Extra Practice L16 - L18

1. **Jellyfish**

   Just like people, jellyfish sleep for around eight hours a day, and take more naps after a bad night's sleep. A marine biologist claims that a certain species of jellyfish sleeps an average of 8 hours per day. A random sample of 100 jellyfish showed that they slept an average of 8.4 hours per day. Suppose that the population standard deviation is known to be 1.6 hours.

   (a) At the 0.05 level of significance, does the data indicate that the average amount of time this species of jellyfish sleeps is more than 8 hours per day? Compute a P-value and write a conclusion in the context of the problem.

   (b) Construct and interpret an appropriate confidence bound/interval to support the conclusion found in (a). Explain how this estimate could be used to corroborate the conclusion of the hypothesis test.

2. **Macho Man**

   In 1978, The Village People recruited new members through a newspaper ad that read "Macho Types Wanted: Must Dance and Have a Moustache." A study claims that professional disco dancers in New York City spent an average of 6 hours per week practising their dance routines. A random sample of 40 professional disco dancers showed that they spent an average of 6.3 hours per week practising. Suppose that the population standard deviation is known to be 1.5 hours.

   (a) At the 0.15 level of significance, does the data indicate that the average amount of time professional disco dancers spent practising their dance routines is different from 6 hours per week? Compute a P-value and write a conclusion in the context of the problem.

   (b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence bound/interval.

3. **Ambulance**

   Until the 1960s, the US had no properly organised nationwide ambulance services. In case of an at-home emergency, many people had to ask the police, fire department, or a local funeral home to drive them to the hospital. A study claims that, before organized ambulance services became widely available, the average response time for emergency transportation to the hospital was 28 minutes. A random sample of 64 emergency transportation cases showed an average response time of 26.5 minutes. Suppose that the population standard deviation is known to be 6 minutes.

   (a) At the 0.025 level of significance, does the data indicate that the average response time for emergency transportation to the hospital was less than 28 minutes?Compute a P-value and write a conclusion in the context of the problem.

(b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence bound/interval.

4. **Library Fees**

For one month in 2024, Worcester Public Library in Massachusetts waived fees for overdue and damaged books for anyone who showed staff a picture of a cat. A study claims that library patrons with overdue or damaged books owe an average of \$12 in library fees. A random sample of 25 patrons who participated in the cat-picture fee waiver program showed that they owed an average of \$13.40 in library fees, with a sample standard deviation of \$4.20.

(a) At the 0.05 level of significance, does the data indicate that the average amount owed in library fees by patrons who participated in the cat-picture fee waiver program is different from \$12? Estimate a P-value and write a conclusion in the context of the problem.

(b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence interval/bound.

(c) State the Type I and Type II errors in the context of the problem.

5. **Science Project**

The largest vinegar-and-baking-soda 'volcano' was made in a British school in 2015. It stood 8.62 metres tall and used 100 litres of vinegar. A study claims that students spend an average of 3.5 hours preparing a science project. A random sample of 30 students who built vinegar-and-baking-soda volcanoes showed that they spent an average of 4.1 hours preparing their projects, with a sample standard deviation of 1.4 hours.

(a) At the 0.05 level of significance, does the data indicate that the average amount of time students spend preparing vinegar-and-baking-soda volcano projects is more than 3.5 hours? Compute a P-value and write a conclusion in the context of the problem.

(b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence interval/bound.

6. **Gifts**

In a recent survey, 10% of pet-owning Brits said they were disappointed when guests didn't bring a Christmas present for their animal. A study claims that pet-owning Brits spend an average of \$35 on Christmas gifts for their pets. A random sample of 110 pet-owning Brits showed that they spent an average of \$31.50 on Christmas gifts for their pets, with a sample standard deviation of \$9.20.

(a) At the 0.005 level of significance, does the data indicate that the average amount spent by pet-owning Brits on Christmas gifts for their pets is less than \$35? Compute a P-value and write a conclusion in the context of the problem.

(b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence interval/bound.

(c) State the Type I and Type II errors in the context of the problem.

7. **Conspiracy Theories**

In a conspiracy theory study, 10% of respondents claimed to believe that the Canadian Armed Forces were secretly developing an army of super intelligent giant raccoons to invade neighbouring countries (a theory invented by the researchers). A researcher claims that 10% of Canadians believe this giant-raccoon conspiracy theory. A random sample of 400 Canadians showed that 32 of them believed the conspiracy theory.

(a) At the 0.05 level of significance, does the data indicate that the proportion of Canadians who believe this giant-raccoon conspiracy theory is less than 10%? Compute a P-value and write a conclusion in the context of the problem.

(b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence interval/bound.

8. **Premature Aging**

Having difficult relatives or colleagues could age you 1.5% faster. A study claims that 42% of adults report having at least one difficult relative or colleague who causes them regular stress. A random sample of 500 adults showed that 230 of them reported having at least one difficult relative or colleague who causes them regular stress.

(a) At the 0.02 level of significance, does the data indicate that the proportion of adults who report having at least one difficult relative or colleague who causes them regular stress is different from 42%? Compute a P-value and write a conclusion in the context of the problem.

(b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence interval/bound.

9. **Crying at the Movies**

In a survey, 15% of men said they were more likely to cry while watching a film on a flight than at home. Only 6% of women said the same.A study claims that 15% of men are more likely to cry while watching a film on a flight than while watching the same film at home. A random sample of 300 men showed that 57 of them said they were more likely to cry while watching a film on a flight.

(a) At the 0.05 level of significance, does the data indicate that the proportion of men who are more likely to cry while watching a film on a flight is greater than 15%?Compute a P-value and write a conclusion in the context of the problem.

(b) Construct and explain how the question in (a) could be answered by constructing an appropriate confidence interval/bound.