Case 1. Mouse Strains

http://phenome.jax.org
Tordoff MG, Bachmanov AA. Survey of calcium & sodium intake and metabolism with bone and body composition data
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The body weight and composition of ~10 male and ~10 female mice from 40 inbred strains were measured. Body composition was assessed in ~16-wk old mice that had been individually housed and fed a high-carbohydrate, low-fat diet (AIN-76A) for the previous 8 wk. Carcass lean and fat weights were assessed using a PIXIMus II DEXA and confirmed by fat extraction assay.

Variable	Description
ID	mouse ID
Strain	mouse strain
Sex	mouse sex
Starting age	age of a mouse when experiment began, days
Ending age	age of a mouse when experiment ended, days
Starting weight	starting weight of a mouse, g
Ending weight	ending weight of a mouse, g
Weight change	weight change
Bleeding time	time of the bleeding, after damaging tail
Ionized Ca in blood	Concentration of ionized Ca in blood
Blood pH	pH of blood
Bone mineral density	the density of bones
Lean tissues weight	the weight of lean tissue
Fat weight	the weight of fat tissue

The data are in `mice.xls`

Report

Use the tabular and graphical methods of descriptive statistics to help researchers understand the results. Your report should include the following.

1. Pie chart showing the *sex* composition, bar chart showing the number of mice per *strain*

2. Descriptive statistics for *ending age*, *ending weight*, *weight change*, *bleeding time*

3. Are there any outliers in these variables?

4. Scatter diagram between *ending weight* and *fat* and *lean tissue weights*. Comment finding.

5. Compare the mean *ending weight* and *weight change* for male and female populations. Build box plots. Can you make any conclusions?

6. Provide the interval estimations for *ending weight*, *weight change*, *bleeding time*

7. Compare the mean *ending weight* and *weight change* for male and female populations using the hypothesis about means.

Case 2. Specialty Toys

Specialty Toys, Inc., sells a variety of new and innovative children's toys. Management learned that the preholiday season is the best time to introduce a new toy, because many families use this time to look for new ideas for December holiday gifts. When *Specialty* discovers a new toy with good market potential, it chooses an October market entry date.

In order to get toys in its stores by October, *Specialty* places one-time orders with its manufacturers in June or July of each year. Demand for children's toys can be highly volatile. If a new toy catches on, a sense of shortage in the market place often increases the demand to high levels and large profits can be realized. However, new toys can also flop, leaving *Specialty* stuck with high levels of inventory that must be sold at reduced prices. The most important question the company faces is deciding how many units of a new toy should be purchased to meet anticipated sales demand. If too few are purchased, sales will be lost; if too many are purchased, profits will be reduced because of low prices realized in clearance sales.

For the coming season, *Specialty* plans to introduce a new product called Weather Teddy. This variation of a talking teddy bear is made by a company in Taiwan. When a child presses Teddy's hand, the bear begins to talk. A built-in barometer selects one of five responses that predict the weather conditions. The responses range from "It looks to be a very nice day! Have fun." to "I think it may rain today. Don't forget your umbrella." Tests with the product show that, even though it is not a perfect weather predictor, its predictions are surprisingly good. Several of Specialty's managers claimed Teddy gave predictions of the weather that were as good as many local television weather forecasters.

As usual, *Specialty* faces the decision of how many Weather Teddy units to order for the coming holiday season. Members of the management team suggested order quantities of 15 000, 18 000, 24 000, or 28 000 units. The wide range of order quantities suggested indicate considerable disagreement concerning the market potential. The product management team asks you for an analysis of the stock-out probabilities for various order quantities, an estimate of the profit potential, and to help make an order quantity recommendation. *Specialty* expects to sell Weather Teddy for €24 based on a cost of €16 per unit. If inventory remains after the holiday season, *Specialty* will sell all surplus inventory for €5 per unit. After reviewing the sales history of similar products, Specialty's senior sales forecaster predicted an expected demand of 20 000 units with a 0.90 probability that demand would be between 10 000 units and 30 000 units.

Report

Prepare a managerial report that addresses the following issues and recommends an order quantity for the Weather Teddy product.

1. Use the sales forecaster's prediction to describe a normal probability distribution that can be used to approximate the demand distribution. Sketch the distribution and show its mean and standard deviation.

2. Compute the probability of a stock-out for the order quantities suggested by members of the management team.

3. Compute the projected profit for the order quantities suggested by the management team under three scenarios: worst case in which sales = 10 000 units, most likely case in which sales = 20000 units, and best case in which sales = 30 000 units.

4. One of *Specialty*'s managers felt that the profit potential was so great that the order quantity should have a 70% chance of meeting demand and only a 30% chance of any stock-outs. What quantity would be ordered under this policy, and what is the projected profit under the three sales scenarios?

5. Provide your own recommendation for an order quantity and note the associated profit projections. Provide a rationale for your recommendation.

Case 3. Depression Study

As part of a long-term study of individuals 65 years of age or older, sociologists and physicians at the Wentworth Medical Center in upstate New York investigated the relationship between geographic location and depression. A sample of 60 individuals, all in reasonably good health, was selected; 20 individuals were residents of Florida, 20 were residents of New York, and 20 were residents of North Carolina. Each of the individuals sampled was given a standardized test to measure depression. The data collected follow; higher test scores indicate higher levels of depression. These data are available in the file `depression.xls` (see Group 1 sheet).

A second part of the study considered the relationship between geographic location and depression for individuals 65 years of age or older who had a chronic health condition such as arthritis, hypertension, and/or heart ailment. A sample of 60 individuals with such conditions was identified. Again, 20 were residents of Florida, 20 were residents of New York, and 20 were residents of North Carolina. The levels of depression recorded for this study follow. These data are available in the file named `depression.xls` (see Group 2 sheet).

1. Good health respondents

Florida	New York	North Carolina
3	8	10
7	11	7
7	9	3
3	7	5
8	8	11

2. Bad health respondents

Florida	New York	North Carolina
13	14	10
12	9	12
17	15	15
17	12	18
20	16	12

Report

1. Use descriptive statistics to summarize the data from the two studies. What are your preliminary observations about the depression scores?
2. Use ANOVA on both data sets. State the hypotheses being tested in each case. What are your conclusions?
3. Discuss extensions of this study or other analyses that you feel might be helpful.