

Exercise Series 5: Statistical Tests

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Exercise 1

A machine fills coffee packets. A sample of size $n_1 = 120$ is taken with mean weight 48.53 g and standard deviation 2.8 g . The next day a sample of size $n_2 = 270$ is taken with mean 50.08 g and standard deviation 3.1 g .

At a significance level of 5% (risk of error), determine if there exists a significant difference between the mean weights of the packets.

Exercise 2

The weight of a drug packaged in boxes follows a normal distribution $N(m, \sigma)$. Two samples of sizes $n_1 = 12$ and $n_2 = 18$ have means $\bar{x} = 22.235\text{ g}$ and $\bar{y} = 21.988\text{ g}$ and sample standard deviations (estimators) $\hat{S}_1 = 0.18\text{ g}$ and $\hat{S}_2 = 0.23\text{ g}$.

Determine if there exists a significant difference between the mean weights of the two samples at a significance level of 5%.

Exercise 3

A vaccine against a disease M is tested on animals. A random sample of size $n_1 = 80$ vaccinated animals shows that 42 of them contracted the disease. A random sample of size $n_2 = 113$ unvaccinated animals shows that 76 of them contracted the disease.

Can we conclude, at the 5% significance level, that the vaccine is ineffective?

Exercise 4

Consider the following data from two samples:

Sample 1	7	18	9	9	18	27	12	10	32	6	37
Sample 2	12	15	14	16	22	17	25	9	18	/	/

Test if there is a significant difference between the variances of the two samples at a 5% significance level. We set $H_0 : \sigma_1 = \sigma_2$.

Exercise 5

A cross between red and white roses produced, in the second generation, red, pink, and white roses. From a sample of size 600, we obtained the following results:

Color	Observed counts
Red	141
Pink	315
White	144

Can we conclude that the results conform to Mendel's laws?