**Problem 1**

A tire manufacturer claims that its tires have a mean life of at least 50 000 km. A random sample of 16 of these tires is tested and the sample mean is 33 000 km. Assume the population's standard deviation is 3000 km and the lives of tires are approximately normally distributed. To test the manufacturer’s claim using the 5% level of significance the analyst should

(a) use a one-tail test in the right tail and the test statistic Z

(b) use a one-tail test in the left tail and the test statistic Z

(c) use a one-tail test in the left tail and the test statistic t

(d) use a two-tail test and the test statistic t

**Problem 2**

A drink vending machine is adjusted so that, on average, it dispenses 220 ml of fruit juice (with a standard deviation of 10 ml) into a plastic cup. However, the machine has a tendency to go out of adjustment and periodic checks are made to determine the average amount of fruit juice actually being dispensed. A sample of 45 drinks is taken to test the adjustment of the machine. For α = 5%, an appropriate decision rule would be

(a) reject the null if TS > 1.96

(b) do not reject the null if |TS| < 1.96

(c) reject the null if Z ≠ 1.96

(d) reject the null if |Z| > 1.96

**Problem 3**

A manufacturer of car batteries claims that his product will last at least 4 years on average. A sample of 50 is taken and the mean and standard deviation are found. The test statistic is calculated to be -1.656. Using a 5% level, the conclusion would be

(a) there is sufficient evidence for the manufacturer’s claim to be considered correct.

(b) there is insufficient evidence for the manufacturer’s claim to be considered correct.

(c) there is sufficient evidence for the manufacturer’s claim to be considered incorrect.

(d) there is insufficient evidence for the manufacturer’s claim to be considered incorrect.

**Problem 4**

Given Ho: µ = 25, Ha: µ ≠ 25, and P-value = 0.041. Do you reject or fail to reject Ho at the 0.01 level of significance?

A) fail to reject Ho

B) not sufficient information to decide

C) reject Ho

**Problem 5**

If a hypothesis test were conducted using α = 0.05, for which of the following p-values would the null hypothesis be rejected?

A) 0.100

B) 0.041

C) 0.055

D) 0.060

**Problem 6**

The area to the left of the test statistic is 0.375. What is the P-value if this is a two-tail test?

A ) 0.625

B ) 0.750

C ) 0.375

D ) 0.188

**Problem 7**

In hypothesis testing, the hypothesis tentatively assumed to be true is

A. the alternative hypothesis

B. the null hypothesis

C. either the null or the alternative

D. None of these alternatives is correct.

**Problem 8**

Conduct a test to determine whether or not the population proportion of voters in favor of proposal A is greater than 50%. In a random sample of 200 voters, 140 said that they were in favor of this proposal. Compute the test statistic.

 A) z = 6.17  
 B) z = 19.80  
 C) z = 5.66  
D) z = 7.07  
  
**Answer - C**:  you get this answer when you plug it into the calculator and set it to not equal p

**Problem 9**

The proportion of defective items is not allowed to be over 15%. A buyer wants to test whether the proportion of defectives exceeds the allowable limit. The buyer takes a random sample of 100 items and finds that 19 are defective. Find the p-value.

**A)**0.3686  
**B)**0.1314  
**C)**0.2628   
**D)**0.8686

**Answer - B**: you get this answer when you plug it into the calculator and set  
                 it to be > p

**Problem 10**

It is thought that 12% of all students taking a particular course received a grade of A. In a sample of 155 students, it is found that 21 made an A. What is the test statistic for testing the true proportion is 12%?

a. 0.53

b. 0.01

c. 0.577 ⎜

**Problem 11**

Consider a test of H0: µ = 6. For the following case, give the rejection region for the test in terms of the z-statistic: Ha: 6, with significance level = 0.10.

A) |z| > 1.28

B) z > 1.28

C) z > 1.645

D) |z| > 1.645

**Problem 12**

In a random sample of 1000 students, = 0.80 (or 80%) were in favor of long hours at the school library. What is the margin of error for testing the null hypothesis Ho: p = 0.75 at significance level ?

A. 0.025

B. 0.314

C. 1.254

D. 1.568

**Answer: A**

**Problem 13**

A pharmaceutical company claims that 8% or fewer of the patients taking their new statin drug will have a heart attack in a 5-year period. In a government-sponsored study of 2300 patients taking the new drug, 198 have heart attacks in a 5-year period. Is this strong evidence against the company's claim?  
  
A. Yes, because the P-value is 0.005657.  
B. Yes, because the P-value is 0.086087.  
C. No, because the P-value is only 0.005657.  
D. No, because the P-value is only 0.086087.  
E. No, because the P-value is over 0.10.

**Problem 14**

A research dermatologist believes that cancers of the head and neck will occur most often of the left side, the side next to a window when a person is driving. In a review of 565 cases of head/neck cancers, 305 occurred on the left side. What is the resulting P-value?

A. Text

Description automatically generated with medium confidence

B. A picture containing text

Description automatically generated

C. A picture containing text

Description automatically generated

D. Text

Description automatically generated

E. Text

Description automatically generated with medium confidence

**Problem 15**

Joe Palermo interviewed 507 randomly chosen PSU students and found that 59%of the students in his sample like to play chess. Consider the research question of whether or not a majority of PSU students like to play chess. The test for this research question is a:

(A) Neither a one-sided nor two-sided test.

(B) One-sided test.

(C) Both one-sided and two-sided tests.

(D) Two-sided test.

**Problem 16**

To study the effects of exercise on lean body (muscle) weight change, a random sample of 36 students was placed on a two-month-long exercise program. At the end of the program, all 36 students’ changes in lean body weight were measured. The sample average change in muscle weight was 1.05 pounds and the sample standard deviation was 3.6 pounds. The study organizers wish to know if the results of this sample provide good evidence that this exercise program causes a statistically significant change in the population's mean lean body weight. The value of this test statistic is:

Background pattern

Description automatically generated with low confidence

**Problem 17**

The death rate from a particular form of cancer is 23% during the first year. When treated with an experimental drug, only 15 out of 84 patients die during the initial year. Is this strong evidence to claim that the new medication reduces the mortality rate?

(A) Yes, because the P-value is .0459.

(B) Yes, because the P-value is .1314.

(C) No, because the P-value is only .0459.

(D) No, because the P-value is above .10.

(E) An answer cannot be given without first knowing if a placebo was also used and what the results were.

**Problem 18**

A test is conducted for H 0: μ = 34 of a population with σ = 5 at a significance level of 0.05. A sample of size 100 is selected that yielded a sample mean of 35. The value of the test statistic is

A. 19.6

B. 2.0

C. 1.0

D. 16.45

**Answer: B**

**Problem 19**

A test is conducted for H 0: μ 50 vs. H a: μ > 50. The test statistic is 2.46. The *p*‐value is

A. 0.0069

B. 0.0138

C. 0.9931

D.0.0250

**Answer: A**

**Problem 20**

A test is conducted with the null hypothesis H 0: μ 10 vs. the alternative hypothesis H a: μ 10 at the α = 0.05 level. The test statistic is *z* = –1.75. The correct conclusion is

A. reject Ho

B. fail to reject Ho

C. reject Ha

D. insufficient information to draw a conclusion.