

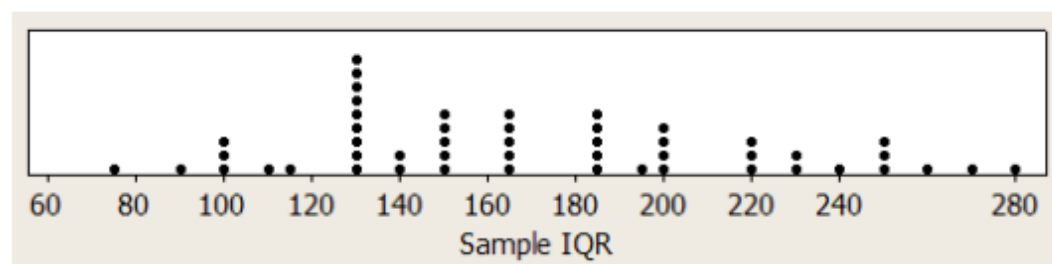
Part II: Free Response. Only one part at a time.

Please remember to check conditions.

1. Buying a year's worth of textbooks for college can be expensive! Consider a large population of college students for whom the distribution of the annual cost of textbooks is slightly skewed to the left. Here is the five-number summary for the annual cost of textbooks for this population:

Minimum = 80 Quartile 1 = 215 Median = 335 Quartile 3 = 380 Maximum = 440

Suppose we take random samples of size 32 from this population and calculate the interquartile range (IQR) for each of our samples. Below is a dotplot of the IQR from 50 such samples.



- (a) Briefly explain what the dot at 240 represents.

[2]

- (b) Is the sample IQR an unbiased estimator of the population IQR? Justify your answer.

[2]

2. A friend has offered to play a game with you that involves flipping a coin that he has provided. Since a flip of heads will be to his advantage, you want to test the coin for fairness before you begin to play. Your friend is willing to let you flip the coin 50 times to determine if the probability of getting heads is actually 0.50, as it should be if the coin is fair.

- (a) Assume for the moment that the coin is fair. If \hat{p} is the proportion of heads in 50 flips of the coin, what are the mean and standard deviation of the sampling distribution of \hat{p} ?

[2]

- (b) Explain why you can use the formula for the standard deviation of \hat{p} in this setting.

[3]

- (c) You flip the coin 50 times and get 30 heads. Do you risk insulting your friend by refusing to play with his coin? Support your answer with an appropriate probability calculation. Include a graph with your solution.

[4]

3. A study of college freshmen's study habits found that the time (in hours) that freshmen study each week follows a distribution with a mean of 7.2 hours and a standard deviation of 5.3 hours.

- (a) Can you calculate the probability that a randomly chosen freshman studies more than 9 hours? If so, do it. If not, explain why not.

[2]

- (b) What is the *shape* of the sampling distribution of the mean \bar{x} for samples of 55 randomly selected freshmen? Justify your answer.

[3]

- (c) What are the mean and standard deviation of the sampling distribution of the mean \bar{x} for samples of 55 randomly selected freshmen?

[3]

- (d) Find the probability that the average number of hours spent studying by an SRS of 55 students is greater than 9 hours. Show your work.

[3]