MAT121 Quiz 06

Problem 1

For a sample taken from a non-normal population, what sample size (n) is considered *insufficiently* large enough to guarantee a good approximation of the sample mean to a normal distribution?

A. n = 50
B. n = 20
C. n = 35
D. n = 41

Answer: B. n = 20 < 30.

Problem 2.
The mean and standard deviation of a sampled population are μ = 200 and σ = 24. What is the mean and standard deviation of the sample if n = 64?
A. (200, 3)
B. (25, 24)
C. (25, 3)
D. (200, 24)

Answer: A. The sample mean is equal to the population mean of 200 and the sample standard deviation is equal to 24/sqrt(64) = 24/8 = 3.

Problem 3.

A high school has kept a record of its seniors' SAT scores over the past several years and has found the scores to have a mean of 1256 (out of 1600) and a standard deviation of 168. The school randomly sampled 144 students from this population. What is the sample's mean and standard deviation of SAT scores?

A (1256, 1.67)
B. (1256, 14)
C. (89.7, 1.67)
D. (89.7, 12)

Answer: B. Application of the central limit theorem

Problem 4.
Suppose it is known that 23% of Americans will obtain a higher educational degree after completing their undergraduate courses (such as a Master's or Doctoral degree). If a random sample of 25 Americans were surveyed, which of the following statements about the sampling distribution of the sample proportion $\hat{p}$ is correct?

A. The standard deviation of the sample proportion is 23/5.
B. The standard deviation of the sample proportion is 0.23/5.
C. The standard deviation of the sample proportion is 0.23×0.77/5.
D. The standard deviation of the sample proportion is $\sqrt{0.23 \times 0.77/25}$.

Answer: D.

Problem 5.

A sample of 49 workers was asked to rate their job satisfaction on a scale of 1 to 10. The sample mean was 6.8 and the standard deviation was 2.1. To construct a 95% confidence interval for the mean rating scale, what is the margin of error?

A. 1.645×2.1/49
B. 1.645×2.1/$\sqrt{49}$
C. 1.960×2.1/49
D. 1.960×2.1/$\sqrt{49}$

Answer: D. Use the sampling distribution of the sample mean based on the central limit theorem.

Problem 6

A random sample of 36 public universities was asked to report their semester tuition cost. The mean was found to be $12,000 and the standard deviation was $1752. The 95% confidence interval of the mean tuition cost is

A. (11427.68, 12572.32)
B. (11519.66, 12480.34)
C. (11919.94, 12080.06)
D. (9117.96, 14882.04)

Answer: A. Following the steps for constructing large sample confidence intervals.

Problem 7.

For sample size 16, the sampling distribution of the mean will be approximately normally distributed.

A) if the population is normally distributed.
B) if the sample standard deviation is known.
C) if the shape of the population is symmetrical.
D) regardless of the shape of the population.

Answer: A. This is based on the important fact of normal populations given in the lecture note.

Problem 8.

Which of the following statements about the sampling distribution of the sample mean is **incorrect**?

A) The sampling distribution of the sample mean is approximately normal whenever the sample size is sufficiently large ($n > 30$).
B) The mean of the sampling distribution of the sample mean is equal to the population mean.
C) The standard deviation of the sampling distribution of the sample mean is equal to the population standard deviation.
D) The sampling distribution of the sample mean is generated by repeatedly taking samples of size n and computing the sample means.

Answer: C. Based on the CLT.

Problem 9.

Suppose the ages of students in Statistics I follow a right-skewed distribution with a mean of 23 years and a standard deviation of 3 years. If we randomly sampled 100 students, which of the following statements about the sampling distribution of the sample mean age is **incorrect**?

A) The standard deviation of the sampling distribution is equal to 3 years.
B) The standard error of the sampling distribution is equal to 0.3 years.
C) The shape of the sampling distribution is approximately normal.
D) The mean of the sampling distribution is equal to 23 years

Answer: A. The standard deviation of the sample mean is 3/sqrt{100}

Problem 10.

Fifty SmartCars were randomly selected and the highway mileage of each was noted. The analysis yielded a mean of 47 miles per gallon and a standard deviation of 5 miles per gallon. Which of the following would represent a 95% confidence interval for the average highway mileage of all SmartCars?

A). $47 \pm 1.345 \times (5/\sqrt{50})$
B). $47 \pm 1.645 \times (5/\sqrt{50})$
C). $47 \pm 1.96 \times (5/\sqrt{50})$
D). $47 \pm 2.575 \times (5/\sqrt{50})$

Answer: C. This is a large sample confidence interval of the population mean.

Problem 11

A sample of 892 people were asked to report their weekly grocery expenditures. The mean was found to be \$77.54. Assume σ = \$15.43. What is the margin of error for the 95% confidence interval for the mean grocery cost of the population?
A. \$1.01
B. \$1.49
C. \$2.54
D. \$0.69

Answer: A. Using the formula of the margin of error.

Problem 12.

The owner of a fish market has an assistant who has determined that the weights of catfish are normally distributed, with a mean of 3.2 pounds and a standard deviation of 0.8 pounds. If a sample of 16 fish is taken, what would the standard error of the mean weight equal?

A) 0.800
B) 0.003
C) 0.200
D) 0.050

Answer: C. Using the result of the important fact.

Summary of Weekly Quiz #6

1. Grade Distribution - Histogram

cut.data.freq	Freq	midpts	rel.freq	cum.freq	rel.cum.freq
[6e+01,7e+01]	2	65.00	0.03	2	0.03
(7e+01,8e+01]	24	75.00	0.30	26	0.33
(8e+01,9e+01]	24	85.00	0.30	50	0.62
(9e+01,1e+02]	30	95.00	0.38	80	1.00

2. 5-Number-Summary and Boxplot

1. Five Number Summary :

The five-number summary is use used to describe the shape of the distribution of a given numerical data. It consists of five numbers: minimum data value, first quartile, median, the third quartile, and the maximum data value.

The five-number summary of this given data set is:

stats	value
Min.	60.00
1st Qu.	80.00
Median	90.00
3rd Qu.	100.00
Max.	100.00

2. Boxplot :

The boxplot is a geometric representation of the five-number summary. The boxplot of the given data set is given below.