Practice Final Exam 2

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion p.

1) When 328 college students are randomly selected and surveyed, it is found that 122 own a car. Find a 99% confidence interval for the true proportion of all college students who own a car. 1) (0.301, 0.439)

$n = 328 \quad \hat{p} = \frac{122}{328} = 0.37 \quad \hat{q} = 0.63 \quad 99\% \rightarrow z_{0.99} = 2.58$

$E = z_c \sqrt{\frac{pq}{n}}$

$= (2.58)\sqrt{\frac{0.37 \times 0.63}{328}} = 0.069$

$\hat{p} \pm E = 0.37 \pm 0.069 = (0.301, 0.439)$

2) Of 380 randomly selected medical students, 21 said that they planned to work in a rural community. Find a 95% confidence interval for the true proportion of all medical students who plan to work in a rural community. 2) (0.036, 0.084)

$n = 380 \quad \hat{p} = \frac{21}{380} = 0.06 \quad \hat{q} = 0.94 \quad 95\% \rightarrow z_{0.95} = 1.96$

$E = 1.96\sqrt{\frac{0.06 \times 0.94}{380}} = 0.024$

$0.06 \pm 0.024 = (0.036, 0.084)$

Use the confidence level and sample data to find a confidence interval for estimating the population μ. Round your answer to the same number of decimal places as the sample mean.

3) A laboratory tested 82 chicken eggs and found that the mean amount of cholesterol was 228 milligrams with $\sigma = 19.0$ milligrams. Construct a 95% confidence interval for the true mean cholesterol content, μ, of all such eggs. 3) (223.89, 232.11)

$n = 82 \quad \bar{x} = 228 \quad \sigma = 19 \quad 95\% \rightarrow z_{0.95} = 1.96$

$E = z_c \frac{\sigma}{\sqrt{n}} = (1.96)\frac{19}{\sqrt{82}} = 4.11$

$\bar{x} \pm E = 228 \pm 4.11$

4) A random sample of 104 light bulbs had a mean life of $\bar{x} = 543$ hours with a standard deviation of $\sigma = 26$ hours. Construct a 90% confidence interval for the mean life, μ, of all light bulbs of this type. 4) (538.806, 547.194)

$n = 104$ $\quad \bar{x} = 543 \quad \sigma = 26 \quad 90\% \rightarrow z_{0.9} = 1.645$

$$E = (1.645)\frac{26}{\sqrt{104}} = 4.194$$

$$543 \pm 4.194$$

For problems #5–9, find:

1. Null, Alternate Hypothesis, type of test & level of significance

2. Check the conditions.

3. Compute the sample test statistic, draw a picture and find the P-value.

4. State the conclusion about the Null Hypothesis.

5. Interpret the conclusion.

5) In a clinical study of an allergy drug, 108 of the 202 subjects reported experiencing significant relief from their symptoms. At the 0.01 significance level, test the claim that more than half of all those using the drug experience relief. 5) _____

$n = 202 \quad \hat{p} = \frac{108}{202} = 0.53$

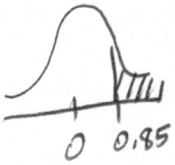
$\hat{q} = 0.47$

① $H_0: p = 0.5$ $\quad \alpha = 0.01$

$H_a: p > 0.5$ (right)

② $np = (202)(0.5) \geq 10$ ✓ $\quad nq = (202)(0.5) \geq 10$ ✓

③ $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.53 - 0.5}{\sqrt{\frac{0.5 \times 0.5}{202}}} = 0.85$



pvalue $= 1 - 0.8023$
$= 0.1977 > 0.01$

④ Since pvalue $> \alpha$, then we fail to reject H_0.

⑤ At a 1% level of significance, there is not enough evidence to say that more than half of all who used the drug experienced relief.

6) In a sample of 167 children selected randomly from one town, it is found that 37 of them suffer from asthma. At the 0.05 significance level, test the claim that the proportion of all children in the town who suffer from asthma is 11%. 6) _____

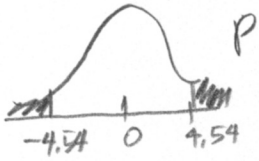
$n = 167 \quad \hat{p} = \frac{37}{167} = 0.22$

$\hat{q} = 0.78$

① $H_0: p = 0.11$
$H_a: p \neq 0.11$ (2 tailed test) $\quad \alpha = 0.05$

② $np = (167)(0.11) = 18.37 \geq 10$ ✓ $\quad nq = (167)(0.89) \geq 10$ ✓

③ $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.22 - 0.11}{\sqrt{\frac{0.11 \times 0.89}{167}}} = 4.54$



pvalue $= 2(0)$
$= 0 < 0.05$

④ since pvalue $< \alpha$, reject H_0.

⑤ At a 5% level of significance, there is enough evidence to say that the proportion of children in this town who suffer from asthma is different from 11%.

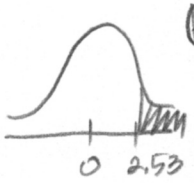
7) Last year, the mean running time for a certain type of flashlight battery was 8.5 hours. This year, the manufacturer has introduced a change in the production method which he hopes will increase the mean running time. A random sample of 40 of the new light bulbs was obtained and the mean running time was found to be 8.7 hours. Do the data provide sufficient evidence to conclude that the mean running time, μ, of the new light bulbs is larger than last year's mean of 8.5 hours? Perform the appropriate hypothesis test using a significance level of 5%. Assume that σ = 0.5 hours. 7) _____

$n = 40 \quad \bar{x} = 8.7 \quad \sigma = 0.5$

① $H_0: \mu = 8.5$
$H_a: \mu > 8.5$ (right tailed) $\quad \alpha = 0.05$

② $n \geq 30$ ✓

③ $z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{8.7 - 8.5}{0.5/\sqrt{40}} = 2.53$



pvalue $= 1 - 0.9943$
$= 0.0057 < 0.05$

④ since pvalue $< \alpha$, reject H_0.

⑤ At a 5% level of significance there is enough evidence to conclude that the mean running time of the new light bulbs is larger than 8.5 hrs.

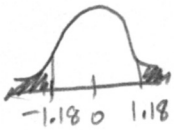
8) In 2000, the average duration of long-distance telephone calls originating in one town was 9.4 minutes. A long-distance telephone company wants to perform a hypothesis test to determine whether the average duration of long-distance phone calls has changed from the 2000 mean of 9.4 minutes. They randomly sampled 50 calls originating in the town and found that the mean duration of these 50 calls was 8.6 minutes. Do the data provide sufficient evidence to conclude that the mean call duration, μ, has changed from the 2000 mean of 9.4 minutes? Perform the appropriate hypothesis test using a significance level of 1%. Assume that $\sigma = 4.8$ minutes. 8) _____

$n = 50 \quad \bar{x} = 8.6 \quad \sigma = 4.8$

① $H_0: \mu = 9.4$
$H_a: \mu \neq 9.4$ (2 tailed) $\quad \alpha = 0.01$

② $n \geq 30$ ✓

③ $z = \dfrac{8.6 - 9.4}{4.8/\sqrt{50}} = -1.18$



pvalue $= 2(0.119)$
$= 0.238 > 0.01$

④ since pvalue $> \alpha$, fail to reject H_0.

⑤ At a 1% level of significance there is not enough evidence to conclude that the mean call duration is different from 9.4 min.

9) A local group claims that the police issue at least 56 parking tickets a day in their area. To prove their point, they randomly select two weeks. Their research yields the number of tickets issued for each day. The data are listed below. At $\alpha = 0.01$, test the group's claim. Round the test statistic to the nearest thousandth. 9) _____

70 48 41 68 69 55 70 57 60 83
32 60 72 58

$n = 14 \quad \bar{x} = 60.21$
$s = 13.43$

① $H_0: \mu = 56$
$H_a: \mu > 56$ (right tailed) $\quad \alpha = 0.01$

② Normal distribution / σ unknown → t table

③ $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{60.21 - 56}{13.43/\sqrt{14}} = 1.173 \qquad d.f. = n - 1 = 13$

$1.173 < 1.35$
pvalue $> 0.10 \quad > 0.01$

④ since pvalue $> \alpha$, fail to reject H_0.

⑤ At a 1% level of significance there is not enough evidence to conclude that the police issue more than 56 tickets a day.

Use the given data to find the equation of the regression line. Round the final values to three significant digits, if necessary.

10) 10) _____

x	6	8	20	28	36
y	2	4	13	20	30

a) Use a calculator to find the following:

$\bar{x} = 19.6$ $\bar{y} = 13.8$

$s_x = 12.84$ $s_y = 11.58$ $r = 0.995$

b) Use these formulas to find the Regression Equation:

$b = r \cdot \frac{s_y}{s_x} = (0.995)\frac{11.58}{12.84} = 0.897$

$a = \bar{y} - b\bar{x} = 13.8 - (0.897)(19.6) = -3.781$

$\hat{y} = a + bx$ $\boxed{\hat{y} = -3.781 + 0.897x}$

Find the value of the linear correlation coefficient r.

11) A study was conducted to compare the average time spent in the lab each week versus course grade for computer programming students. The results are recorded in the table below. 11) _____

Number of hours spent in lab	Grade (percent)
10	96
11	51
16	62
9	58
7	89
15	81
16	46
10	51

a) Use a calculator to find the following:

$\bar{x} = 11.75$ $\bar{y} = 66.75$

$s_x = 3.45$ $s_y = 19.20$ $r = -0.335$

b) Use these formulas to find the Regression Equation:

$b = r \cdot \frac{s_y}{s_x} = (-0.335)\frac{19.2}{3.45} = -1.864$

$a = \bar{y} - b\bar{x} = 66.75 - (-1.864)(11.74) = 88.633$

$\hat{y} = a + bx$ $\boxed{\hat{y} = 88.633 - 1.864x}$

12) Two different tests are designed to measure employee productivity and dexterity. Several employees are randomly selected and tested with these results. 12) _____

Productivity	23	25	28	21	21	25	26	30	34	36
Dexterity	49	53	59	42	47	53	55	63	67	75

a) Use a calculator to find the following:

$\bar{x} = 26.9$ $\bar{y} = 56.3$

$s_x = 5.13$ $s_y = 9.91$ $r = 0.986$

b) Use these formulas to find the Regression Equation:

$b = r \cdot \frac{s_y}{s_x} = (0.986)\frac{9.91}{5.13} = 1.905$

$a = \bar{y} - b\bar{x} = 56.3 - (1.905)(26.9) = 5.0555$

$\hat{y} = a + bx$ $\boxed{\hat{y} = 5.0555 + 1.905x}$