LESSON MAKER PRO

Means Under the Microscope

Use simulated samples to check a claim.

HIGH SCHOOL · S.IC.A.1.a

S.IC.A.1.a "Introduce sampling distributions as a means to explore variability in sample statistics and ultimately evaluate a claim about a population."

NAME _____ DATE _____

THE BIG IDEA

A sampling distribution shows how a sample mean can change from sample to sample. To check a claim about a population mean, simulate samples under that claim and find the fraction of simulated means at least as extreme as the observed mean.

WORKED EXAMPLE

These sample means were simulated under a claim. What fraction are at least as large as the observed mean?

Simulated sample means	Observed sample mean
30, 32, 34, 34, 36, 38	38

1. Count simulated means of 38 or more: 1.
2. Divide by the number of simulations: 1/6.

Answer: 1/6

PRACTICE 4 problems

1 Simulated means: 12, 14, 16, 18. Observed mean: 16. What fraction are at least 16?

ANSWER _____

2 Simulated means: 41, 43, 45, 47, 49. Observed mean: 47. What fraction are at least 47?

ANSWER _____

3 Simulated means: 60, 62, 64, 66. Observed mean: 62. What fraction are at most 62?

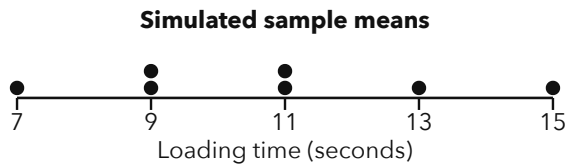
ANSWER _____

4 Simulated means: 70, 72, 74, 76, 78. Observed mean: 80. What fraction are at least 80? Is 80 surprising in these simulations?

ANSWER _____

APPLY IT Show your work

1 A game company claims its mean loading time is 11 seconds. The plot shows sample means simulated under this claim. A player's sample mean was 15 seconds. What fraction of simulated means are at least 15? Is 15 common in these simulations?



ANSWER _____

2 A music app claims students listen for 58 minutes per day on average. Simulated sample means under this claim are 51, 53, 55, 57, 59, 61, 63, 65 minutes. A survey finds a sample mean of 63 minutes. What fraction of simulations reached at least 63? Does this prove the claim false?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Under a claimed mean, simulated sample means are 37, 39, 41, 43, 45, 47, 49, 51. Two surveys have observed means of 37 and 49. Which is more surprising? Compare the fraction at most 37 with the fraction at least 49.

WORK SPACE AND ANSWER

ANSWER KEY

Means Under the Microscope

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Simulated means: 12, 14, 16, 18. Observed mean: 16. What fraction are at least 16?	**1/2**
2	Simulated means: 41, 43, 45, 47, 49. Observed mean: 47. What fraction are at least 47?	**2/5**
3	Simulated means: 60, 62, 64, 66. Observed mean: 62. What fraction are at most 62?	**1/2**
4	Simulated means: 70, 72, 74, 76, 78. Observed mean: 80. What fraction are at least 80? Is 80 surprising in these simulations?	**0/5; yes, none of the simulated means reached 80.**

PART 2 · APPLY IT

1. **1/7; no, only one simulated mean reached 15.** One of the seven simulated means is at least 15 seconds.
2. **1/4; no.** Two of eight simulated means reached at least 63, so the fraction is 2/8 = 1/4. This result does not prove the claim false.

CHALLENGE

37 is more surprising: 1/8 of simulated means are at most 37, while 2/8 are at least 49.

Accept equivalent fractions. A small simulated fraction suggests an observed mean is unusual under the claim, but does not prove the claim false.