

Quiz 18 : Conditional Expectation

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This quiz does not count towards your grade. It exists to simply gauge your understanding. Treat this as though it were a portion of your midterm or final exam.

1 Concepts

1. For each of the following, identify "random variable" or "scalar value". Consider all upper case letters to be random variables and all lower case letters to be scalars.

- (a) $E[Y]$
- (b) $E[E[Y]]$
- (c) $E[Y|X]$
- (d) $E[E[Y|X]]$
- (e) $\Pr(X|Y)$
- (f) $E[X^2|Y]$
- (g) $E[Y|X = x]$

2. (**True** or **False**) If X and Y are dependent, $cov(X, Y)$ is non-zero.

2 Dilution and Mixing

- Allen is writing an essay for graduate school applications. After writing a page, he decides with probability p to extend his essay's desired length by $\frac{N}{2}$ or with probability $1 - p$ to shorten his essay's desired length by $\frac{N}{2}$, where N is the number of desired pages at the moment he makes his decision. Let Allen's initial goal, before he has written any pages, be x pages.

1. After writing m pages, how many pages does he desire for his essay?
2. After m pages, how many *remaining* pages do we expect Allen to have to write? Now, N from the original problem is the number of *remaining* pages Allen has to write.