USCOTS 2011 – Breakout Session:

**Technology for Teaching Bootstraps and Randomizations**

Data for these problems in various formats can be found at *www.lock5stat.com* under “Datasets”.

**Problem #1: Mustang Prices.** A student collected data on the selling prices for a sample of used Mustang cars being offered for sale at an internet website. The price (in $1,000’s), age (in years) and miles driven (in 1,000’s) for the 25 cars in the sample are given in the table below. Use these data to construct a 90% confidence interval for the mean price (in $1,000’s) for used Mustangs at this website.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Price | 32 | 45 | 11.9 | 24.8 | 22 | 10 | 5 | 9 | 23 | 37.9 | 32.5 | 3 | 9 |
| Age | 6 | 7 | 9 | 2 | 3 | 15 | 10 | 9 | 1 | 1 | 4 | 14 | 8 |
| Miles | 8.5 | 33 | 82.8 | 7 | 23 | 111 | 136.2 | 78.2 | 26.1 | 1.1 | 18.2 | 144.9 | 100.8 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Price | 13 | 14.9 | 7 | 16 | 21 | 7 | 8.2 | 9.7 | 8 | 11.8 | 12.9 | 4.9 |  |
| Age | 10 | 5 | 9 | 6 | 1 | 12 | 14 | 10 | 13 | 13 | 12 | 14 |  |
| Miles | 51.4 | 38.5 | 61.9 | 71.2 | 26.4 | 117.4 | 102 | 86.4 | 72.7 | 71.8 | 72.9 | 115.1 |  |

**Problem #2: NFL overtimes.** The National Football League (NFL) uses an overtime period to determine a winner for games that are tied at the end of regulation time. The first team to score in the overtime wins the game and a coin flip is used to determine which team gets the ball first. Is there an advantage to winning the coin flip? Data from the 1974 through 2009 seasons show that the coin flip winner won 240 of the 428 games where a winner was determined in overtime. Treat these as a sample of NFL games to test whether there is sufficient evidence to show that the proportion of overtime games won by the coin flip winner is more than one half.

**Problem #3: Sleep vs. Caffeine.** In an experiment on memory1, students were given lists of 24 words to memorize. After hearing the words they were assigned at random to different groups. One group of 12 students took a nap for 1.5 hours while a second group of 12 students stayed awake and was given a caffeine pill. The table below shows the number of words each participant was able to recall after the break. Test whether the data indicate a difference in mean number of words recalled between the two treatments.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sleep | 14 | 18 | 11 | 13 | 18 | 17 | 21 | 9 | 16 | 17 | 14 | 15 | mean=15.25 |
| Caffeine | 12 | 12 | 14 | 13 | 6 | 18 | 14 | 16 | 10 | 7 | 15 | 10 | mean=12.25 |

**(Optional) Bonus problem:** The data on Mustang prices in Problem #1 also contains the number of miles each car had been driven (in thousands). Find a 95% confidence interval for the *correlation* between price and mileage.

1Mednicj, Cai, Kanady and Drumond, “Comparing the benefit of caffeine, naps and placebo on verbal, motor and perceptual memory”, *Behavioural Brain Research*, 193 (2008), 79-86.

**Presenter stations**

Excel Eric Lock – University of North Carolina

Fathom Robin Lock - St. Lawrence University

JMP Brady Brady - JMP

Lock Applets Patti Frazer Lock – St. Lawrence University

Matlab Eric Lock – University of North Carolina

Minitab Robin Lock – St. Lawrence University

R Kari Lock – Harvard University/Duke University

R Andrew Zieffler – University of Minnesota

R Applets Bob delMas - University of Minnesota

RossmanChance Applets Beth Chance, Allan Rossman – Cal Poly San Luis Obispo

RStudio Danny Kaplan – Macalester College

SAS Dennis Lock – Iowa State University

StatCrunch Brooke Barkley – Northern Kentucky

Tinkerplots Laura Le, Rebekah Isaak, Laura Ziegler - University of Minnesota