Problem 1

A researcher would like to know which is the average time kids spent playing outdoors after school. A random sample of fifty kids were surveyed, the data with the corresponding plots and summary are included. The time is given in minutes:

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| 29 29 29 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 |
| 30 31 31 31 31 31 31 31 31 31 31 32 32 32 32 32 32 32 33 33 |
| 33 33 33 34 34 |

1. Identify the random variable
   \( X: \) time kids spent playing outdoors after school
2. Define the population parameter.
   \( \mu \): mean time kids spent playing outdoors after school
3. Provide a 95% CIF for the population parameter.
   a. Which is the sampling distribution used for the CI?
      \( t \)-distribution with 49 degrees of freedom

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b. Which is the critical value used for this CI?

\[ t^*_{49} = 2.021 \]

4. In order to make inference about the population inference, the conditions for using the CI method should be verified. List the conditions that need to be verified.
   a. The observations are independent
   b. n=50 is larger than 30

5. Assuming the conditions are satisfied, which is the interpretation of your confidence interval.

We are 95% confident that the average time kids spent outdoors after school is between 29.64 minutes and 30.67 minutes.

**Problem 2:**

6. A researcher conducted an experiment on 8 randomly selected NASCAR drivers in which their reaction time was measured. The sample mean reaction time was 1.24 seconds. The sample standard deviation reaction time was 0.12 seconds. Assume that reaction time follows a normal distribution. A 98% confidence interval for the population mean reaction time based on these data is given by

   a) 1.24 ± 0.083
   b) 1.24 ± 0.127
   c) 1.24 ± 0.099
   d) 1.24 ± 0.120
   e) Sample size is too small to construct a confidence interval

**Problem 3:**

Laura is interested in the mean height of the girls in her 9th grade class year. Assume the population standard deviation is known to be 1.2 inches. She takes a sample of 48 students and calculates a sample mean of 64.5 inches and a sample standard deviation of 0.9.

7. What is the parameter of interest?

(a) The mean height of the 48 girls in Laura's 9th grade class year.
(b) The mean height of girls in Laura's 9th grade class year.
(c) The mean height of the girls in Laura's entire school.
(d) The mean height of the 48 girls in Laura's entire school.

8. Assume Laura wants to create a 95% confidence interval about the true parameter. What is the margin of error?

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Assume the mean height of the population is 64 inches, and Laura wants to test the claim that the mean height is greater than 64 inches. The population standard deviation is 1.2. Laura uses a sample size of 48 and the sample mean is 67. Use the following significance level: \( \alpha = .05 \)

9. Which are the hypotheses you will need to use? Is this a one-sided or two-sided test?
   - Ho: The mean height of the population is 64 inches
   - Ha: The mean height of the population is greater than 64 inches
   - It is a one-sided test

10. Which distribution should she use if she tests this claim?
    - Letter a)
    - (a) \( N \left( 64, \frac{1.2}{\sqrt{48}} \right) \)
    - (b) \( N \left( 64.5, \frac{1.2}{\sqrt{48}} \right) \)
    - (c) \( t_{48} \)
    - (d) \( t_{47} \)

11. Which is the value of the test statistic?
   - \( z \)-test = 17.32

12. Which is the p-value and its interpretation?
   - \( p \)-value = \( P(Z > 17.32) \) \( \rightarrow \) almost zero

13. What can you conclude from this test?
   - We have strong evidence to reject the null hypothesis and we conclude that the mean height of the population is greater than 64 inches.

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14. Researchers want to test the hypotheses: $H_0: \mu = -4.5$ versus $H_a: \mu < -4.5$. Which of the following test statistics gives the smallest p-value?

a) 10.3  

b) -8.4  

c) -0.5  

d) 3.5  

e) 0.0  

15. When doing a significance test, a student gets a p-value of 0.003. This means that:
I. Assuming $H_0$ were true, this sample’s results were an unlikely event.  
II. We reject $H_0$ at any reasonable alpha level. 

a. I.  

b. II  

c. I and II  

d. None of the other options  

16. Suppose our p-value is .044. What will our conclusion be at alpha levels of .10, .05, and .01?

a) We will reject $H_0$ at alpha=.10, but not at alpha=.05  

b) We will reject $H_0$ at alpha=.10 or .05, but not at alpha=.01  

c) We will reject $H_0$ at alpha=.10, .05, or .01  

d) We will not reject $H_0$ at alpha=.10, .05, or .01  

17. A manufacturer claims that the mean amount of juice in its 16 ounce bottles is 16.1 ounces. A consumer advocacy group wants to perform a hypothesis test to determine whether the mean amount is actually less than this. The mean volume of juice for a random sample of 70 bottles was 15.94 ounces. Do the data provide sufficient evidence to conclude that the mean amount of juice for all 16-ounce bottles, $\mu$, is less than 16.1 ounces? Perform the appropriate hypothesis test using a significance level of 0.10. Assume that $\sigma = 0.9$ ounces.

$H_0: \mu = 16.1$  

$H_a: \mu < 16.1$  

$z_{test} = \frac{15.94 - 16.1}{0.9/\sqrt{70}} = -1.49$  

p-value=P(Z<-1.49)=.0681  

p-value < alpha  

We have enough evidence to reject the null hypothesis and conclude that the mean amount of juice for all 16-ounce bottles is less than 16.1 ounces.