

## Homework 5, STAT764

1. Generate 30 normal random numbers with mean 3.1 and variance 4, generate 28 normal random numbers with mean 3 and variance 3.9. and then generate 32 normal random numbers with mean 3.05 and variance 4.1. For your simulated data, test the following hypotheses:

$$\mathcal{H}_0 : \mu_1 = \mu_2 = \mu_3 \quad \longleftrightarrow \quad \mathcal{H}_a : \text{not all } \mu s \text{ are equal,}$$

assuming that three population variances are equal but unknown.

2. The Kenton Food Company wished to test four different package designs for a new breakfast cereal. Twenty stores, with approximately equal sales volumes, were selected as the experimental units. Each store was randomly assigned one of the package designs, with each package design assigned to five stores. A fire occurred in one store during the study period, so this store had to be dropped from the study. Hence, one of the designs was tested in only four stores. The stores were chosen to be comparable in location and sales volume. Other relevant conditions that could affect sales, such as price, amount and location of shelf space, and special promotional efforts, were kept the same for all of the stores in the experiment. Sales, in number of cases, were observed for the study period, and the results are recorded below.

Table 1: Number of Cases Sold by Stores for Each of Four Package Designs

| Package Design | Store 1 | Store 2 | Store 3 | Store 4 | Store 5 |
|----------------|---------|---------|---------|---------|---------|
| 1              | 11      | 17      | 16      | 14      | 15      |
| 2              | 12      | 10      | 15      | 19      | 11      |
| 3              | 23      | 20      | 18      | 17      |         |
| 4              | 27      | 33      | 22      | 26      | 28      |

- (i) Find the sample mean for each package design.
- (ii) Test whether or not mean sales are the same for the four package designs, assuming the population variances are equal but unknown. Write down the null and alternative hypotheses, derive the ANOVA table, find p-value, and make decision.