

Name: _____

1. A sports writer wished to see if a football filled with helium travels farther, on average, than a football filled with air. To test this, the writer used 20 adult male volunteers. These volunteers were randomly divided into two groups of 10 subjects each. Group 1 kicked a football filled with helium to the recommended pressure. Group 2 kicked a football filled with air to the recommended pressure. The mean yardage for group 1 was $\bar{x}_1=32$ yards, with a standard deviation $s_1 = 9$ yards. The mean yardage for group 2 was $\bar{x}_2=27$ yards, with a standard deviation $s_2 = 6$ yards. Assume the two groups of kicks are independent. Let μ_1 and μ_2 represent the mean yardage we would observe for the entire population represented by the volunteers if all members of this population kicked, respectively, a helium-filled and an air-filled football. Assume that two-sample t procedures are safe to use.
 - a. What is the 99% confidence interval for $\mu_1 - \mu_2$?
 - b. Suppose the researcher had wished to test the hypotheses $H_0: \mu_1 = \mu_2$. $H_a: \mu_1 > \mu_2$ The P-value is

2. About 90% of young adult Internet users (aged 18 to 29) use social network sites. Suppose that a sample survey contacts an SRS of 1500 young adult Internet users and calculates the proportion \hat{p} in this sample who use social network sites.
 - a. What is the approximate distribution of \hat{p} ?
 - b. If the sample size were 6000 rather than 1500, what would be the approximate distribution of \hat{p} ?

Use the following to answer Questions 3–6.

Each person in a random sample of 2000 “likely voters” (as defined by a professional polling organization) was questioned about his or her political views. Of those surveyed, 1308 felt that “the economy’s state” was the most urgent national concern.

3. Using ~~the point~~ ^{the} ~~sample~~ ^{point} estimate, \hat{p} , we estimate the proportion of likely voters that felt the economy’s state was the most urgent national concern to be
 - a. 0.357.
 - b. 0.500.
 - c. 0.654.
 - d. 0.732.

4. The standard error SE of \hat{p} , the estimated proportion viewing the economy’s state as most urgent, is
 - a. 0.0001.
 - b. 0.0106.
 - c. 0.0312.
 - d. 0.4926.

5. A 99% confidence interval for the proportion p of all likely voters that feel the economy's state is the most urgent national concern is given by ~~(use the plus four confidence interval procedure)~~
- 0.624 to 0.663.
 - 0.627 to 0.681.
 - 0.615 to 0.672.
 - 0.606 to 0.680.
6. If we want to estimate p , the population proportion of likely voters that believe the economy's state is the most urgent national concern with 99% confidence and a margin of error no greater than 3%, how many likely voters need to be surveyed? Assume that you have no idea of the value of p .
- 22
 - 56
 - 716
 - 1844

Use the following to answer Questions 7 and 8.

A local board of education conducted a survey of residents in the community concerning a property tax levy on the coming local ballot. They randomly selected 850 residents in the community and contacted them by telephone. Of the 850 residents surveyed, 410 supported the property tax levy. Let p represent the proportion of residents in the community that support the property tax levy.

7. A 90% confidence interval for p is
- 0.4489 to 0.5159.
 - 0.4543 to 0.5105.
 - 0.4487 to 0.5161.
 - 0.4463 to 0.5185.
8. How large a sample n would you need to estimate p with margin of error 0.04 with 95% confidence? Assume that you don't know anything about the value of p .
- $n = 256$
 - $n = 423$
 - $n = 601$
 - $n = 1037$

Use the following to answer Questions 9–11.

According to the National Institute on Alcohol Abuse and Alcoholism (NIAAA), and the National Institutes of Health (NIH), 41% of college students nationwide engage in "binge drinking" behavior, having 5 or more drinks in one occasion during the past two weeks. A college president wonders if the proportion of students enrolled at her college that binge drink is lower than the national proportion. In a commissioned study, 462 students are selected randomly from a list of all students enrolled at the college. Of these, 162 admitted to having engaged in binge drinking.

9. Based on the results of the test, a 95% confidence interval (using the plus four method) for the proportion of all students at this college that engage in binge drinking is
- 0.308 to 0.394.
 - 0.318 to 0.384.
 - 0.321 to 0.381.
 - 0.325 to 0.377.

10. The college president is more interested in testing her suspicion that the proportion of students at her college that binge drink is lower than the national proportion of 0.41. Her staff tests the hypotheses $H_0: p = 0.41$, $H_a: p < 0.41$. The P -value is
- Between 0.05 and 0.10.
 - Between 0.025 and 0.05.
 - Between 0.01 and 0.025.
 - Below 0.01.
11. Which of the following conclusions is reasonable, based on the P -value computed in Question 10?
- There is little evidence to support a conclusion that the proportion of students at this particular college that binge drink is lower than the national proportion of 0.41.
 - There is moderate but not strong evidence that the proportion of binge drinking students at this college is lower than the national proportion of 0.41.
 - There is strong evidence that the proportion of students at this college that binge drink is lower than the national proportion of 0.41.
 - We can't reach any reasonable conclusion because the assumptions necessary for a significance test for a proportion are not met in this case.

Use the following to answer Questions 12–18.

In the United States, there is a strong relationship between smoking and education, with well-educated people less likely to smoke. A study in France included a sample of 459 men who were selected at random from men who had visited a health center for a routine checkup. Education is classified into three categories corresponding to the highest level of education and smoking status is classified into four categories.

Smoking Status

Education	Nonsmoker	Former	Moderate	Heavy	Total
Primary school	56	54	41	36	187
Secondary school	37	43	27	32	139
University	53	28	36	16	133
Total	146	125	104	84	459

12. The proportion of men with a primary school education that are nonsmokers is
- 0.12.
 - 0.30.
 - 0.38.
 - 0.58.
13. The proportion of former smokers with an university education is
- 0.22.
 - 0.17.
 - 0.12.
 - 0.06.

14. This is an $r \times c$ table. The number c has value

- a. 2.
- b. 3.
- c. 4.
- d. 6.

15. Suppose we wish to test the null hypothesis that there is no association between education level and smoking status. Under the null hypothesis, the expected number of nonsmokers with a primary school education is

- a. 42.37.
- b. 50.93.
- c. 59.48.
- d. 62.34.

16. The degrees of freedom for the chi-square test for this two-way table are

- a. 2.
- b. 6.
- c. 7.
- d. 12.

17. The chi-square value (critical value) is _____.

18. If $\alpha = 0.05$, will you reject H_0 ? What if $\alpha = 0.025$?

Key

1a) -6.1-16.1 yards, 1b) between 0.05 and 0.10

2a) Normal(0.90, 0.0077) 2b) Normal (0.90, 0.0039)

3c 4b 5b 6d 7b 8c 9a 10d 11c 12b 13a 14c 15c 16b 17
(13.30) 18 Reject H_0 at 5% level; not reject H_0 at 2.5% level

Name: Key

* 1. A sports writer wished to see if a football filled with helium travels farther, on average, than a football filled with air. To test this, the writer used 20 adult male volunteers. These volunteers were randomly divided into two groups of 10 subjects each. Group 1 kicked a football filled with helium to the recommended pressure. Group 2 kicked a football filled with air to the recommended pressure. The mean yardage for group 1 was $\bar{x}_1=32$ yards, with a standard deviation $s_1 = 9$ yards. The mean yardage for group 2 was $\bar{x}_2=27$ yards, with a standard deviation $s_2 = 6$ yards. Assume the two groups of kicks are independent. Let μ_1 and μ_2 represent the mean yardage we would observe for the entire population represented by the volunteers if all members of this population kicked, respectively, a helium-filled and an air-filled football. Assume that two-sample t procedures are safe to use.

a. What is the 99% confidence interval for $\mu_1 - \mu_2$?

$(-6.1, 16.1)$

H
 $n=10$
 $\bar{x}=32$
 $s_x=9$

A
 $n=10$
 $\bar{x}=27$
 $s_x=6$

$\bar{x}_1 - \bar{x}_2 = 5$
 $\sigma_{\bar{x}_1 - \bar{x}_2} = 3.4$
 $T = 3.25$

b. Suppose the researcher had wished to test the hypotheses $H_0: \mu_1 = \mu_2$, $H_a: \mu_1 > \mu_2$. The P-value is

$T = 1.46$ $DF = 9$ $p\text{-value} = .09$

2. About 90% of young adult Internet users (aged 18 to 29) use social network sites. Suppose that a sample survey contacts an SRS of 1500 young adult Internet users and calculates the proportion \hat{p} in this sample who use social network sites.

a. What is the approximate distribution of \hat{p} ?

Normal $\mu_{\hat{p}} = .9$ $\sigma_{\hat{p}} = \sqrt{\frac{.9(.1)}{1500}} = .0077$

b. If the sample size were 6000 rather than 1500, what would be the approximate distribution of \hat{p} ?

Normal $\mu_{\hat{p}} = .9$ $\sigma_{\hat{p}} = .0039$

Use the following to answer Questions 3-6.

Each person in a random sample of 2000 "likely voters" (as defined by a professional polling organization) was questioned about his or her political views. Of those surveyed, 1308 felt that "the economy's state" was the most urgent national concern.

* 3. Using the plus four estimate, \hat{p} , we estimate the proportion of likely voters that felt the economy's state was the most urgent national concern to be

- a. 0.357.
- b. 0.500.
- c. 0.654.
- d. 0.732.

$\hat{p} = \frac{1308}{2000} = .654$

4. The standard error SE of \hat{p} , the estimated proportion viewing the economy's state as most urgent, is

- a. 0.0001.
- b. 0.0106.
- c. 0.0312.
- d. 0.4926.

$\sigma_{\hat{p}} = \sqrt{\frac{.654 \cdot .346}{2000}} = .0106$

5. A 99% confidence interval for the proportion p of all likely voters that feel the economy's state is the most urgent national concern is given by (use the plus four confidence interval procedure)
- 0.624 to 0.663.
 - 0.627 to 0.681.
 - 0.615 to 0.672.
 - 0.606 to 0.680.
6. If we want to estimate p , the population proportion of likely voters that believe the economy's state is the most urgent national concern with 99% confidence and a margin of error no greater than 3%, how many likely voters need to be surveyed? Assume that you have no idea of the value of p .

- 22
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$$\text{Stat } \pm z \cdot \sigma_{\text{stat}}$$

$$2.58 \sqrt{\frac{pq}{n}} = .03$$

$$2.58 \sqrt{\frac{.5 \cdot .5}{n}} = .03$$

$$.0116 = \sqrt{\frac{.25}{n}}$$

$$\frac{.000135}{1} = \frac{.25}{n}$$

$$1844$$

Use the following to answer Questions 7 and 8.

A local board of education conducted a survey of residents in the community concerning a property tax levy on the coming local ballot. They randomly selected 850 residents in the community and contacted them by telephone. Of the 850 residents surveyed, 410 supported the property tax levy. Let p represent the proportion of residents in the community that support the property tax levy.

7. A 90% confidence interval for p is

- 0.4489 to 0.5159.
- 0.4543 to 0.5105.
- 0.4487 to 0.5161.
- 0.4463 to 0.5185.

$$\hat{p} = \frac{410}{850}$$

8. How large a sample n would you need to estimate p with margin of error 0.04 with 95% confidence? Assume that you don't know anything about the value of p .

- $n = 256$
- $n = 423$
- $n = 601$
- $n = 1037$

$$.04 = 1.96 \sqrt{\frac{.25}{n}}$$

$$.02 = \sqrt{\frac{.25}{n}}$$

$$\frac{.000416}{1} = \frac{.25}{n}$$

$$600.25$$

Use the following to answer Questions 9–11.

According to the National Institute on Alcohol Abuse and Alcoholism (NIAAA), and the National Institutes of Health (NIH), 41% of college students nationwide engage in "binge drinking" behavior, having 5 or more drinks in one occasion during the past two weeks. A college president wonders if the proportion of students enrolled at her college that binge drink is lower than the national proportion. In a commissioned study, 462 students are selected randomly from a list of all students enrolled at the college. Of these, 162 admitted to having engaged in binge drinking.

9. Based on the results of the test, a 95% confidence interval (using the plus four method) for the proportion of all students at this college that engage in binge drinking is

- 0.308 to 0.394.
- 0.318 to 0.384.
- 0.321 to 0.381.
- 0.325 to 0.377.

$$\hat{p} = \frac{162}{462}$$

10. The college president is more interested in testing her suspicion that the proportion of students at her college that binge drink is lower than the national proportion of 0.41. Her staff tests the hypotheses $H_0: p = 0.41$, $H_a: p < 0.41$. The P -value is
- Between 0.05 and 0.10.
 - Between 0.025 and 0.05.
 - Between 0.01 and 0.025.
 - Below 0.01.
11. Which of the following conclusions is reasonable, based on the P -value computed in Question 10?
- There is little evidence to support a conclusion that the proportion of students at this particular college that binge drink is lower than the national proportion of 0.41.
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Use the following to answer Questions 12–18.

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Education	Smoking Status				Total
	Nonsmoker	Former	Moderate	Heavy	
Primary school	56	54	41	36	187
Secondary school	37	43	27	32	139
University	53	28	36	16	133
Total	146	125	104	84	459

12. The proportion of men with a primary school education that are nonsmokers is
- 0.12.
 - 0.30.
 - 0.38.
 - 0.58.
- $\frac{56}{187} = .3$
13. The proportion of former smokers with an university education is
- 0.22.
 - 0.17.
 - 0.12.
 - 0.06.
- $\frac{28}{125} = .224$

14. This is an $r \times c$ table. The number c has value

- a. 2.
- b. 3.
- c. 4.
- d. 6.

15. Suppose we wish to test the null hypothesis that there is no association between education level and smoking status. Under the null hypothesis, the expected number of nonsmokers with a primary school education is

- a. 42.37.
- b. 50.93.
- c. 59.48.
- d. 62.34.

$$\frac{187.146}{459}$$

16. The degrees of freedom for the chi-square test for this two-way table are

- a. 2.
- b. 6.
- c. 7.
- d. 12.

$$\begin{aligned} &(R-1)(C-1) \\ &(3-1)(4-1) \\ &2 \cdot 3 = 6 \end{aligned}$$

17. The chi-square value (critical value) is 13.3.

18. If $\alpha = 0.05$, will you reject H_0 ? What if $\alpha = 0.025$?

$$p\text{-value} = .038$$

Yes, reject at $\alpha = .05$
 NO, Fail to reject at $\alpha = .025$

Key

1a) -6.1-16.1 yards, 1b) between 0.05 and 0.10

2a) Normal(0.90, 0.0077) 2b) Normal(0.90, 0.0039)

3c 4b 5b 6d 7b 8c 9a 10d 11c 12b 13a 14c 15c 16b 17

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