will NOT count towards your total course grade.

1 1 point

An administrator is reviewing some statistics on the client requests handled by a certain web server. It is known that the probability of a randomly selected process being memory-intensive is 0.54, the probability of it being CPU-intensive is 0.66, and the probability of it being both memory-intensive and CPU-intensive is 0.21. Determine probability of the event that the process is neither CPU-intensive nor memory intensive.

Type your answer...

2 1 point

A renowned lawyer L has argued 100 cases (all for distinct clients) in the courtroom, out of which, he has won 95. We randomly sample 3 of his clients. What is the probability that all the three clients won their cases argued by L ?

- $\frac{95 \times 95 \times 95}{100 \times 100 \times 100}$
- $\frac{95 \times 94 \times 93}{100 \times 100 \times 100}$
- $\frac{95 \times 94 \times 93}{100 \times 99 \times 98}$
- $\frac{95 \times 95 \times 95}{100 \times 99 \times 98}$

3 1 point

In a group of 100 customers at a grocery store, 40 bought dairy products, 30 purchased grains, and 20 purchased dairy products and grains. If a customer chosen at random bought grains, what is the probability they also bought dairy products?

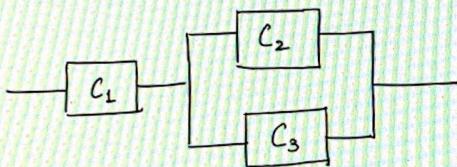
Type your answer...

4 1 point

A person has undertaken a construction job. The probabilities are 0.6 that there will be strike, 0.9 that the construction job will be completed on time if there is no strike, and 0.2 that the construction job will be completed on time if there is a strike. What is the probability that the construction job is completed on time?

Type your answer...

5 1 point



In the above figure, components C_1, C_2, C_3 function independently of one another, and their probabilities of functioning are P_1, P_2, P_3 respectively. The probability that the entire component configuration will function is:

- $P_1 \times (1 - P_2 P_3)$
- $P_1 + P_2 + P_3 - P_2 P_3$
- $P_1 (P_2 + P_3 - P_2 P_3)$
- $P_1 + P_2 P_3$

6 1 point

In answering a question on a multiple choice test, a student either knows the answer or guesses. Let $\frac{3}{4}$ be the probability that he knows the right answer and $\frac{1}{4}$ be the probability that he guesses. Assume that a student who guesses at the answer will be correct with probability $\frac{1}{4}$. What is the probability that the student has guessed the answer given that he answered it correctly? Express your answer till the fourth decimal point.

Type your answer...

7 1 point

How many 4-digit integers start with 6 and end with an odd digit?

- $6 \times 9 \times 9 \times 5$
- $6 \times 10 \times 10 \times 5$
- $1 \times 10 \times 10 \times 5$
- $1 \times 9 \times 9 \times 5$

8 1 point

How many distinct sequences can we make using 3 letter "A"s and 5 letter "B"s? (AAABBBBB, AABABBBB,etc.)?

- $\binom{8}{3}$
- $\binom{8}{3} \times \binom{8}{5}$
- 3×5
- $\frac{3 \times 5}{3}$

9 1 point

A strand of DNA is a sequence of the nucleotides adenine, cytosine, guanine, and thymine (abbreviated A, C, G, T). Assume that the nucleotides can occur in any order and can occur multiple times in a single strand. How many DNA strands are there of length 7 that do not contain the nucleotide G?

Type your answer...

10 1 point

There are 12 people in a party, including Rama and Chris. If the 12 people are divided into 3 groups of 4 people each, what is the probability that Chris and Rama are in the same group?

- $\frac{5}{11}$
- $\frac{3}{11}$
- $\frac{3}{12}$
- $\frac{5}{12}$

11 1 point

How many integers n such that $1 \leq n \leq 100$ are divisible by at least one of the three numbers 9, 12, and 16?

Type your answer...

12 1 point

What is the total number of permutations of the letters in the word "EXCELLENCE" in which the two L's are separated from each other, and the other letters may be in any other order?

- $\frac{11!}{4!2!2!} - \frac{10!}{4!2!2!}$
- $\frac{10!}{4!2!2!}$
- $\frac{9!}{4!2!}$
- $\frac{10!}{4!2!2!} - \frac{9!}{4!2!}$

13 1 point

4 households are planning to celebrate a festival together and decide to do a potluck i.e. each household cooks and brings a certain number of dishes to the celebration. A 56 dishes are to be made. If each house must cook at least 10 dishes, how many ways are there to distribute the cooking responsibilities for the 56 dishes between the 4 households? Note: We are not interested in "which" dishes each household cooks, but only interested in "how many" dishes each of the households cooks.

- $\binom{19}{17}$
- $\binom{19}{3}$
- $\binom{18}{4}$
- $\binom{56}{4}$

14 1 point

The probability that a person living in a certain locality is a doctor is estimated to be 0.4. Find the probability that the tenth person randomly interviewed in that locality is the fourth one to be an engineer. Write your answer till the fourth decimal point.

Type your answer...

15 1 point

The prominent physician claims that 70% of those with lung cancer are chain smokers. If his assertion is correct, find the probability that fewer than half of 6 lung cancer patients recently admitted to a hospital are chain smokers.

- $\binom{6}{2} \times 0.7^2 \times 0.3^4$
- $\binom{6}{1} \times 0.7 \times 0.3^5$
- $\sum_{x=0}^2 \binom{6}{x} \times 0.7^x \times 0.3^{6-x}$
- $\sum_{x=0}^1 \binom{6}{x} \times 0.7^x \times 0.3^{6-x}$

16 1 point

The average number of typographical mistakes made by an author on her first draft of a book is 3 per page. What is the probability that he makes exactly 4 mistakes on 2 pages?

- $\frac{6^3 e^{-6}}{3!}$
- $\frac{6^4 e^{-6}}{4!}$
- $\frac{6^6 4^{-6}}{6!}$
- $\frac{e^4 4^{-6}}{6!}$

17 1 point

The average number of typographical mistakes made by an author on his first draft of a book is 7 per chapter. What is the expected number of errors in the entire draft if it contains 9 chapters?

Type your answer...

18 1 point

Suppose that telephone calls arriving at a call center follow a Poisson process with an average of 3 calls coming per minute. Suppose that an operator just finished the 17th call of the day. What is the expected waiting time for the next call to arrive?

- 20 seconds
- 12 seconds
- 33 seconds
- 120 seconds

19 1 point

Let X be a discrete random variable with the following PMF:

$$\begin{aligned}P(X = k) &= 0.1 \times k && \text{if } k \in \{1, 2, 3, 4\} \text{ and} \\P(X = k) &= 0 && \text{otherwise}\end{aligned}$$

If F_X denotes the CDF of X , what is the value of $F_X(2)$?

Type your answer...

20 1 point

Which of the following is FALSE?

- For all real numbers a, b , $E[aX + b] = aE[X] + b$
- For all real numbers a, b , $Var(aX + b) = a^2Var(X)$
- If X_1, X_2, \dots, X_n are any random variables: $E[X_1 + X_2 + \dots + X_n] = E[X_1] + E[X_2] + \dots + E[X_n]$
- If X_1, X_2, \dots, X_n are any random variables: $Var(X_1 + X_2 + \dots + X_n) = Var(X_1) + Var(X_2) + \dots + Var(X_n)$

21 1 point

Peter and Michael are both expert chess players, and they each decide to play 7 chess games with a computer (NOT with each other). Each of them is likely to win against the computer with a probability of 0.75. Assuming that they both play independently (without consulting each other) and that each game is independent of all other games, what is the probability that Peter wins exactly 4 games and Michael answers exactly 3 games?

Type your answer...

22 1 point

X_1 and X_2 are random variables such that $X_1 = Normal(3, 2)$ and $X_2 = Normal(1, 2)$. Assuming that the first and the second parameters represent the mean and the standard deviation respectively, which of the following is True?

- The PDF curve of X_2 must be to the right of PDF curve for X_1 .
- The PDF curve of X_1 must be to the right of PDF curve for X_2 .
- The PDF curve of X_2 must be narrower than the PDF curve for X_1 .
- The PDF curve of X_1 must be narrower than the PDF curve for X_2 .

23 1 point

Suppose Z is standard normal random variable. If $P(Z \leq -a) = .3$, then what is the value of $P(Z < a)$?

Type your answer...

24 1 point

Consider the density function:

$$\begin{aligned}f(x) &= 4x^{-5} && \text{if } x > 1 \\f(x) &= 0 && \text{elsewhere}\end{aligned}$$

Find $F_x(2)$. Specify your answer till the 4th decimal point.

Type your answer...

25 1 point

A random variable Y represents the monthly expenses of a certain household, and has a uniform distribution. If the lowest and highest monthly expenses possible are 2000 and 3000 dollars respectively, what is the standard deviation of Y ? Specify your answer till the third decimal digit.

Type your answer...

26 1 point

Assume that the scores of students in a class has approximately a normal distribution with mean 70 points and standard deviation 10 points. What is the probability that the score of a randomly selected student from the class is less than 50 points. (Specify your answer till the fourth decimal digit)

You may use the table provided at <https://templeu.instructure.com/courses/71386/files/folder/Tables?preview=8113516>

Type your answer...

27 1 point

Let SEPTA bus number 21 at a certain bus stop run every half hour between 9 am and 6 pm. What is the probability that a student reaching the bus stop at a random time during this period will have to wait more than ten minutes? Specify your answer till the third decimal digit.

Type your answer...

Time Remaining

28 1 point

Based on extensive testing, it is determined by the manufacturer of a refrigerator that the time X (in years) before a major repair is required is characterized by the probability density function:

$$\begin{aligned}f_X(x) &= \frac{1}{6}e^{-\frac{1}{6}x} && \text{if } x > 0 \\f_X(x) &= 0 && \text{otherwise}\end{aligned}$$

Find the probability that the refrigerator lasts at least two years.

- $e^{-\frac{2}{3}}$
- $1 - e^{-\frac{2}{3}}$
- $1 - e^{-\frac{1}{3}}$
- $e^{-\frac{1}{3}}$

29 1 point

A forest inspector is in-charge of monitoring a 2 km^2 area of a small forest. The officer has access to fire detection data collected by sensors -- MODIS and VIIRS -- on two different weather satellites launched in the earth's orbit. Let X and Y be random variables such that x indicates the number of forest fire alerts reported by MODIS, y indicates the number of alerts reported by VIIRS in the area under the inspector's supervision at a given hour. Suppose that the joint probability distribution of X and Y is given by the following table:

	$X = 0$	$X = 1$	$X = 2$
$Y = 0$	0.85	0.03	0.02
$Y = 1$	0.01	0.04	0.01
$Y = 2$	0.02	0.01	0.01

$$E[XY] = ?$$

Type your answer...

30 1 point



Which of the following statements regarding the Central Limit Theorem is FALSE?

- The Central Limit Theorem assumes that the sample drawn from the population consists of i.i.d random variables.
- The Central Limit Theorem assumes that the distribution of the population from which the sample is drawn is normal.
- The Central Limit Theorem states that, for large sample sizes, the sample mean has an approximately normal distribution.
- The Central Limit Theorem states that, for a large sample size n , the random variable $\frac{\bar{X} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)}$ has an approximately standard normal distribution where \bar{X} , μ , and σ are the sample mean, population mean, and population standard deviation respectively.

31 2 points



A team of students create a mobile application that recommends healthy cooking recipes based on user inputs regarding available ingredients and time-to-cook constraints. Once the application is ready to test, the team asks 6 of their friends to try the application with their individual preferences. They observe that the time taken (in seconds) by the application to return recommendations on the six different inputs is:

9.4, 9.6, 10.2, 11.8, 12.5, 12.5

Fill in the following blanks. State your answer till the first decimal point.

Given this sample of running times, the sample median is and the sample standard deviation is .

32 4 points



Chris is a medical researcher who is interested in studying the bone health of senior citizens. He looks up data from a previous clinical trial with 25 different senior citizens, where the average calcium level is reported to be 8.5 mg/dl. It is known that the population standard deviation $\sigma = 0.5$ mg/dl.

Based on this, he finds that the 95% confidence interval for the mean calcium level in senior citizens is (,).

On the other hand, if the value of σ were not known, but the sample standard deviation was known $s = 0.5$ mg/dl, the the 95% confidence interval for the mean calcium level would be

(,).

33 1 point

If the covariance of two random variables X and Y is a positive real number, then their correlation is a positive real number.

- True
- False