**Statistician: Ryan Andersen** **Version: B**

## Directions

The final exam will consist of several application-type questions related to the following topics we've covered this semester – univariate EDA (quantitative & categorical), bivariate EDA (quantitative & categorical), linear regression, one-sample t-test, two-sample t-test, and chi-square. On the final exam, you will be asked to answer each question from results that you have prepared prior to the exam using R.

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## Data Set -- BatMorph

The Hawaiian hoary bat, *Lasiurus cinereus semotus*, is an endemic subspecies of the North American hoary bat; the mainland subspecies is *L. c. cinereus*. Researchers in Hawaii and on the mainland recorded a variety of morphological (body) characteristics on bats collected from three different types of habitat. Specifics of the variables recorded are documented in the **`Batmorph.txt`** data file (open the data file outside of R to read comments at the top). You should prepare results for each of these items …

1. Univariate EDA for canine, wingspan, and habitat.
2. Bivariate EDA for bodymass and wingspan, and skull length and wingspan.
3. Linear regression results (equation results and $r^2$) for predicting the height of the coronoid process from the height of the canine tooth.
4. Results for testing the following research hypotheses (use 5% level for each)
   a. The mean height of the canine tooth is different between the two subspecies of bats.
   b. The distribution of individuals into the three habitats differs between the two subspecies.
   c. The mean body mass of the *L. c. cinereus* subspecies is greater than 35 g.

**Version: B** **Statistician: Ryan Andersen**

**Directions:**

You may have a pencil, a calculator, and your R output document for the **`BatMorph.txt`** file on your desk. All other materials should be fully stored out of sight and your computer should be turned off.

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**11 Steps for any Significance Test**

1. **[1]** state the rejection criterion ($\alpha$),
2. **[2]** state the null and alternative hypotheses to be tested – define the parameter,
3. **[1]** determine which hypothesis test to use – thoroughly explain why,
4. **[1]** collect the data (address type of study and randomization),
5. **[2]** check all necessary assumptions – explain how you tested the validity,
6. **[1]** calculate the appropriate statistic(s),
7. **[2]** calculate the appropriate test statistic,
8. **[2]** calculate the p-value,
9. **[1]** state rejection decision,
10. **[2]*** summarize your findings in terms of the problem, and
11. **[2]* If reject $H_0$,** compute a **100(1-$\alpha$)%** *confidence region* for the parameter.

**Questions:**

1. **[3pts]** Identify what type of variable each of the following is: bodymass, wingspan, and hab.
2. **[5pts]*** Perform a thorough EDA for the wingspan of bats.
3. **[2pts]*** Perform a thorough EDA for the habitat variable.
4. **[5pts]*** Perform a thorough EDA for the relationship between skull length and wingspan.
5. **[2pts]*** Interpret the slope of the linear regression that you performed.
6. **[2pts]** Predict the height of the coronoid process if the height of the canine tooth equals the median height of the canine tooth.
7. **[2pts]** What proportion of the total variability in the coronoid process is explained by knowing the height of the canine tooth?
8. **[15pts]** Test that distribution of individuals into the three habitats differs between the two subspecies.
9. **[15 or 17 pts]** Test that the mean height of the canine tooth is different between the two subspecies of bats.
10. **[8 pts]*** Describe the importance of statistics (as a field of study or a collection of methods). Among other things make sure you describe the two major goals of statistics, identify at least three major concepts or ideas of statistics, and identify how some of the "tools" you have learned this semester illustrate or are related to why you think statistics is important.

**Statistician: Stephanie Anderson** **Version: B**

## Directions

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## Data Set -- BatMorph

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4. Results for testing the following research hypotheses (use 5% level for each)
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   b. The distribution of individuals into the three habitats differs between the two subspecies.
   c. The mean body mass of the *L. c. cinereus* subspecies is greater than 35 g.

**Version: B** **Statistician: Stephanie Anderson**

**Directions:**

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**Questions:**

1. **[3pts]** Identify what type of variable each of the following is: bodymass, wingspan, and hab.
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7. **[2pts]** What proportion of the total variability in the coronoid process is explained by knowing the height of the canine tooth?
8. **[15pts]** Test that distribution of individuals into the three habitats differs between the two subspecies.
9. **[15 or 17 pts]** Test that the mean height of the canine tooth is different between the two subspecies of bats.
10. **[8 pts]*** Describe the importance of statistics (as a field of study or a collection of methods). Among other things make sure you describe the two major goals of statistics, identify at least three major concepts or ideas of statistics, and identify how some of the "tools" you have learned this semester illustrate or are related to why you think statistics is important.

**Statistician: Jay Bongey** **Version: B**

## Directions

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## Data Set -- BatMorph

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   c. The mean body mass of the *L. c. cinereus* subspecies is greater than 35 g.

**Version: B** **Statistician: Jay Bongey**

**Directions:**

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**Questions:**

1. **[3pts]** Identify what type of variable each of the following is: bodymass, wingspan, and hab.
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**Statistician: Devon Brock-Montgomery** **Version: B**

## Directions

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**Version: B** **Statistician: Devon Brock-Montgomery**

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**Questions:**

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**Statistician: Emily Donaldson** **Version: B**

## Directions

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**Version: B** **Statistician: Emily Donaldson**

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**Statistician: Michaela Fisher** **Version: B**

## Directions

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**Version: B** **Statistician: Michaela Fisher**

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11. **[2]* If reject $H_0$,** compute a **100(1-$\alpha$)%** *confidence region* for the parameter.

**Questions:**

1. **[3pts]** Identify what type of variable each of the following is: bodymass, wingspan, and hab.
2. **[5pts]*** Perform a thorough EDA for the wingspan of bats.
3. **[2pts]*** Perform a thorough EDA for the habitat variable.
4. **[5pts]*** Perform a thorough EDA for the relationship between skull length and wingspan.
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6. **[2pts]** Predict the height of the coronoid process if the height of the canine tooth equals the median height of the canine tooth.
7. **[2pts]** What proportion of the total variability in the coronoid process is explained by knowing the height of the canine tooth?
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10. **[8 pts]*** Describe the importance of statistics (as a field of study or a collection of methods). Among other things make sure you describe the two major goals of statistics, identify at least three major concepts or ideas of statistics, and identify how some of the "tools" you have learned this semester illustrate or are related to why you think statistics is important.

**Statistician: John Graetz** **Version: B**

## Directions

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## Data Set -- BatMorph

The Hawaiian hoary bat, *Lasiurus cinereus semotus*, is an endemic subspecies of the North American hoary bat; the mainland subspecies is *L. c. cinereus*. Researchers in Hawaii and on the mainland recorded a variety of morphological (body) characteristics on bats collected from three different types of habitat. Specifics of the variables recorded are documented in the **`Batmorph.txt`** data file (open the data file outside of R to read comments at the top). You should prepare results for each of these items …

1. Univariate EDA for canine, wingspan, and habitat.
2. Bivariate EDA for bodymass and wingspan, and skull length and wingspan.
3. Linear regression results (equation results and $r^2$) for predicting the height of the coronoid process from the height of the canine tooth.
4. Results for testing the following research hypotheses (use 5% level for each)
   a. The mean height of the canine tooth is different between the two subspecies of bats.
   b. The distribution of individuals into the three habitats differs between the two subspecies.
   c. The mean body mass of the *L. c. cinereus* subspecies is greater than 35 g.

**Version: B** **Statistician: John Graetz**

**Directions:**

You may have a pencil, a calculator, and your R output document for the **`BatMorph.txt`** file on your desk. All other materials should be fully stored out of sight and your computer should be turned off.

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**11 Steps for any Significance Test**

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9. **[1]** state rejection decision,
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11. **[2]* If reject $H_0$,** compute a **100(1-$\alpha$)%** *confidence region* for the parameter.

**Questions:**

1. **[3pts]** Identify what type of variable each of the following is: bodymass, wingspan, and hab.
2. **[5pts]*** Perform a thorough EDA for the wingspan of bats.
3. **[2pts]*** Perform a thorough EDA for the habitat variable.
4. **[5pts]*** Perform a thorough EDA for the relationship between skull length and wingspan.
5. **[2pts]*** Interpret the slope of the linear regression that you performed.
6. **[2pts]** Predict the height of the coronoid process if the height of the canine tooth equals the median height of the canine tooth.
7. **[2pts]** What proportion of the total variability in the coronoid process is explained by knowing the height of the canine tooth?
8. **[15pts]** Test that distribution of individuals into the three habitats differs between the two subspecies.
9. **[15 or 17 pts]** Test that the mean height of the canine tooth is different between the two subspecies of bats.
10. **[8 pts]*** Describe the importance of statistics (as a field of study or a collection of methods). Among other things make sure you describe the two major goals of statistics, identify at least three major concepts or ideas of statistics, and identify how some of the "tools" you have learned this semester illustrate or are related to why you think statistics is important.

**Statistician: Eva Hagen** **Version: B**

## Directions

The final exam will consist of several application-type questions related to the following topics we've covered this semester – univariate EDA (quantitative & categorical), bivariate EDA (quantitative & categorical), linear regression, one-sample t-test, two-sample t-test, and chi-square. On the final exam, you will be asked to answer each question from results that you have prepared prior to the exam using R.

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## Data Set -- BatMorph

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4. Results for testing the following research hypotheses (use 5% level for each)
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   c. The mean body mass of the *L. c. cinereus* subspecies is greater than 35 g.

**Version: B** **Statistician: Eva Hagen**

**Directions:**

You may have a pencil, a calculator, and your R output document for the **`BatMorph.txt`** file on your desk. All other materials should be fully stored out of sight and your computer should be turned off.

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**Questions:**

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**Statistician: Nicole Hayes** **Version: B**

## Directions

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**Version: B** **Statistician: Nicole Hayes**

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**Statistician: Meghan Vondriska** **Version: B**

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