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## 13. Exercise: The variance of a sum

Exercises due Mar 25, 2020 05:29 IST Completed

### Exercise: The variance of a sum

1/1 point (graded)

The random variables  $X_1, \dots, X_8$  satisfy  $\mathbf{E}[X_i] = 1$  and  $\text{Var}(X_i) = 4$  for  $i = 1, 2, \dots, 8$ . Also, for  $i \neq j$ ,  $\mathbf{E}[X_i X_j] = 3$ . Then,

$\text{Var}(X_1 + \dots + X_8) =$

✓ Answer: 144

#### Solution:

For  $i \neq j$ , we have  $\text{Cov}(X_i, X_j) = \mathbf{E}[X_i X_j] - \mathbf{E}[X_i] \cdot \mathbf{E}[X_j] = 3 - 1 = 2$ . Thus,

$$\text{Var}(X_1 + \dots + X_8) = 8 \cdot \text{Var}(X_1) + 56 \cdot \text{Cov}(X_1, X_2) = 32 + 112 = 144.$$

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You have used 3 of 3 attempts

**i** Answers are displayed within the problem

## Discussion

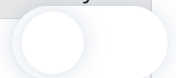
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? [Naive math question](#)

🗨️ question about number before covariance in explanation  
I'm trying to be spoiler free, so this might not make complete sense. I got most of the work right for this...

5

? question  
are we assuming here zero means?

3

🗨️ Use python  
It's nice to use python and do a quick nested loop to solve this problem !

4

🗨️ No Python needed  
The previous lecture gives you the formulas. Find  $cov(X_i, X_j)$  and voila.

5

🗨️ Hint:  
Don't assume zero mean while calculating the covariance.

1

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