

“FRAPPY” {Free Response AP Problem... Yay!}

The following problem is taken from an actual Advanced Placement Statistics Examination. Your task is to generate a complete, concise statistical response in 15 minutes. You will be graded based on the AP rubric and will earn a score of 0-4. After grading, keep this problem in your binder for your AP Exam preparation.

A bottle-filling machine is set to dispense 12.1 fluid ounces into juice bottles. To ensure that the machine is filling accurately, every hour a worker randomly selects four bottles filled by the machine during the past hour and measures the contents. If there is convincing evidence that the mean amount of juice dispensed is different from 12.1 ounces or if there is convincing evidence that the standard deviation is greater than 0.05 ounce, the machine is shut down for recalibration. It can be assumed that the amount of juice that is dispensed into bottles is normally distributed. During one hour, the mean number of fluid ounces of four randomly selected bottles was 12.05 and the standard deviation was 0.085 ounce.

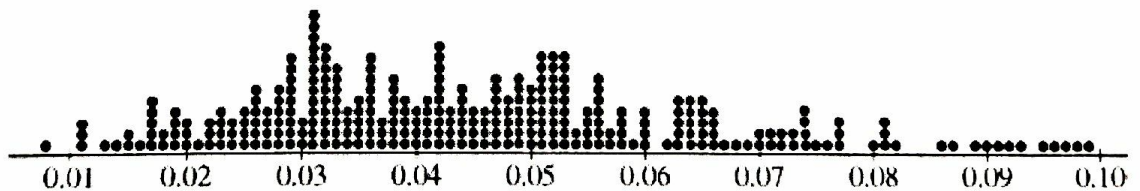
Scoring: (a) Perform a test of significance to determine whether the mean amount of juice dispensed is different from 12.1 fluid ounces. Assume the conditions for inference are met.

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(b) To determine whether this sample of four bottles provides convincing evidence that the standard deviation of the amount of juice dispensed is greater than 0.05 ounce, a simulation study was performed. In the simulation study, 300 samples, each of size 4, were randomly generated from a normal population with a mean of 2.1 and a standard deviation of 0.05. The sample standard deviation was computed for each of the 300 samples. The dotplot below displays the values of the sample standard deviations.



Use the results of this simulation study to explain why you think the sample provides or does not provide evidence that the standard deviation of the juice dispensed exceeds 0.05 fluid ounce.

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Total: __/4

2009B #5

(a) ① Let μ = mean amount of juice dispensed by the machine ~~per~~ hour

1-samp T-test

$H_0: \mu = 12.1$

$H_A: \mu \neq 12.1$

Problem says they are met

② Conditions:

- Random ✓
- Normal ✓
- Independent ✓

Problem states
"Assume normally distributed
assume there are at least 40 bottles filled and the bottles are independent"

③ Calculations:

$t = -1.18$

$p\text{-val} = 0.32$

$\alpha = 0.05$

④ Since $p\text{-val} > \alpha$,
fail to reject H_0

④ There is not sufficient data to conclude that the mean amount of juice dispensed is ~~different~~ different from 12.1 ounces.