1. **Single Sample Estimation:** a. A random sample of 50 students from a university has a mean GPA of 3.2 with a standard deviation of 0.5. Estimate the population mean GPA, and calculate the standard error of the point estimate. b. Using the same sample, construct a 95% prediction interval for the GPA of a single randomly selected student from the university.
2. **Two Sample Estimation:** a. Compare the mean heights of two different populations, A and B, with samples of sizes 30 and 40, respectively. The sample means and standard deviations are provided. Estimate the difference between the means of the two populations. b. Using the same data, construct a confidence interval for the difference between the mean heights of populations A and B.
3. 3. **Two Sample Proportion Estimation:** a. Compare the proportions of individuals who prefer brand X in two different markets, A and B, with sample sizes of 100 and 150, respectively. The sample proportions are provided. Estimate the difference between the proportions of brand X preference in the two markets. b. Using the same data, construct a confidence interval for the difference between the proportions of brand X preference in markets A and B.
4. . **Two Sample Estimation of Variances:** a. Conduct a hypothesis test to compare the variances of two different samples, A and B, with sample sizes of 25 and 30, respectively. The sample variances are provided. b. Based on the test conducted in part (a), draw a conclusion regarding the equality of variances between samples A and B.
5. .Matched Pair Estimation: Suppose you're conducting a study to assess the effectiveness of a new teaching method in improving students' test scores. You collect data from 20 students who took a pre-test and post-test. Calculate the mean difference between pre-test and post-test scores and construct a confidence interval for this mean difference. Additionally, discuss how you would interpret the results in terms of the effectiveness of the new teaching method