



Problem 1

For each of the following situations, state whether the parameter of interest is a mean (μ) or a proportion (p). Also identify the corresponding statistic.

1. In a survey, one hundred college students are asked how many hours per week they spend on the Internet.
X: hours per week spend on internet. Continuous r.v.
Parameter of interest: Mean (μ) – “mean number of hours per week spend on internet”
Statistic: \bar{X}
2. In a survey, one hundred college students are asked whether or not they cited information from Wikipedia in their papers.
Y: whether they cited information from Wikipedia or not. Proportion (p)
3. In a sample of one hundred recent college graduates, it is found that 85 percent expect to get a job within one year of their graduation date.
Z: get a job within one year of their graduation date. Proportion (p)
4. In a survey, one hundred college students are asked how many hours per week they spend on the Internet.

Problem 2

5. A sampling distribution is the probability distribution for which one of the following:
 - a) A sample
 - b) A sample statistic**
 - c) A population
 - d) A population parameter
 - e) None of the above

Problem 3

The average number of acres burned by all wildfires in the United States is 780 acres with a standard deviation 500 acres. The distribution of acres burned by wildfires is bell shaped.

6. What is the probability that a random wildfire burns more than 800 acres? **0.484**

The average number of acres burned by all wildfires in the United States is 780 acres with a standard deviation 500 acres. Of course, some wildfires burn thousands of acres, so the distribution of acres burned by wildfires is strongly right skewed.

A simple random sample of 200 wildfires is to be taken from this population and the sample mean acres burned calculated. Use this to answer the next two questions.

7. What is the probability to have a sample mean that is higher than 800 acres? Find the closest answer. **Answer – 0.286**



- a) 0.391
- b) 0.484
- c) 0.516
- d) 0.286
- e) none of above

8. What is the third quartile (Q3) of the sampling distribution of sample mean acres burned? Find the closest answer. **Answer - 804**

- a) 1116 acres
- b) 756 acres
- c) 804 acres
- d) 782 acres
- e) 815 acres

Problem 4

The distribution of the number of eggs laid by a certain species of hen during their breeding period is 35 eggs with a standard deviation of 18.2. Suppose a group of researchers randomly samples 45 hens of this species, counts the number of eggs laid during their breeding period, and records the sample mean.

9. Define the random variable of interest.

X : number of eggs laid by a certain species of hen.

10. Which are the parameters of the population distribution of X?

$\mu = 35$ and $\sigma = 18.2$

11. Which is the shape of the population distribution of X?

Unknown.

12. Suppose the researchers take all the possible samples of size 45 and estimate the sample mean for each sample. Which is the name of the distribution that they obtain by plotting all the estimated sample means?

Answer: The sampling distribution of \bar{X}

13. Would you expect the shape of this distribution to be symmetric, right skewed, or left skewed? Explain your reasoning.

Symmetric bell shape due to Central Limit Theorem, as $n \geq 30$ and observations are independent.

14. Calculate the variability of the sampling distribution and state the appropriate term used to refer to this value.



Standard deviation of $(\bar{X}) = \sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} = \frac{18.2}{\sqrt{45}}$

15. Suppose the researchers' budget is reduced and they are only able to collect random samples of 10 hens. The sample mean of the number of eggs is recorded, and we repeat these 1,000 times, and build a new distribution of sample means. How will the variability of this new distribution compare to the variability of the original distribution?

Standard deviation of $(\bar{X}) = \sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} = \frac{18.2}{\sqrt{10}}$, the variability will be larger.