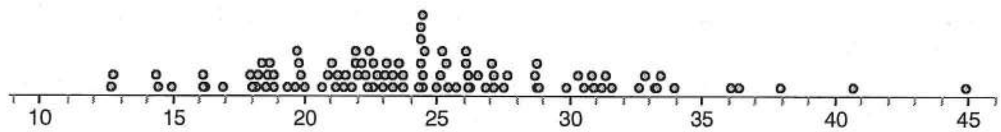
Sampling Distributions for means practice PLEASE SHOW WORK ON SEPARATE PAPER

1. Suppose that in the United States the true mean number of tacos consumed in a year is 18 tacos per person with a standard deviation of 25 tacos per person. Each person in a random sample of size 50 from the United States was asked how many tacos they consumed in the last year.
    a. What is the probability that the mean number of tacos per person in the sample is at most 20?
    b. What can you do to increase this probability?

To estimate the sampling distribution of the sample standard deviation, 100 random samples of size 50 were taken from a population with a mean of 18 and a standard deviation of 25. This estimated distribution is shown below.



c. Briefly explain the meaning of the phrase "sampling distribution of the sample standard deviation."
d. Briefly explain what the dot at 45 represents.
e. Estimate the probability that the sample standard deviation will be at most 20 tacos.

2) Suppose that the population of residents of local town has a mean annual income of $50,000 and a standard deviation of $35,000. If a random sample of 100 town residents is selected, what is the probability that their sample mean is within $5000 of the true mean?

b) What will happen to this probability if we increase the sample size?

3) Suppose that a random sample of 100 New Paltz residents was asked about their annual income. If x = annual income, briefly explain the difference between $\overline{x}$, μ, and $\mu_{\overline{x}}$

4) The College Board reported the score distribution for all students who took the

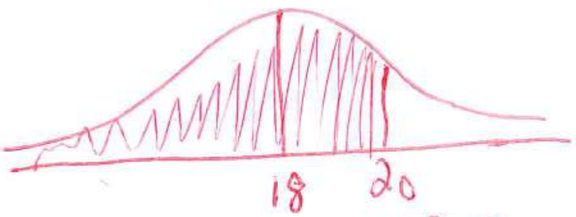
AP STATISTICS exam in 2008: here are the results:

Grade	5	4	3	2	1
Percent of students	12.5	22.5	24.8	19.8	20.4

a) find the mean and standard deviation of the scores
b) If a random sample of 40 students were selected would you expect their scores to follow a normal model? Explain
c) Consider the mean scores of randomly selected samples of 40 students, describe the sampling distribution for the data collected (shape, center, spread)
d) What assumptions/conditions did you make to answer part c.
e) What are the chances that a teacher who had 40 students preparing for the AP exam would achieve an average score of at least 3? (are the assumptions/conditions met in order to justify your conclusion?)

1] I'm going to use a N.D to answer this. The N.D applies to the Sampling Distribution because the Conditions were met (Randomly Selected, less than 10% of the Population and the Sample was "Big Enough")

a] $\mu_{\bar{x}} = \mu = 18$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{25}{\sqrt{50}} = 3.536$ ish



normalcdf $(-100, .566) = \boxed{71.43\%}$

$Z = \frac{20-18}{3.536} = .566$

b] To increase the probability, I would want the 20 to have a larger Z-score (Further from the mean) so that will happen when there are more standard deviations between the mean and the 20, so S.D should be Smaller which happens when n is larger; the sample would need to increase to increase the probability.

c] Samples of size 50 were taken and the S.D. of that sample was computed and a dot was placed, then I put the 50 back, picked a new Sample of 50, computed S.D put a dot, REPEAT....

d] IT means that one of the samples had a S.D of 45.

e] Don't use a Normal Distribution here, we don't know if Sampling Distributions for S.D are normal. Just count dots. Approx. 23 out of the 100 dots are @ 20 or less so 23 %.

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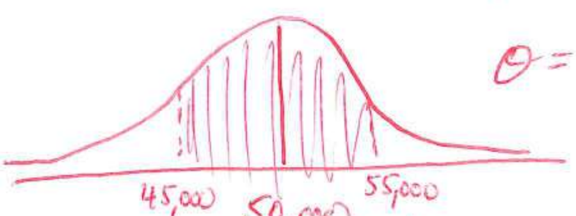
② Again I will justify my work with the N.D by checking the Appropriate conditions.

① The 100 people in the sample were randomly selected, which leads me to believe the incomes are Independent.

② 100 is less than 10% of the entire U.P. population.

③ The 100 people in the Sample is big enough.



$\sigma = \frac{35,000}{\sqrt{100}} = 3,500$

$z =$ $\qquad$ $z =$

normalcdf $(-1.429, 1.429) \approx \boxed{84.7\%}$

b] The prob. will increase.

3.

$\bar{X}$ = the Mean of each Sample

$\mu_{\bar{x}}$ = the mean of the Sampling Distribution For all Samples

μ = the Population mean

4a] I put the data into L_1 and its Frequency into L_2 (as a decimal) then did 1-varstats L_1, L_2

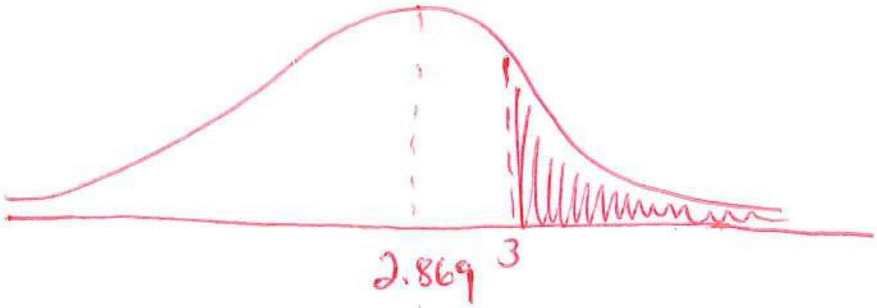
* $\mu = 2.869$
  $\sigma = 1.3122$

b] No, that would be the distribution of the sample NOT a Sampling distribution.

c] I would expect it to be approximately normal with a mean of 2.869 and a standard deviation of $\frac{1.3122}{\sqrt{40}} = .2075$

d] Assuming the Samples are drawn with randomness (to ensure independence) And that 40 is less than 10% of the population And the 40 is Big Enough, than my answer to C would be justified.

e]



$Z = \frac{3-2.869}{.2075} = .6313$ normalcdf(.6313, 100) $\approx \boxed{26.4\%}$

the Condition of Randomness to ensure independence is not satisfied here. these 40 students are all from the same class with the same teacher. If all teachers were the same than maybe the above calculated ~~prop~~ probability would be justified.