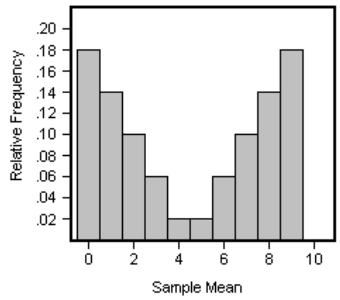
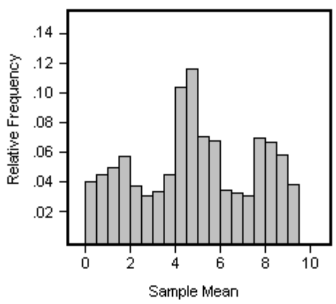
Math 263
Quiz 3 Name___________________________________

A population has the distribution shown:[1]

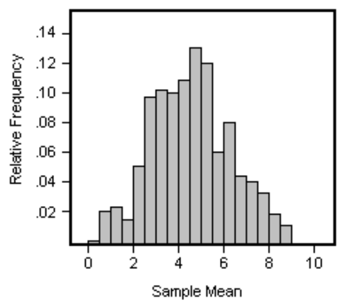


(a) The distribution of three sets of samples, each of a fixed sample size, drawn from this population are shown in I-III. Match each one with the correct sample size, mean and standard deviation.

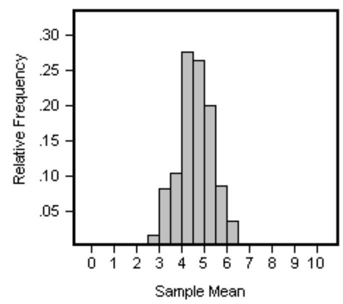
I.



II



III



Sample sizes: 2, 4, 25
Mean and Standard Deviation: 4.39 and 1.84; 4.53 and 0.70; 4.47 and 2.39
(These are in pairs, μ and σ. Each pair goes with one sample size.)

Sampling distribution I has $n =$________ and $\mu_{\bar{x}} =$________, $\sigma_{\bar{x}} =$________
Sampling distribution II has $n =$________ and $\mu_{\bar{x}} =$________, $\sigma_{\bar{x}} =$________
Sampling distribution III has $n =$________ and $\mu_{\bar{x}} =$________, $\sigma_{\bar{x}} =$________

(b) For which sample sizes is it reasonable to assume that 95% of the sample means are within $2\sigma_{\bar{x}}$ of the population mean? Why?

(c) Why are the means of I-III not equal?

[1] From *Statistics in Action* by Ann Watkins, et al. (Key Curriculum, 2004)

Solutions

Distributions I-III are each approximations to a sampling distribution of means for some value of n. They are only approximations, not the actual sampling distribution because each shows only the mean of a set of samples, not all samples.

(a) Sample sizes: 2, 4, 25
Mean and Standard Deviation: 4.39 and 1.84; 4.53 and 0.70; 4.47 and 2.39
(These are in pairs, μ and σ. Each pair goes with one sample size.)

Sampling distribution I has $n =$____2____ and $\mu_{\bar{x}} =$__4.47______, $\sigma_{\bar{x}} =$___2.39_____
Sampling distribution II has $n =$____4____ and $\mu_{\bar{x}} =$___4.39_____, $\sigma_{\bar{x}} =$___1.84_____
Sampling distribution III has $n =$____25____ and $\mu_{\bar{x}} =$___4.53_____, $\sigma_{\bar{x}} =$___0.70_____

(b) For which sample sizes is it reasonable to assume that 95% of the sample means are within $2\sigma_{\bar{x}}$ of the population mean? Why?

The larger the sample size, the closer the sampling distribution is to normal and the better this assumption. Thus distribution III, where $n = 25$, will satisfy this assumption best. Distribution II, where $n = 4$, will be the next best, but is noticeably less normal looking.

(c) Why are the means of I-III not equal?

Because we are not looking at all possible samples of a certain size, but only a set of samples. Thus we are not looking at the sampling distribution, but only an approximation to it. The sampling distributions for each value of n would have exactly the same mean (equal to the mean of the population). The approximations here all have similar means (4.47, 4.39, 4.53), but not identical.