Stats Review
Chapter 8

Revised 8/16

Note:

This review is meant to highlight basic concepts from the course.   It does not cover all concepts presented by your instructor. Refer back to your notes, unit objectives, handouts, etc. to further prepare for your exam.

The questions are displayed on one slide followed by the answers are displayed in red on the next.

This review is available in alternate formats upon request.

Distribution of Sample Mean

Based on tests of the Chevy Cobalt, engineers have found that the miles per gallon are normally distributed with a mean of 32 miles per gallon and a standard deviation of 3.5 mile per gallon.

a) What is the probability that a randomly selected Cobalt gets more than 34 miles per gallon.

b) Twenty Cobalts are randomly selected and the miles per gallon is recorded. What is the probability that the mean miles exceeds 34 miles per hour? Would this result be unusual?

Distribution of Sample Mean

Based on tests of the Chevy Cobalt, engineers have found that the miles per gallon are normally distributed with a mean of 32 miles per gallon and a standard deviation of 3.5 mile per gallon.

a) What is the probability that a randomly selected cobalt gets more than 34 miles per gallon.

Find the z-value

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{34 - 32}{3.5/\sqrt{1}} = .57$$

The corresponding probability is .7157. Since we want the probability that the car gets *more than* 34 miles per gallon, we need to subtract from 1.

1-.7157=.2843

Thus the probability is **.2843**.

b) Twenty Cobalts are randomly selected and the miles per gallon is recorded. What is the probability that the mean miles exceeds 34 miles per hour? Would this result be unusual?

Find the z-score

$$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma/\sqrt{n}} = \frac{34-32}{3.5/\sqrt{20}} = 2.56$$

Find the probability associated with a z-value of 2.56. The probability is .9949. We want the probability it exceeds 34, we need to subtract from 1. 1-.9949=.0051.

The probability is .0051.

Since the probability is less than 5%, the result would be unusual.

Conditions

Under what conditions is the sample distribution of $\bar{x}$ normal?

If the population is not normal with mean μ and standard deviation σ, what happens as the sample size increases?

Under what conditions is the sample distribution of $\hat{p}$ normal?

Conditions

Under what conditions is the sample distribution of $\bar{x}$ normal?

Population needs to be normal

Large sample size (at least 30)

If the population is not normal with mean μ and standard deviation σ, what happens as the sample size increases?

The distribution of the sample mean becomes approximately normal

Under what conditions is the sample distribution of $\hat{p}$ normal?

$n \leq .05N$ (sample size is less than 5% of the population)

$np(1-p) \geq 10$

Distribution of Sample Mean: Nonnormal population

You have 5 coins that are aged 2,6, 11, 18, and 30 years old. If you select 3 coins at a time, what is the probability that the population mean falls between 12 and 17 years old.

Distribution of Sample Mean: Nonnormal population

You have 5 coins that are aged 2,6, 11, 18, and 30 years old. If you select 3 coins at a time, what is the probability that the population mean falls between 12 and 17 years old.

1) Find the number of groups of three that can be formed: ${}_5C_3$=10 groups (see ch. 5).
2) Find each group and their sample mean

Group	*Sample Mean*	*Group*	*Sample Mean*
2,6,11	$\frac{2+11+6}{3}$ ≈6.333	2,18,30	16.667
2,6,18	8.667	6,11,18	11.667
2,6,30	12.667	6,11,30	15.667
2,11,18	10.333	6,18,30	18.000
2,11,30	14.333	11,18,30	19.667

3) Find how many are between 12 and 17. There are 4 (12.667,14.333,16.667, and 15.667)

4) Use $\frac{number\ of\ ways\ event\ can\ occur}{number\ of\ possible\ outcomes}$ to find the probability.

Probability that the population mean falling between 12 and 17 years old is $\frac{4}{10} = .4$

Describe a Sample Distribution

At a college, the average number of credits is 14 with a standard deviation of 3. Suppose a random sample of size 36 students was conducted to determine the number of credits taken in a semester. What is the sampling distribution of $\bar{x}$?

Based on a study, 59% said of Americans said they liked ice cream. Suppose a simple random sample of 100 people were asked if they liked ice cream. What is the sample distribution of $\hat{p}$?

Describe a Sample Distribution

At a college, the average number of credits is 14 with a standard deviation of 3. Suppose a random sample of size 36 students was conducted to determine the number of credits taken in a semester. What is the sampling distribution of $\bar{x}$?

Sample size ≥30, so normal distribution

1. $\mu_{\bar{x}} = \mu = 14$

2. $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{3}{\sqrt{36}} = .5$

The sampling distribution of $\bar{x}$ is normal with $\mu_{\bar{x}} = 14$ and $\sigma_{\bar{x}} = .5$.

Based on a study, 59% said of Americans said they liked ice cream. Suppose a simple random sample of 100 people were asked if they liked ice cream. What is the sample distribution of $\hat{p}$?

100 people is less than 5% of the population of the US, so normal distribution

1. $\mu_{\hat{p}} = p = .59$

2. $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{.59(1-.59)}{100}} = .049$

The sample distribution of $\hat{p}$ is normal with $\mu_{\hat{p}} = .59$ and $\sigma_{\hat{p}} = .049$.

Describe a Sample Distribution

The National Association of Retailers estimates that 23% of all homes purchased were investment properties. If a sample of 800 homes sold was obtained:

a) what is the probability that at most 200 homes are going to be used as an investment property.

b) What is the probability that at is between 150 and 199 homes are going to be used as an investment property.

Distribution of Sample Proportion

The National Association of Retailers estimates that 23% of all homes purchased were investment properties. If a sample of 800 homes sold was obtained:

a) what is the probability that at most 200 homes are going to be used as an investment property.

1) $\hat{p} = \frac{x}{n} = \frac{200}{800} = .25$

2) Identify $\mu_{\hat{p}} = p.\ \ p = .23$

3) Find the z-value.

$$z = \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{.25-.23}{\sqrt{\frac{.23(1-.23)}{800}}} = 1.34$$

4) Find the probability. **The probability is 0.9099**.

b) What is the probability that at is between 150 and 199 homes are going to be used as an investment property.

Steps	150	199
1. $\hat{p}$	$\hat{p} = \frac{x}{n} = \frac{150}{800} = .1875$	$\hat{p} = \frac{x}{n} = \frac{199}{800} = .24875$
2. p	$p = .23$	$p = .23$
3. Z	$z = \frac{.1875-.23}{\sqrt{\frac{.23(1-.23)}{800}}} = -2.86$	$z = \frac{.24875-.23}{\sqrt{\frac{.23(1-.23)}{800}}} = 1.26$
4. Probability	.0021	.8962

5. Subtract: .8962-.0021=.8941. **The probability is 0.8941**.