



## MITx: 6.041x Introduction to Probability - The Science of Uncertainty



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## Exercise: A simple CI

(1/2 points)

Let  $\theta$  be an unknown parameter, and let  $X$  be uniform on the interval  $[\theta - 0.5, \theta + 0.5]$ .Is  $[X - 2, X + 2]$  an 80% confidence interval?

Yes ▾



Answer: Yes

I form a confidence interval of the form  $[X - a, X + a]$ . What is the narrowest confidence interval of this type (i.e., what is the smallest possible choice of  $a$ ) if I want to have an 80% confidence interval?

0.5


 $a =$  Answer: 0.4

Answer:


- ▶ Unit 6: Further topics on random variables
- ▶ Unit 7: Bayesian inference
- ▶ Exam 2
- ▼ **Unit 8: Limit theorems and classical statistics**

#### Unit overview


##### Lec. 18: Inequalities, convergence, and the Weak Law of Large Numbers

Exercises 18 due Apr 27, 2016 at 23:59 UTC 

##### Lec. 19: The Central Limit Theorem (CLT)

Exercises 19 due Apr 27, 2016 at 23:59 UTC 

##### Lec. 20: An introduction to classical statistics


Exercises 20 due Apr 27, 2016 at 23:59 UTC 

**$\mathbf{P}(X - 2 \leq \theta \leq X + 2) = \mathbf{P}(\theta - 2 \leq X \leq \theta + 2) = 1 \geq 0.80$** , and therefore, it is a 80% confidence interval, although, admittedly not a very intelligent one.

Note that  **$\mathbf{P}(X - a \leq \theta \leq X + a) = \mathbf{P}(\theta - a \leq X \leq \theta + a) = 2a$** , for  $a \in [0, 0.5]$ . In order to have an 80% confidence interval, I need  **$2a \geq 0.8$**  or  **$a \geq 0.4$** . Therefore, the smallest possible choice of  **$a$**  is 0.4.

*You have used 1 of 1 submissions*

[Solved problems](#)[Additional theoretical material](#)[Problem Set 8](#)

Problem Set 8 due Apr 27, 2016  
at 23:59 UTC 

[Unit summary](#)

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