6 A *1. Standard Error for the Mean

Formula 6.1
$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

The unbiased **variance** (s^2) **200** participants is **55**.

a) What is the value of the estimated **standard error of the mean** ($s_{\bar{X}}$)?

$s_{\bar{X}}$ = __________

b) If the variance were the same but the sample were increased to **1800 participants**, what would be the new value of $s_{\bar{X}}$?

$s_{\bar{X}}$ = __________

6 A 2. Sample Mean: z-score and p-value

A survey of **144 college students** reveals a mean beer consumption **rate of 8.4** beers per week, with a **standard deviation of 5.6**.

a) If the **national average is seven** beers per week, what is **the z score** for the college students? What **p value** does this correspond to?

POPULATION PARAMETERS

H_0: μ = ______

n = ______

SAMPLE STATISTICS

$\bar{X}$ = ______

SD: s_X = _____ → SE: $s_{\bar{X}}$ = ______

Formula 6.1
$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

Formula 6.2A
$$z = \frac{\bar{X} - \mu}{s_{\bar{X}}}$$

z = __________ **2-tail: p =** __________

b) If the **national average were four** beers per week, what would the **z score** be? What can you say about the **p value** in this case?

z = __________ **2-tail: p =** __________

6 A 4. One Sample Mean: df and Critical Values of t

a.) In a one-group t test based on a sample of **20 participants**, what is the value for df?

df = __________

b.) What are the **two-tailed critical t** values for alpha = .05? For alpha = .01?

α =.05: t_{cv} = ________ **α =.01: t_{cv} =** ________

c.) What is the **one-tailed critical t** for alpha = .05? For alpha = .01?

α =.05: t_{cv} = ________ **α =.01: t_{cv} =** ________

6	A	*5. One Sample Mean: t-score and Critical Values of t (change n)

Twenty-two stroke patients performed a maze task. The **mean** number of trials ($\bar{X}$) for success was **14.7** with **s = 6.2**. If the **population mean** (μ) for this task is **6.5…**

a.) What is the calculated value for t ? What is the critical t for a **.05**, **two-tailed** test?

POPULATION PARAMETERS

H_0: μ = ______

n = ______

SAMPLE STATISTICS

$\bar{X}$ = ______

SD: s_X = ______ → SE: $s_{\bar{X}}$ = ______

Formula 6.1

$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

Formula 6.3

$$t = \frac{\bar{X} - \mu}{s_{\bar{X}}}$$

$$df = n - 1$$

t(___) = ________

tCV = ________

b.) If only **11 patients** had been run but the data were the same as in part a, what would be the calculated value for t ?

t(___) = ________

tCV = ________

How does this value compare with the t value calculated in part a?

6	A	6. One Sample Mean: t-score and Critical Values of t (change n)

a.) Referring to **part a** of Exercise 5, what would the **calculated t value** be if **s = 3.1** (all else remaining the same)?

t(___) = ________

b.) Comparing the t values you calculated for Exercises 5a and 6a, what can you say about the relation between t and the sample standard deviation?

6	B	*1. One Sample Mean: t-test

A high school is proud of its advanced chemistry class, in which its **16 students** scored an **average of 89.3** on the statewide exam, with **s = 9**.

a.) Test the null hypothesis that the advanced class is just a random selection from the state population **(μ = 84.7),** using alpha = **.05 (two**-tailed).

POPULATION PARAMETERS

H_0: μ = ______

n = ______

SAMPLE STATISTICS

$\bar{X}$ = ______

SD: s_X = _____ → SE: $s_{\bar{X}}$ = ______

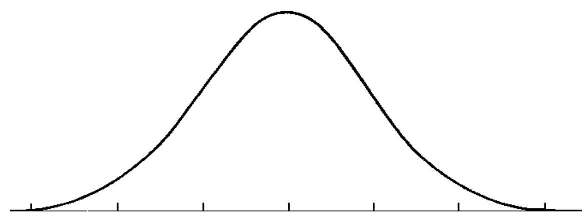
Formula 6.1

$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

Formula 6.3

$$t = \frac{\bar{X} - \mu}{s_{\bar{X}}}$$

$$df = n - 1$$



t(___) = _________ | t_{CV} = _________ | **2-tail: p = ______________**

☐ ***Provides evidence*** *the advanced chemistry class at this school is not a random selection from the state.*

☐ ***No evidence*** *that the advanced chemistry class at this school is not a random selection from the state.*

b.) Test the same hypothesis at the **.01 level (two**-tailed).

☐ ***Provides evidence*** *the advanced chemistry class at this school is not a random selection from the state.*

☐ ***No evidence*** *that the advanced chemistry class at this school is not a random selection from the state*

Considering your decision with respect to the null hypothesis, what type of error (Type I or Type II) **could you be making**?

☐ Type I
☐ Type II

6	B	2. One Sample: t-test for Mean

Are serial killers more introverted than the general population?

A sample of **14 serial killers** serving life sentences was tested and found to have a **mean** introversion score ($\bar{X}$) of **42** with **s = 6.8**. If the **population mean (μ) is 36**, are the serial killers significantly more introverted at the .05 level? (Perform the appropriate **one-tailed test**, *although normally it would not be justified*.)

POPULATION PARAMETERS

H_0: μ = ______

n = ______

SAMPLE STATISTICS

$\bar{X}$ = ______

SD: s_X = ______ → SE: $s_{\bar{X}}$ = ______

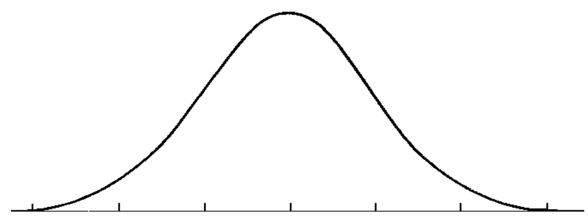
Formula 6.1

$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

Formula 6.3

$$t = \frac{\bar{X} - \mu}{s_{\bar{X}}}$$

$$df = n - 1$$



t(___) = __________

t_{CV} = __________

1-tail: p = _______________

EXPLAIN CONCLUSION: Are serial killers more introverted than the general population?

- ☐ Yes
- ☐ NO

6	B	*4. One Sample: Confidence Interval for the Mean

A psychologist studying the dynamics of marriage wanted to know how many hours per week the average American couple spends discussing marital problems. The sample **mean** ($\bar{X}$) of **155 randomly selected** couples turned out to be **2.6 hours**, with **s = 1.8.**

a.) Find the **95% confidence interval for the mean** (μ) of the population.

POPULATION PARAMETERS

μ ← 95% CI for

n = ______

SAMPLE STATISTICS

$\bar{X}$ = ______

SD: s_X = ______ → SE: $s_{\bar{X}}$ = ______

Formula 6.1
$s_{\bar{X}} = \frac{s}{\sqrt{n}}$

Formula 6.3
$df = n - 1$

Formula 6.6
$\bar{X} \pm t_{CV} \cdot s_{\bar{X}}$

t_{CV} = __________

95% CI: (______________ , ______________)

b.) A European study had already estimated the population mean to be **3 hours per week** for European couples. Are the American couples **significantly different** from the European couples at the **.05 level?**

☐ Yes
☐ NO

Show how your answer to part a makes it easy to answer part b.

6	B	5. Sample Size ← width of CI

If the psychologist in exercise 4 wanted the **width of the confidence interval to be only half an hour**, how many couples would have to be sampled?

Formula 6.5
$n = \left(\frac{4s}{W}\right)^2$

n = __________

6	B	8. One Sample: Confidence Interval for the Mean

A psychologist would like to know how many casual friends are in the average person's social network. She interviews a random sample of people and determines for each the **number of friends** or social acquaintances they see or talk to at least once a year. The data are as follows:

5, 11, 15, 9, 7, 13, 23, 8, 12, 7, 10, 11, 21, 20, 13

a.) Find the **90% confidence interval for the mean** number of friends for the entire population.

POPULATION PARAMETERS

μ ← CI for

n = ______

SAMPLE STATISTICS

$\bar{X}$ = ______

SD: s_X = ______ → SE: $s_{\bar{X}}$ = ______

Formula 6.1
$s_{\bar{X}} = \frac{s}{\sqrt{n}}$

Formula 6.3
$df = n - 1$

Formula 6.6
$\bar{X} \pm t_{CV} \cdot s_{\bar{X}}$

t_{CV} = __________

90% CI: (______________ , ______________)

b.) Find the **95%** CI.

t_{CV} = __________

95% CI: (______________ , ______________)

c.) If a previous researcher had predicted a **population mean of 10** casual friends per person, could that prediction be **rejected as an hypothesis at the .05 level, twotailed**?

☐ Yes
☐ NO

EXPLAIN.

6	C	1. One Sample: Confidence Interval for the Mean

Perform **one-sample t tests** to determine whether the baseline, pre-, or postquiz **anxiety scores** of Ihno's students differ significantly (α = **.05, two**-tailed) from the mean **(μ = 18)** found by a very large study of college students across the country. Find the **95% CI for the population mean** for each of the three anxiety measures.

Type **R code** into Skeleton and Knit to get **pdf** including output

	Sample Mean	**95% CI** (71.63, 72.91)	**Test value = 18** t(99) = 24.744, p=.013	**Ihno's different?**
Baseline				☐ Different ☐ Same
Pre-quiz				☐ Different ☐ Same
Post-Quiz				☐ Different ☐ Same

6	C	2. One Sample: Confidence Interval for the Mean

Perform a one-sample t test to determine whether the average **baseline heart rate** of Ihno's **male** students differs significantly from the mean HR **(μ = 70)** for college-aged men at the **.01 level, two**-tailed. Find the **99% CI** for the population mean represented by Ihno's male students.

	Sample Mean	**99% CI** (71.63, 72.91)	**Test value = 70** t(99) = 24.744, p=.013	**Ihno's different?**
MALE Baseline				☐ Different ☐ Same

6	C	3. One Sample: Confidence Interval for the Mean

Perform a one-sample t test to determine whether the average **postquiz heart rate** of Ihno's **female** students differs significantly (α = .**05, two**-tailed) from the mean resting HR **(μ = 72)** for college-aged women. Find the **95% CI** for the population mean represented by Ihno's female students.

	Sample Mean	**95% CI** (71.63, 72.91)	**Test value = 72** t(99) = 24.744, p=.013	**Ihno's different?**
FEMALE Post-Quiz				☐ Different ☐ Same