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**CONFIDENCE INTERVAL exercises**

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1. A test of 40 cables produced by a company and selected at random showed an average breaking tension of 2400 kg and a standard deviation of 150 kg. Assuming that the breaking tension is a normally distributed random variable.

1. Determine the 95% and 99% confidence intervals for the mean breaking tension of all cables produced by the company. Use R for this calculation as well.
2. With what level of confidence can we say that the mean breaking tension of all the company's cables is 2400  35 kg?

2. A test of 40 cables produced by a company and selected at random showed an average breaking tension of 2400 kg. Assuming that the breaking tension is a normally distributed random variable with a standard deviation of 150 kg, determine the 95% confidence interval for the evaluation of the average breaking tension of all cables produced by the company.

3. The marketing department of a factory wants to assess the brand awareness of one of its products. To this end, it conducted a survey of 1200 randomly selected people and found that only 240 were unaware of the brand.

1. Estimate the true proportion of individuals who are familiar with the brand, using a 90% confidence interval. Use R for this calculation as well.
2. Knowing that the confidence interval determined by the factory management was [0.767, 0.833], calculate the confidence level used.

4. In a clinical trial, the objective is to evaluate the effectiveness of a new drug for high blood pressure. To this end, the drug will be administered to a large group of randomly selected hypertensive individuals.

1. Determine the minimum sample size required to ensure that the width of a 99% confidence interval for the proportion of cured individuals is always less than 0.12.
2. Construct the 99% confidence interval for this proportion using a sample of 300 hypertensive individuals, of whom 180 were cured.

5. Let X and Y be the lifetimes of light bulbs of brands A and B, respectively. We assume that the characteristic under study in the two populations follows a Normal distribution.

A sample of 53 bulbs of brand A provides the following values:

For a sample of 67 bulbs of brand B, we obtained:

Construct a 95% confidence interval for the difference between the mean lifetimes of bulbs of types A and B. What do you conclude? Use R for this calculation as well.

6. A study aimed at analysing the economic level of the school population in a certain region of the country, as well as verifying whether the economic level improved significantly from 2015 to 2025, collected the following data in a representative school of that region:

YEAR

|  |  |  |
| --- | --- | --- |
|  | 2015 | 2025 |
| Total number of students surveyed | 350 | 400 |
| Number of students receiving social support | 42 | 30 |

1. Verify whether the collected sample allows the construction of a 90% confidence interval for the proportion of disadvantaged children in 2025, with a width smaller than 0.04. If not, what sample size should be considered?
2. Based on the collected data, construct a 95% confidence interval for the difference in proportions *p1p2* of disadvantaged children in 2015 and 2025. Use R to perform this calculation as well.

SOLUÇÕES:

1. a) [2351.42, 2448.58] ; [2334.96, 2465.04] b) 85.57%

2. [2353.5 , 2446.5]

3. a) [0.781 , 0.819] b) 99.58%

4. a) *n*= 461 b) [0*.*527, 0*.*673]

5. [27.86 , 42.14]. Type A bulbs last longer on average.

9. a) No. b) [0.00228 , 0.08772]