

## Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

- Lecture 13: Equality checking. Poisson distribution

- Lecture 14: Concentration inequalities. Variance.

- Lecture 15: Weak linearity of variance. Law of large numbers.

- Lecture 16: Chernoff's bound. k-wise independence.

- Week-4 Slides: Equality checking and Poisson distribution

- Week-4 Slides: Concentration Inequalities.

- Week-4 Slides: Chernoff Bound

- Feedback For Week 4

- Quiz: Week 4: Assignment 4

- Week 4: Assignment 4 Solutions

Week 5

Week 6

Week 7

Week 8

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## Week 4: Assignment 4

The due date for submitting this assignment has passed.

Due on 2021-09-22, 23:59 IST.

As per our records you have not submitted this assignment.

 1) Recall the Equality Checking Protocol covered in class, which is a probabilistic algorithm to test whether two files, each of n-bit size, are same **1 point** or not. Which of the following is true for the protocol?

- If the two files are equal, then the protocol may output NO with probability  $< 1/n$ .  
 If the two files are different, then the protocol always outputs NO.  
 If the two files are different, then the protocol may output YES with probability  $< 1/n$ .  
 None of the above.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

If the two files are different, then the protocol may output YES with probability  $< 1/n$ .

 2) Let X be a Poisson random variable with parameter  $\alpha$ . What is expectation and variance of X respectively? **1 point**

- $\alpha, \alpha$ .  
  $\alpha, \alpha^2$ .  
  $e^{-\alpha}, e^{-\alpha}$ .  
  $e^{-\alpha}, e^{-\alpha^2}$ .

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$\alpha, \alpha$ .

 3) Let  $X_1, X_2, \dots, X_n$  be binary, i.i.d (identical and mutually independent) random variables. Consider  $S = X_1 + \dots + X_n$  such that expectation of S,  $E(S) = \mu$ . Then, which of the following is true? **1 point**

- $P(S < \frac{\mu}{2}) < e^{-\frac{\mu}{8}}$ .  
  $P(S \geq 2\mu) \leq \frac{1}{2}$ .  
 Both of the above.  
 None of the above.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

Both of the above.

 4) Let X,Y be two independent random variables. What is the variance  $\text{Var}(X-Y)$  equal to? **1 point**

- $\text{Var}(X) - \text{Var}(Y)$ .  
  $\text{Var}(X)^2 - \text{Var}(Y)^2$ .  
  $\text{Var}(X) + \text{Var}(Y)$ .  
 None of these.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$\text{Var}(X) + \text{Var}(Y)$ .

 5) Let  $X_1, X_2, \dots, X_n$  be i.i.d.~ random variables with mean  $\mu$ . Let their sum be  $S := (X_1 + \dots + X_n)$ . Define a new random variable  $W := X_1/S$ . What random variable does  $nW$  converge to, as  $n \rightarrow \infty$ ? **1 point**

- $\mu$ .  
  $1/\mu$ .  
  $S/\mu$ .  
  $X_1/\mu$ .

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$X_1/\mu$ .