

Statistical Methods Test 3 Practice

Chapters 13, 22 – 24. Round to three decimal places, unless otherwise noted.

- I. Determine whether the following describe a prospective observational study, retrospective observational study, or an experiment.**
1. Researchers identified 242 children in the Cleveland area who had been born prematurely (at about 29 weeks). They examined these children at age 8 and again at age 20, comparing them to another group of 233 children not born prematurely. According to their report, published in the *New England Journal of Medicine*, the “preemies” engaged in significantly less risky behavior than the others.
 2. Researchers investigating appetite control as a means of losing weight found that female rats ate less and lost weight after injections of the hormone leptin, while male rats responded better to insulin.
 3. Researchers at the Purina Pet Institute studied Labrador retrievers for evidence of a relationship between diet and longevity. At 8 weeks of age, two puppies of the same gender and weight were randomly assigned to one of two groups – a total of 48 dogs in all. One group was allowed to eat all they wanted, while the other group was fed a low-calorie diet (about 75% as much as the others). The median lifespan of dogs fed the restricted diet was 22 months longer than other dogs.
 4. Physically fit people are less likely to die of cancer. A report in the May 2002 issue of *Medicine and Science in Sports and Exercise* followed 25,892 men aged 30 to 87 for 10 years. The most physically fit men had a 55% lower risk of death from cancer than the least fit group.
- II. Answer the following questions.**
5. What is a double blind experiment?
 6. What is the difference between an observational study and an experiment?
- III. During the 2000-2001 NBA Season, San Antonio Spurs player Tim Duncan made 409 out of 662 free throws. During the 2001-2002 season he made 460 out of 568 free throws.**
7. Calculate the \hat{p} for the 2001-2002 season.
 8. Construct a 95% confidence interval for the increase in percent of foul shots he can make.
- IV. Do the rates of snoring change for those less than 30 years of age versus those over 30 years of age? A study found that 37% of 136 individuals under age 30 snored while 65% of 493 individuals over age 30 snored. Perform an hypothesis test of the claim, using alpha level of 0.01.**
9. State the H_0 and the H_A .
 10. Calculate the P-value.
 11. Make a decision about the hypothesis.
 12. State conclusion in context of claim.

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- V. **Do people lie about voting? In a survey of 1002 people, 701 people said that they voted in the recent presidential election (based on data from ICR Research Group). Voting records show that 71% of the 5000 eligible voters actually did vote. Using these survey results, find the following and round to four decimal places:**
13. Calculate the observed difference between the proportions that said they voted compared to the voting records data.
 14. Construct a 99% confidence interval for the difference between the proportions that said they voted compared to the voting records data.
- VI. **A manufacturer claims that a new design for a portable phone has increased the range to 150 feet, allowing customers to use the phone throughout their home and yards. An independent testing laboratory found that a random sample of 44 of these phones worked over an average distance of 142 feet, with a standard deviation of 12 feet. Is their evidence that the manufacturer's claim is false? Perform an hypothesis test of the claim, using alpha level of 0.05.**
15. State the H_0 and the H_A .
 16. Calculate the P-value.
 17. Make a decision about the hypothesis.
 18. State conclusion in context of claim.
- VII. **A man who moves to a new city sees that there are two routes he could take to work. A neighbor who has lived there a long time tells him Route A will save 5 minutes. The man decides to conduct an experiment to determine which is faster. Each day he flips a coin to determine which way to go, driving each route 20 days. He finds that Route A takes an average of 40 minutes with a standard deviation of 3 minutes. Route B takes an average of 43 minutes with a standard deviation of 2 minutes.**
19. Calculate the observed difference between the two routes.
 20. Construct a 98% confidence interval for the difference between the average commuting times for the two routes.
- VIII. **A city builds a new parking garage in the business district. The city plans to pay for the structure through parking fees. During 46 workdays they collected an average of \$126 with a standard deviation of \$15. Use the T-Table.**
21. Identify the critical value for a 90% confidence level.
 22. Calculate the Margin of Error.
 23. Construct the 90% confidence interval.
 24. Interpret the interval in context.
- IX. **A study of the new CPMP mathematics methodology tested students' abilities to solve word problems. This table shows how the CPMP and traditional groups performed. Using an alpha level of 0.05, does the CPMP produce higher scores?**

Math Program	n	mean	SD
CPMP	320	57.4	32.1
Traditional	273	53.9	28.5

25. State the H_0 and the H_A .

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26. Calculate the P-value.
27. Make a decision about the hypothesis.
28. State conclusion in context of claim.

Answers:

1. Prospective Observational study
2. Experiment
3. Experiment
4. Prospective Observational study
5. An experiment where both the individuals who conduct the experiment and the subjects are not aware of how things are allocated (meaning real treatment or placebo).
6. An observational study cannot control the subjects or force them to do something and in an experiment a random assignment can be made.
7. $\hat{p} = 0.810$
8. $(0.143, 0.241)$
9. $H_0: p_1 = p_2$
 $H_A: p_1 \neq p_2$
10. $P - value = 3.558 \times 10^{-9}$
11. *Reject H_0 because of low $P - value$.*
12. *There is a change in snoring rates.*
13. 0.0104
14. $(-0.0512, 0.0304)$
15. $H_0: \mu = 150$
 $H_A: \mu < 150$
16. $P - value = 3.272 \times 10^{-5}$
17. *Reject H_0 because of low $P - value$.*
18. *Manufacturer's claim is false, phone does not reach range of 150 feet*
19. *3 minutes*
20. $(1.029, 4.971)$
21. $t^* = 1.679$
22. $ME = 3.713$
23. $(122.287, 129.713)$
24. We can be 90% confident the actual mean of the daily parking fees collected is between \$122.29 and \$129.71
25. $H_0: \mu_1 = \mu_2$
 $H_A: \mu_1 > \mu_2$
26. $P - value = 0.080$
27. *Retain H_0 because $P - value$ greater than 0.05*
28. *Cannot conclude it significantly improves scores.*