Test Canvas

Add, modify, and remove questions. Select a question type from the Add Question drop-down list and click **Go** to add questions. Use Creation Settings to establish which default options, such as feedback and images, are available for question creation.

Add Calculated Formula GO | Creation Settings

Name Preparation Quiz

Description Probability background check

Instructions The questions on this test are multiple choice type, but answering them will require calculations/derivations with pen and paper. At any point during the test, you can save your progress and return it to later.

Notations: I(.) is the indicator function, I(A) = 1 if the statement A is true, and is zero otherwise. Φ(.) is the distribution function of the N(0,1) density.

Modify

Add Question Here

Question 1 **Multiple Choice** **1 points** Modify Remove

Question Let (X, Y) be a pair of random variables where X has a probability density function given by $f(x) = (1 / x^2)\, I(x > 1)$ and Y is conditionally distributed as a Unif(0, x) random variable given X = x, for every x > 1. For any y > 0, the conditional density of X given Y = y is

Answer

A. $g(x) = \{2 \max(1, y^2) / x^3\}\, I(x > \max(1, y))$

B. $g(x) = (2 / x^3)\, I(x > 1)$

C. $g(x) = \{\max(y, 1) / x^2\}\, I(x > \max(y, 1))$

D. $g(x) = (2y^2 / x^3)\, I(x > y)$

Correct Feedback Correct

Incorrect Feedback Incorrect

Add Question Here

Question 2 **Multiple Choice** **1 points** Modify Remove

Question For a pair of random variable (X, Y), suppose $X \sim N(m, s^2)$ and $Y \mid (X = x) \sim N(a + bx, t^2)$. Then the distribution of Y is

Answer

A. $N(a + bm, t^2)$

B. $N(a + bm, t^2 + s^2)$

C. $N(a + bm, t^2 + (bs)^2)$

D. $N(a + bm, (bt)^2 + s^2)$

Correct Feedback Correct

Incorrect Feedback Incorrect

Add Question Here

Question 3 **Multiple Choice** **1 points** Modify Remove

Question Let $X = (X_1, X_2, X_3)$ be a vector of random counts with total count $X_1 + X_2 + X_3 = n$ a fixed positive integer. Suppose
$P(X = (x_1, x_2, x_3)) = \{n! / (x_1! x_2! x_3!)\} p_1^{x_1} p_2^{x_2} p_3^{x_3} I(x_i \text{ non-negative}, x_1 + x_2 + x_3 = n)$
where p_1, p_2 and p_3 are fixed positive numbers with $p_1 + p_2 + p_3 = 1$. Then the correlation coefficient between X_1 and X_2 is

Answer

A. 0
B. $-p_1p_2$
C. $-[\{p_1p_2\} / \{(1 - p_1)(1 - p_2)\}]^{1/2}$
D. $-\{p_1p_2\} / \{(1 - p_1)(1 - p_2)\}$

Correct Feedback Correct
Incorrect Feedback Incorrect

Add Question Here

Question 4 **Multiple Choice** **1 points** Modify Remove

Question Suppose X has probability density $f(x) = (a + 1)(1 - x)^a I(0 < x < 1)$, for some $a > 0$. The probability density function of $Y = - \log(1 - X)$ is

Answer

A. $g(y) = a \exp(-ay) I(y > 0)$
B. $g(y) = (a + 1) \exp\{-(a + 1)y\} I(y > 0)$
C. $g(y) = a^2y \exp(-ay) I(y > 0)$
D. $g(y) = a (1 - y)^{a - 1} I(0 < y < 1)$

Correct Feedback Correct
Incorrect Feedback Incorrect

Add Question Here

Question 5 **Multiple Choice** **1 points** Modify Remove

Question Suppose $X \sim Po(m)$ for some $m > 0$. If $Y = \exp(t X)$ for a $t > 0$, then $E[Y]$ equals

Answer

A. $\exp(m \exp(t))$
B. $\exp(tm)$
C. $\exp(m \exp(t) - m)$
D. $\exp(tm - m)$

Add Question Here

Question 6 **Multiple Choice** **1 points** Modify Remove

Question Suppose $X_1, X_2, ..., X_{100}$ are independent Be(2, 3) random variables. Then $P(X_1 + X_2 + ... X_{100} < 43)$ approximately equals

Answer

A. 0.854
B. 0.682
C. 0.975
D. 0.933

Add Question Here

Question 7 **Multiple Choice** **1 points** Modify Remove

Question Suppose $X_1, X_2, ..., X_n$ are independent random variables with a common distribution function F(x). Let Fn(x) denote the empirical distribution function:

$F_n(x) = \{I(X_1 \le x) + I(X_2 \le x) + ... + I(X_n \le x)\} / n$.

Then for any x, $P(F_n(x) \le F(x) + n^{-1/2})$ is approximately

Answer

A. $\Phi(1)$
B. $\Phi(1 / n)$
C. $\Phi(n^{1/2})$
D. $\Phi(2)$

Add Question Here

Question 8 **Multiple Choice** **1 points** Modify Remove

Question Let X ~ Po(n) and Y | (X = x) ~ Bin(x, p) for every non-negative integer x. Here n is a positive integer and p is a number between 0 and 1. The distribution of Y is

Answer

A. Po(np)
B. Bin(n, p)
C. Geo(pn / (1 + n))
D. Geo(pn / (1 + pn))

Add Question Here

Question 9 **Multiple Choice** **1 points** Modify Remove

Question Suppose X and Y are independent Ex(1) random variables. Then (X - Y)/(X + Y) and X + Y are

Answer

A. Negatively correlated
B. Uncorrelated but dependent
C. Independent
D. Positively correlated

Add Question Here

Question 10 **Multiple Choice** **1 points** Modify Remove

Question Suppose $X_1, X_2, ..., X_n$ are independent Unif(0, a) random variables for some fixed a > 0. Then the probability density function g(z) of $Z = \max(X_1, X_2, ..., X_n) - \min(X_1, X_2, ..., X_n)$ is given by

Answer

A. $g(z) = (n - 1) z^{n-2} I(0 < z < a) / a^{n-1}$
B. $g(z) = n(n - 1)z^{n-2} I(0 < z < a) / a^{n-1}$
C. $g(z) = n(n - 1)(a - z)z^{n-2} I(0 < z < a) / a^n$
D. $g(z) = I(0 < z < a) / a$

Add Question Here

OK