Assignment # 6 (Chapter 6)

Q. 1

You measure the weights of 24 male runners. You do not actually choose an SRS but you are willing to assume that these runners are a random sample from the population of male runners in your city. Here are their weights in kilograms

| 67.8 | 61.9 | 63.0 | 53.1 | 62.3 | 59.7 | 55.4 | 58.9 |
|------|------|------|------|------|------|------|------|
| 60.9 | 69.2 | 63.7 | 68.3 | 64.7 | 65.6 | 56.0 | 57.8 |
| 66.0 | 62.9 | 53.6 | 65.0 | 55.8 | 60.4 | 69.3 | 61.7 |

Suppose the standard deviation of the population is known to be 4.5 kg.

- a) What is the standard deviation of x?
- b) Give a 95% confidence interval for the mean of the population from which the sample is drawn. Are you quite sure that the average weight of the population of runners is less than 65 kg?

Answers

(a)
$$\sigma_x = \frac{\sigma}{\sqrt{n}} = \frac{4.5}{\sqrt{24}} = 0.9186$$

(b) $\overline{\mathbf{x}} \pm \mathbf{z} * \frac{\sigma}{\sqrt{n}}$ where $\mathbf{Z}^* = 1.96$ for the 95%

confidence interval

AND
$$\bar{\mathbf{x}} = \frac{\sum \mathbf{x}}{n} = \frac{1483}{24} = 61.7917$$

$$\overline{x} \pm z * \frac{\sigma}{\sqrt{n}} = 61.7917 \pm 1.96(0.9186)$$

Therefore, the confidence interval is 59.99 kg to 63.59 kg.

Since 65kg falls above the 95% confidence interval, we have good evidence that the mean of the population of runners is less than 65kg.

Q2.

Find the 99% confidence interval for the rent mean of 10 one-bedroom apartments that have a mean monthly rent of \$540. Assume a standard deviation of \$80.

Answer:Determine 99% Confidence Interval ? $\overline{\mathbf{x}} \pm \mathbf{z} * \frac{\sigma}{\sqrt{n}} = 61.7917 \pm 2.576(0.9186)$ Therefore, the 99% confidence interval is59.44 kg. to 64.16 kg.

Q 3. Is the 99% confidence interval narrower that the 95% confidence interval?

Answer:

The 99% confidence interval is broader. This is necessary in order that we can state we have increased confidence that the μ falls within the confidence interval.

Q4.

Here are the Degree of Reading Power scores for a sample of 44 thurd grade students:

| 40 | 26 | 39 | 14 | 42 | 18 | 25 | 43 | 46 | 27 | 19 |
|----|----|-----------|----|----|----|----|----|----|----|----|
| 47 | 19 | 26 | 35 | 34 | 15 | 44 | 40 | 38 | 31 | 46 |
| 52 | 25 | 35 | 35 | 33 | 29 | 34 | 41 | 49 | 28 | 52 |
| 47 | 65 | 48 | 22 | 33 | 41 | 51 | 27 | 14 | 54 | 45 |

Suppose that the standard deviation of the population of the scores is 11. Give the 95% confidence interval for the population mean score.

Answers:

95% Confidence Interval for Population Mean Score? $\overline{x} = \frac{\sum x}{n} = \frac{1544}{44} = 35.09$

 $\overline{x} \pm z * \frac{\sigma}{\sqrt{n}} = 35.09 \pm (1.96) \frac{11}{\sqrt{44}} = 35.091 \pm 3.250$

Therefore, the 95% confidence interval is 31.84 DRP score to 38.34 DRP score.

Q5.

On the Survey of Study Habits and Attitudes, scores range from 0-200. The mean score for U.S. college students is about 115, and a standard deviation is about **30.** A teacher suspects that older students have a better attitude toward school and gives the survey to 20 students who are at least 30 years of age. Their mean is 135.2. Assuming that the standard deviation is 30 for the older students, carry out a test of

Report the P-value of your test, and state your conclusion clearly.

$$Z = \frac{\overline{x} - \mu}{\sigma / \sqrt{n}} = \frac{135.2 - 115}{30 / \sqrt{20}} = \frac{20.2(2\sqrt{5})}{30} = 3.01$$

Since, this is a one-sided hypothesis, p = (1 - 0.9987) = 0.0013.

A p=0.0013 leads us to reject the Null Hypothesis, thus accepting the Alternate Hypothesis that the mean score for students over 30 is greater than 115 (ie. Higher mean score for older students).

Q6. (SPSS)

Here are the Degree of Reading Power scores for a sample of 44 third grade students.

| 40 | 26 | 39 | 14 | 42 | 18 | 25 | 43 | 46 | 27 | 19 |
|----|----|----|----|----|----|----|----|----|----|----|
| 47 | 19 | 26 | 35 | 34 | 15 | 44 | 40 | 38 | 31 | 46 |
| 52 | 25 | 35 | 35 | 33 | 29 | 34 | 41 | 49 | 28 | 52 |
| 47 | 35 | 48 | 22 | 33 | 41 | 51 | 27 | 14 | 54 | 45 |

These are considered to be an SRS of third graders in a suburban district. The scores were approximately normal. Suppose that the standard deviation of the scores in this school district is 11. The researcher believes that the mean of this district is higher than the national mean, which is 32.

- a) State the appropriate H_o and H_a to test this suspicion.
- b) Carry out the test. Give the P value and then interpret the result in plain language.

Answers:

(b)
$$Z = \frac{\overline{x} - \mu}{\sigma / \sqrt{n}} = \frac{6.18 \sqrt{11}}{11} = 1.86$$

A Z-score of 1.86 is (1-0.986) = 0.0314)

With a p value of 0.0314, there is evidence against the null hypothesis. Thus we can accept the Alternate Hypothesis, that the mean of the district is greater than the national mean with confidence. The potential for H_o being true is 3 out of 100 samples.

P92, 107 (SPSS)