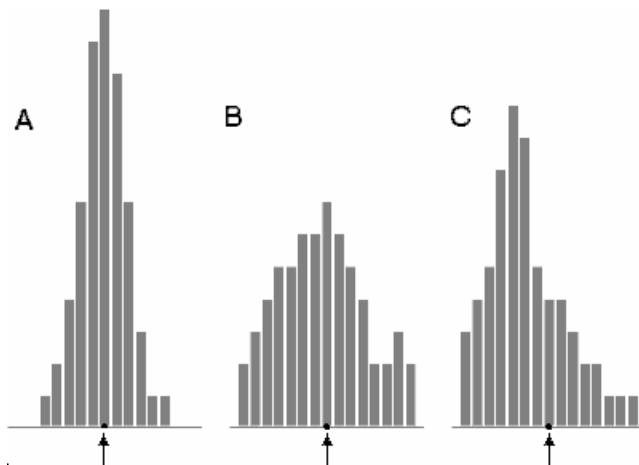


## AP Statistics Practice Free Response Exam – CHAPTER 9

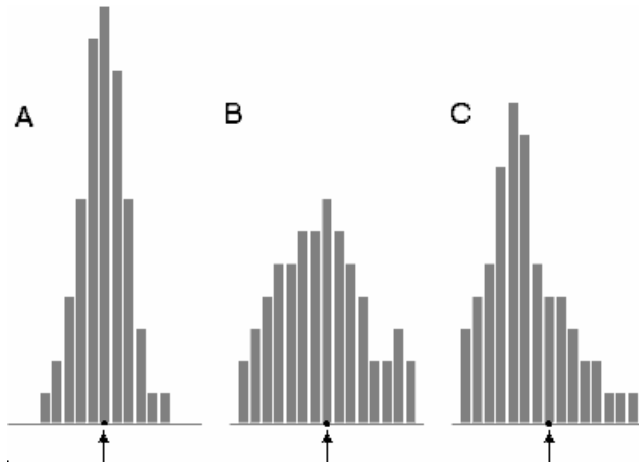
1. Below are histograms of the values taken by three sample statistics in several hundred samples from the same population. The true value of the population parameter is marked on each histogram.



- Which statistic has the largest bias among these three? Justify your answer.
  - Which statistic has the lowest variability among these three?
  - Based on the performance of the three statistics in many samples, which is preferred as an estimate of the parameter? Why?
2. According to government data, 22% of American children under the age of 6 live in households with incomes less than the official poverty level. A study of learning in early childhood chooses an SRS of 300 children.
- Can a normal approximation be used in this setting? Justify your answer.
  - What is the probability that more than 20% of the sample are from poverty households?
3. The weights of newborn children in the United States vary according to the normal distribution with mean 7.5 pounds and standard deviation 1.25 pounds. The government classifies a newborn as having low birth weight if the weight is less than 5.5 pounds.
- What is the probability that a baby chosen at random weighs less than 5.5 pounds at birth?
- You choose three babies at random and compute their mean weight,  $\bar{x}$ .
- What are the mean and standard deviation of the mean weight  $\bar{x}$  of the three babies?
  - Can a normal approximation be used in this setting? Justify your answer.

AP Statistics Practice Free Response Exam – CHAPTER 9 \*\*\* ANSWERS \*\*\*

1. Below are histograms of the values taken by three sample statistics in several hundred samples from the same population. The true value of the population parameter is marked on each histogram.



- a. C – the center of the histogram is noticeably to the left of the parameter.  
b. A is clearly the least variable  
c. Distribution A is unbiased and has the lowest variability, so it should give the best estimates.
2. According to government data, 22% of American children under the age of 6 live in households with incomes less than the official poverty level. A study of learning in early childhood chooses an SRS of 300 children.
- a. Pop. size is  $10 \times$  sample size,  $np=66$  and  $n(1-p)=234$ , so both are greater than 10.  
b.  $z = (.20 - .22) / .024 = -.83$  so  $P(z > -.83) = 1 - .2033 = .7967$ .
3. The weights of newborn children in the United States vary according to the normal distribution with mean 7.5 pounds and standard deviation 1.25 pounds. The government classifies a newborn as having low birth weight if the weight is less than 5.5 pounds.
- a.  $z = (5.5 - 7.5) / 1.25 = -1.60$  so  $P(z < -1.60) = .0548$

You choose three babies at random and compute their mean weight,  $\bar{x}$ .

- b. mean = 7.5 and standard deviation  $1.25/\text{root}(3) = .722$ ?  
c. Yes. Even though the sample size is small (3) the statistic comes from a normal distribution. Thus, any sample size will produce a normal distribution for  $\bar{x}$ .