

R Lesson 8 - Solutions
MSPA 401 – Introduction to Statistical Analysis

- 1) Assume a random sample of size 100 is drawn from a normal distribution with variance 1. The average value of the sample is 50. Find a 95% confidence interval for the mean.

```
> conf.int
[1] 49.804 50.196
```

- 2) Assume the standard deviation for a normal distribution is equal to 100 units. Also assume we want to estimate the unknown mean with a 95% confidence interval of total width 8 units. Calculate the sample size required.

```
> z_score <- qnorm(0.025, mean = 0, sd = 1, lower.tail = FALSE)
> sample_size <- (z_score*100.0/4.0)**2
> round(sample_size)
[1] 2401
```

- 3) A random sample of 1600 registered voters are contacted and asked a variety of questions. For one question, 60% of the voters expressed approval and 40% disapproval. Calculate a 95% confidence interval for the proportion expressing approval.

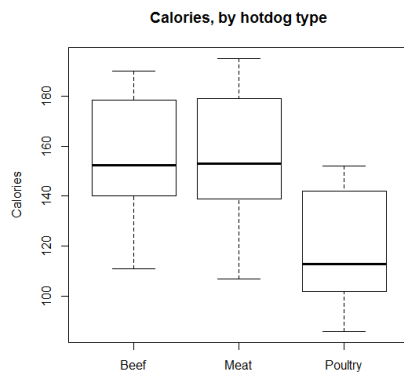
1-sample proportions test with continuity correction

```
data: 1600 * 0.6 out of 1600, null probability 0.5
X-squared = 63.6006, df = 1, p-value = 1.524e-15
alternative hypothesis: true p is not equal to 0.5
95 percent confidence interval:
 0.5754686 0.6240461
sample estimates:
 p
0.6
```

- 4) A random sample of consumers are presented with two beverages in random order and asked which they prefer most. All the consumers expressed a preference. One beverage was preferred 85% of the time. Use this number to determine how large a sample of consumers would be needed to generate a 95% confidence interval with an overall width just less than 2% (i.e. from 84% to 86%)?

```
> p <- 0.85
> z_score <- qnorm(0.025, mean = 0, sd = 1, lower.tail = FALSE)
> sample_size <- (z_score**2)*p*(1-p)/(0.01)**2
> round(sample_size)
[1] 4898
```

- 5) Create boxplots and find 95% confidence intervals for the mean amount of calories in each Type of hot dog: beef, meat and poultry. Construct 99% one-sided lower confidence intervals for the mean amount of calories in each Type of hot dog: beef, meat and poultry.



beef: 146.2532 167.4468
 meat: 145.7308 171.6809
 poultry: 107.1698 130.3596

-Inf 169.7072 mean = 156.85
 -Inf 174.5183 mean = 158.7059
 -Inf 132.8951 mean = 118.7647

The mean value for poultry seems to be statistically different from beef and meat.

- 6) Find a 95% confidence interval for the variance in the amount of calories found for each Type of hot dog: beef, meat and poultry.

```
> with(beef, var.conf.int(Calories))
[1] 296.495 1093.643
> with(meat, var.conf.int(Calories))
[1] 353.2469 1475.1049
> with(poultry, var.conf.int(Calories))
[1] 282.0926 1177.9754
```

The code solution uses a user-defined function, `var.conf.int()`, in making these calculations.