

Hypothesis Testing Exercises

Exercise 1

A machine produces metal rods and the process, assumed to be normal, has variance $\sigma^2 = 4 \text{ cm}^2$. A random sample of 50 rods yields a mean length of $\bar{x} = 105.2 \text{ cm}$. The design specification requires that the average length of the rods should be 106 cm.

Exercise 2

A nutritionist claims that the average sugar content in a brand of breakfast cereal is 18 g but they suspect a larger content. A random sample of 20 cereal boxes yields a mean sugar content of 19.2 g with a sample standard deviation of $s = 2.5 \text{ g}$.

Exercise 3

A survey claims that 60% of adults prefer online shopping over in-store shopping. A random sample of 200 adults shows that 130 prefer online shopping.

Exercise 4

A factory produces light bulbs, and it is claimed that only 5% of them are defective. A sample of 15 light bulbs is taken, and 3 of them are found to be defective.

Exercise 5

A fitness coach wants to compare the effectiveness of two different workout plans, namely, whether the program significantly reduced body fat. She collects the body fat percentages of 10 clients before and after completing a 6-week program. The data is recorded as follows:

Client	Before (%)	After (%)
1	20.4	19.1
2	21.0	19.6
3	22.5	20.8
4	19.8	18.9
5	20.7	19.4
6	21.9	20.2
7	23.0	21.5
8	19.5	18.3
9	22.0	20.7
10	21.4	20.1

Exercise 6

A researcher wants to determine whether there is a difference in average study times between two groups of students preparing for an exam. Group 1 consists of 15 students who attended online tutoring, and Group 2 consists of 20 students who self-studied. The sample data is as follows:

- Group 1 (online tutoring): $\bar{x}_1 = 35$ hours, $s_1 = 5$ hours
- Group 2 (self-study): $\bar{x}_2 = 32$ hours, $s_2 = 6$ hours