Problem Set #4 - Sampling Distributions and The Centr…
Homework • Due in 2 days

Problem Set #4 - Sampling Distributions and The Central Limit Theorem

The following problems will cover material discussed in Week 4. You must answer each question correctly to earn credit on the question. You have three attempts per question.

Question 1
Homework • Answered • Due May 3rd, 11:59 PM

Match the following terms with the correct description.

Drag and drop options on the right-hand side and submit. For keyboard navigation... SHOW MORE

Statistic	≡	A random variable that is calculated from the sample. ✓
Sampling Distribution	≡	The probability distribution of a statistic. ✓

Parameter	≡	A characteristic of the population (typically unknown). ✓
Population Distribution	≡	The distribution of the entire collection of observations. ✓
Sampled Distribution	≡	The distribution of the observations obtained from a random sample. ✓

Answered - Correct! • **1** attempt left

Resubmit

Question 2

Homework • Answered • Due May 3rd, 11:59 PM

Suppose the random variable X comes from some distribution with a mean μ and standard deviation σ. For a sufficiently large sample size, the sampling distribution of the sample mean is:

(Select all that apply)

Multiple answers: Multiple answers are accepted for this question

Select one or more answers and submit. For keyboard navigation... SHOW MORE

a	the same as the population distribution.	
b	centered at μ and has a standard deviation of σ.	
c	centered at μ and has a standard deviation of $\sigma/\sqrt{n}$.	✓ Your answer
d	approximately normally distributed.	✓ Your answer
e	symmetric.	✓ Your answer

Answered - Correct! • **2** attempts left

Resubmit

Question 3

Homework • Answered • Due May 3rd, 11:59 PM

Given the population distribution is very skewed, what sample size is considered to be "sufficiently large" in order for the Central Limit Theorem to hold?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	The sample size can be 1 or greater.
b	The sample size must be 12 or greater.
c	The sample size must be 30 or greater. ✓ Your answer

Answered - Correct! • **2** attempts left

Resubmit

Use the following information to answer the next two questions: The inside diameter of a randomly selected piston ring is a random variable with mean value 15 cm and standard deviation 0.05 cm.

Question 4

Homework • Answered • Due May 3rd, 11:59 PM

Fill in the Blanks

Type your answers in all of the blanks and submit

X_a X^a Ω

(a) If $\overline{X}$ is the sample mean diameter for a random sample of n=20 rings, where is the sampling distribution of $\overline{X}$ centered and what is the standard deviation of the $\overline{X}$ distribution?

center = 15 ✓

You are correct

standard deviation = 0.0112 ✓ (Round your answer to 4 decimal places)

You are correct

(b) Suppose now the sample size is increased to n=80. Where is the sampling distribution of $\overline{x}$ centered and what is the standard deviation of the $\overline{x}$ distribution?

center = 15 ✓

You are correct

standard deviation 0.0056 ✓ (Round your answer to 4 decimal places)

You are correct

Answered - Correct! • **2** attempts left

Resubmit

Question 5

Homework • Answered • Due May 3rd, 11:59 PM

For which of the two random samples, (a) n = 20 or (b) n = 80, is $\overline{x}$ more likely to be within 0.01 cm of 15 cm?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	$\overline{x}$ is more likely to be within 0.01 cm of 15 cm in sample (a) n=20 because of the increased variability with a smaller sample size.
b	$\overline{x}$ is more likely to be within 0.01 cm of 15 cm in sample (a) n=20 because of the decreased variability with a smaller sample size.
c	$\overline{x}$ is more likely to be within 0.01 cm of 15 cm in sample (b) n=80 because of the increased variability with a larger sample size.
d	$\overline{x}$ is more likely to be within 0.01 cm of 15 cm in sample (b) n=80 because of the decreased variability with a larger sample size. ✓ Your answer

Answered - Correct! • **1** attempt left

Resubmit

Use the following information to answer the next **three** questions: Suppose the time between buses at a particular stop is a positively skewed random variable with an average of 55 minutes

and standard deviation of 6 minutes. Suppose the time between buses at this stop is measured for a randomly selected week, resulting in a random sample of $n = 40$ times. The average of this sample, $\overline{x}$, is a random variable that comes from a specific probability distribution.

Question 6

Homework • Answered • Due May 3rd, 11:59 PM

Which of the following is true about the distribution of mean times for n = 40?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	The distribution will be positively skewed with a mean of 55 minutes and a standard deviation of 0.949 minutes.
b	The distribution will be positively skewed with a mean of 55 minutes and a standard deviation of 6 minutes.
c	The distribution will be normally distributed with a mean of 55 minutes and a standard deviation of 0.949 minutes. ✓ Your answer
d	The distribution will be normally distributed with a mean of 55 minutes and a standard deviation of 6 minutes.

Answered - Correct! • **2** attempts left

Resubmit

Question 7

Homework • Answered • Due May 3rd, 11:59 PM

Calculate the probability that the mean time for the sample of 40 observations will be between 54 and 56 minutes. $P(54 \leq \overline{x} \leq 56)$

Hint: you can use the sampling distribution parameters and the pnorm() function in R. Round your answer to 3 decimal places.

Type your numeric answer and submit

0.708 ✓

You are correct

Answered - Correct! • **2** attempts left

Resubmit

Question 8

Homework • Answered • Due May 3rd, 11:59 PM

How likely is it that the average time will exceed 57 minutes? $P(\bar{x} \geq 57)$

Round your answer to three decimal places.

Type your numeric answer and submit

0.018 ✓

You are correct

Answered - Correct! • **2** attempts left Resubmit

Question 9

Homework • Answered • Due May 3rd, 11:59 PM

The single "best guess" for an unknown parameter is referred to as the

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	point estimate	✓ Your answer
b	critical value	
c	standard value	
d	test statistic	
e	parameter	

Answered - Correct! • **2** attempts left Resubmit

Question 10

Homework • Answered • Due May 3rd, 11:59 PM

If $E(\hat{\theta}) = \theta$ then $\hat{\theta}$ is said to be a(n)

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	unknown estimate for θ.	
b	unbiased estimate for θ.	✓ Your answer

c	bad estimate for θ.
d	biased estimate for θ.
e	known estimate for θ.

Answered - Correct! • **2** attempts left Resubmit

Use the following information to answer the next two questions: In May of 2022, Americans were asked by the Pew Research Center whether they think masks should be required by passengers on airplanes. Suppose the population proportion of Americans that think masks should be required on planes is 0.57.

Question 11

Homework • Answered • Due May 3rd, 11:59 PM

Fill in the Blanks

Type your answers in all of the blanks and submit

X_2 X^2 Ω

Consider samples of size n=38 from this population. The distribution of sample proportions will be

approximately [normal ✓] with a mean of

You are correct

[0.57 ✓] and a standard error [0.08 ✓] .

You are correct You are correct

Round your numerical answers to two decimal places.

Answered - Correct! • **2** attempts left

Resubmit

Question 12

Homework • Answered • Due May 3rd, 11:59 PM

Fill in the Blanks

Type your answers in all of the blanks and submit

X_2 X^2 Ω

The probability that from a sample of 38 Americans, less than half think masks should be required on planes is 0.19 ✓ .

You are correct

The probability that from a sample of 38 Americans, more than three quarters think masks should be required on planes is 0.01 ✓ .

You are correct

Round your answers to two decimal places.

Answered - Correct! • **2** attempts left

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