

Chapter 6 Investigation Guide

Before you begin the written report,

1. Design an experiment that will result in paired data or choose a set of athletes or teams that you can compare in two contexts using paired data. For example, using all the teams in a league, investigate if there is a difference in their *ABILITY* at home and on the road. Or, using one athlete or team, investigate if there is a difference in their *ABILITY* at home and on the road for a minimum of 10 consecutive seasons. Or, using all the teams in a league, investigate if a rule change had a significant effect by comparing their *PERFORMANCES* in the year before and the year after the rule change.
2. Choose a single *numerical* variable that you will use to measure the *PERFORMANCES* of the athletes or teams that you chose in step 1.
3. Conduct the experiment or find the relevant data on the internet. In most cases, to find the appropriate data you will need to visit a separate webpage for each athlete or team in your study.

To complete the written report,

1. Write an introduction which states the question of interest and briefly describes the context of the athletes or teams' *PERFORMANCES*, including why you chose to use a particular variable to measure the *PERFORMANCES*. Describe how and where you obtained your data *and* include the null and alternative hypotheses.
2. Include a table that shows the 2 *PERFORMANCES* for each athlete or team and the difference in their *PERFORMANCE*. Make an appropriate graph to display the differences in *PERFORMANCE*. *Do not use Excel to make your graphs!* Describe the graph in detail and include appropriate summary statistics. Give a preliminary answer to the question of interest.
3. Identify and calculate the value of the test statistic you will use to test the hypotheses.
4. Describe how to use note cards to simulate the distribution of the test statistic. Then, by hand or using the applet, conduct at least 50 trials of a simulation to see what values of the test statistic could happen by *RANDOM CHANCE*, assuming that the null hypothesis is true. Include a well-labeled dotplot to display the results of the simulation.
5. Use the results of the simulation to estimate *and* interpret the *p*-value. Then, make an appropriate conclusion about the hypotheses based on the *p*-value.
6. Discuss any limitations or possible errors you may have made in your conclusion. If there is convincing evidence of a difference in *ABILITY*, discuss possible causes.

Web sites with data for multiple sports include:

- www.sports-reference.com
- www.espn.com
- www.usatoday.com/sports
- sports.yahoo.com
- www.si.com

Web site for applet:

- www.whfreeman.com/SRIS

Rubric for Chapter 6 Investigation	4 = Complete	3 = Substantial	2 = Developing	1 = Minimal
Introduction and Data Collection	<ul style="list-style-type: none"> Describes the context of the research (sport, player, team, year, etc.) and includes reasons for variable choice Has a clearly stated question of interest, including formal hypotheses Specifically describes how the data was collected (including source) Uses appropriate data to answer the question of interest and includes raw data 	<ul style="list-style-type: none"> Has a specific question of interest and includes raw data, but doesn't adequately introduce the context, describe how the data was collected, or state correct hypotheses 	<ul style="list-style-type: none"> Has a question of interest and uses appropriate data, but has several other problems 	<ul style="list-style-type: none"> Has a question of interest
Graph and Summary Statistics	<ul style="list-style-type: none"> Includes appropriate type of graph for differences Graph is clearly labeled and easy to read Graph are described accurately, including a comparison to 0 Appropriate summary statistics are calculated and discussed 	<ul style="list-style-type: none"> Appropriate graph and summary statistics are included, but graph is not well done, graph is not described adequately, or summary statistics are not discussed 	<ul style="list-style-type: none"> Includes appropriate graph and summary statistics, but there are several problems (e.g. graph or statistics are incorrect or have other major problems) 	<ul style="list-style-type: none"> A graph are included or some summary statistics are calculated
Analysis/ Simulation	<ul style="list-style-type: none"> Test statistic is clearly identified and correctly calculated Clearly describes method for performing a simulation and includes an adequate number of trials Displays results of simulation in a clear, well labeled dotplot Estimates p-value correctly 	<ul style="list-style-type: none"> Conducts a reasonable simulation/calculation to estimate the p-value, but there is a small error, the method is not clearly described, or the test statistic is not clearly identified or calculated 	<ul style="list-style-type: none"> Attempts a simulation/calculation to estimate p-value 	<ul style="list-style-type: none"> Attempts to analyze the data
Conclusions	<ul style="list-style-type: none"> Correctly interprets p-value in context Correctly uses the results of the simulation to draw an appropriate conclusion about the question of interest Shows evidence of critical reflection (discusses possible errors, shortcomings, limitations, alternate explanations, etc.) 	<ul style="list-style-type: none"> Makes the correct conclusion based on simulation/p-value Shows some evidence of critical reflection 	<ul style="list-style-type: none"> Makes a partially correct conclusion based on simulation/p-value (e.g. accepts null) Little evidence of critical reflection 	<ul style="list-style-type: none"> Makes a conclusion
Overall Presentation/ Communication	<ul style="list-style-type: none"> Clear, holistic picture of the investigation as a two-step process (e.g., includes preliminary and final conclusions) Investigation is well organized, neat and easy to read Ideas are well communicated, including appropriate transitions between sections Clearly contrasts the concepts of <i>PERFORMANCE</i> and <i>ABILITY</i> in context 	<ul style="list-style-type: none"> Investigation is organized, easy to read, and has appropriate transitions, but lacks clear communication, a holistic picture of the investigation, or does not clearly contrast the concepts of <i>PERFORMANCE</i> and <i>ABILITY</i> 	<ul style="list-style-type: none"> Investigation is somewhat organized, but has several major problems 	<ul style="list-style-type: none"> Communication and organization are poor