

Unit 5 - Week 4

Course outline

How does an NPTEL online course work?

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Assignment Solution

Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-26, 23:59 IST.

Let $X_1, X_2, X_3, \dots, X_{4n}$ be i.i.d. variables such that X_i is distributed as $U(\alpha, \beta)$ for $i = 1, 2, 3, \dots, 4n$. Let $X_{(j)}$ be the i^{th} smallest random variable in the sample.

Answer questions 1-5 using the above information.

1) What is the expectation of interquartile range if $n = 10$?

1 point

- $\frac{21(\beta-\alpha)}{41}$
 $\frac{(\beta-\alpha)}{2}$
 $\frac{20(\beta-\alpha)}{41}$
 $\frac{21(\beta-\alpha)}{40}$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\frac{20(\beta-\alpha)}{41}$$

2) What is expectation of median ($X_{(2n)}$) if $n = 5$, $\alpha = 0.1$, $\beta = 0.9$? (Please mark the closest option)

1 point

- 0.52
 0.48
 0.49
 0.51

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$0.48$$

3) What is variance of median (i.e. $X_{(2n)}$) ?

1 point

- $\frac{n(\beta-\alpha)^2}{(4n+2)(4n+1)}$
 $\frac{n(\beta-\alpha)^2}{(4n+1)^2}$
 $\frac{2n(\beta-\alpha)^2}{(4n+2)(4n+1)}$
 $\frac{(2n+1)(\beta-\alpha)^2}{(4n+1)^2}$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\frac{n(\beta-\alpha)^2}{(4n+1)^2}$$

4) Let $X = X_{(i)}$ and $Y = X_{(j)}$ s.t. $i \neq j$. What is the joint probability distribution of $f_{X,Y}(x, y)$?

0 points

- $\frac{4n!(x+0.1)^{i-1}(y-x)^{j-i}(0.9-j)^{4n-j}}{(i-1)!(j-i)!(4n-j)!}$
 $\frac{4n!(x+0.1)^{i-1}(y-x)^{j-i}(0.9-j)^{4n-j-1}}{(i-1)!(j-i)!(4n-j-1)!}$
 $\frac{4n!(x+0.1)^i(y-x)^{j-i-1}(0.9-j)^{4n-j-1}}{(i)!(j-i-1)!(4n-j-1)!}$
 $\frac{4n!(x+0.1)^{i-1}(y-x)^{j-i-1}(0.9-j)^{4n-j}}{(i-1)!(j-i-1)!(4n-j)!}$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\frac{4n!(x+0.1)^{i-1}(y-x)^{j-i-1}(0.9-j)^{4n-j}}{(i-1)!(j-i-1)!(4n-j)!}$$

5) What is the expectation of $X(1) + X(4n)$ when n is sufficiently large?

1 point

- $\beta-\alpha$
 $\beta+\alpha$
 $\frac{\beta+\alpha}{2}$
 β

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\beta+\alpha$$

6) Let X_1, X_2, X_3 be a random sample drawn from an exponential distribution with the density function $f(x) = 0.3e^{-0.3x}$ where $x > 0$. Find the probability that the sample maximum is greater than 4. (Find the closest answer)

1 point

- 0.66
 0.60
 0.56
 0.62

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$0.66$$

7) Draw a random sample of size 6 from a distribution with density function $f(x) = \frac{2}{25}x$ where $0 < x < 5$. Find the mean and variance of $X_{(5)}$, the fifth order statistic.

1 point

- 4.2, 0.25
 4.6, 0.25
 4.2, 0.3
 4.6, 0.3

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$4.2, 0.25$$

8) Draw a random sample of size 4 drawn from the uniform distribution $U(0,1)$. The sample range is $X_{(4)} - X_{(1)}$, the difference of the sample maximum and the sample minimum. Find the expected value of the sample range.

1 point

- 0.2
 0.4
 0.6
 0.8

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$0.6$$

9) Let $X_1, X_2, X_3, \dots, X_9$ be a random sample of size 9 drawn from an exponential distribution with mean 8. Find the probability $P(X_{(1)} > 5 | X_{(1)} > 2)$. ($X_{(j)}$ is the j^{th} order statistic)

0 points

- 3.5
 -3.175
 -3.375
 -3.75

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$-3.375$$

10) Draw a sample of size n from a $U(0,1)$ distribution. What distribution does the j^{th} order statistic follow?

1 point

- Gamma $(n-j, j)$
 Gamma $(j, n-j)$
 Beta $(j, n-j+1)$
 Beta $(j, n-j)$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\text{Beta}(j, n-j+1)$$