



<u>Course</u> > <u>Unit 8:</u> ... > <u>Lec. 19:</u>... > 5. Exer...

## 5. Exercise: CLT applicability

Exercises due May 1, 2020 05:29 IST Completed

Exercise: CLT applicability

4/4 points (graded)

Consider the class average in an exam in a few different settings. In all cases, assume that we have a large class consisting of equally well-prepared students. Think about the assumptions behind the central limit theorem, and choose the most appropriate response under the given description of the different settings.

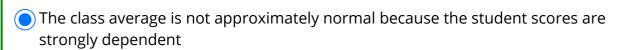
1. Consider the class average in an exam of a fixed difficulty.

The class average is approximately normal							
The class average is not approximately normal because the student scores are strongly dependent							
The class average is not approximately normal because the student scores are not identically distributed							



2. Consider the class average in an exam that is equally likely to be very easy or very hard.

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<ul> <li>The class average is not approximately normal because the student scores are not identically distributed</li> <li>✓</li> <li>Consider the class average if the class is split into two equal-size sections. One section gets</li> </ul>
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an easy exam and the other section gets a hard exam.
The class average is approximately normal
The class average is not approximately normal because the student scores are strongly dependent
The class average is not approximately normal because the student scores are not identically distributed
<b>✓</b>
4. Consider the class average if every student is (randomly and independently) given either an easy or a hard exam.
The class average is approximately normal
The class average is not approximately normal because the student scores are strongly dependent
The class average is not approximately normal because the student scores are not identically distributed
<b>✓</b>

## **Solution:**

1. Since students are equally well-prepared and the difficulty level is fixed, the only randomness in a student's score comes from luck or accidental mistakes of that student. It is then plausible to assume that each student's score will be an independent random variable drawn from the same distribution, and the CLT applies.

- 2. Here, the score of each student depends strongly on the difficulty level of the exam, which is random but common for all students. This creates a strong dependence between the student scores, and the CLT does not apply.
- 3. This is more subtle. The scores of the different students are not identically distributed. However, let  $Y_i$  be the score of the ith student from the first section and let  $Z_i$  be the score of the ith student in the second section. The class average is the average of the random variables  $\left(Y_i+Z_i\right)/2$ . Under our assumptions, these latter random variables can be modeled as i.i.d., and the CLT applies.
- 4. Unlike part (2), here the student scores are i.i.d., and the CLT applies.

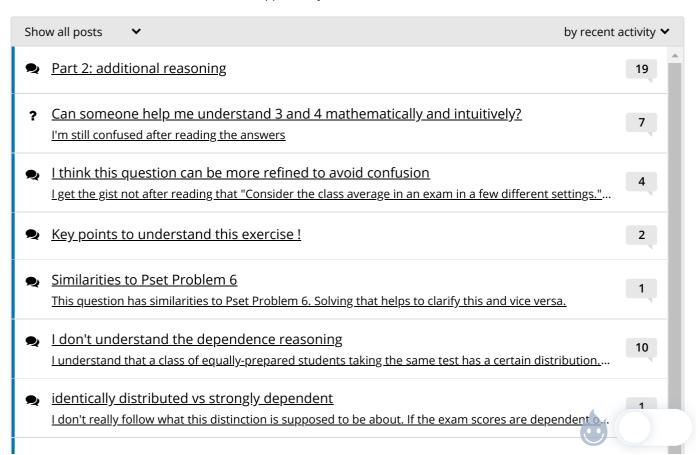
Submit You have used 1 of 1 attempt

**1** Answers are displayed within the problem

## Discussion

**Hide Discussion** 

**Topic:** Unit 8: Limit theorems and classical statistics:Lec. 19: The Central Limit Theorem (CLT) / 5. Exercise: CLT applicability



[STAFF] Fixed difficulty does the scores depend on fixed difficulty in case of the first question?	3
Part 3: Discussion of the Answer How can Yi AND Zi be i.i.d random variables although they come from different random variables?	3
Part 2 statement could be more clear It's just a suggestion, but in Part 2 could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student a exam with different could be more clear that for **each** student could be more clear that the could be more clear that for **each** student could be more clear that the could be more cle	2 ere
what the dependent mean?  Does the word "dependent" mean that the score of student A is dependent of student B? If it is true.	<u>ue, l</u>
? The random variable	1
Question on part 4: the probability of getting a hard or easy exam is always the same Can we assume that the probability of getting a hard or an easy exam is the same for every students.	3
Question 2	1

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