Section 4.1 IRA Guide

Introduction

Screen 1: This review problem asks you to compute a sample mean. Use StatCrunch. Refer back to Section 3.1 if you need a refresher.

Screen 2: This review problem asks you to compute sample standard deviation. Use StatCrunch. Refer back to Section 3.2 if you need a refresher.

Screen 3: This review problem asks you to compute z-scores. You will have to do this with a calculator, not StatCrunch. Refer back to Section 3.4 if you need a refresher or the formula for z-scores.

Screen 4: Read through this quick reminder about confounding and lurking variables.

Screen 5: List of Objectives
Definitions of ***bivariate data***, ***response (or dependent) variable***, and ***explanatory (or independent) variable***.
This chapter is all about how one numerical variable affects a second numerical variable, and these terms are very important.

Objective 1: Draw and Interpret Scatter Diagrams

Screen 1: Definition of a ***Scatter Diagram***. This is one of the two key graphs in this chapter, and should remind you of plotting points in algebra.

Screen 2: Example 1 shows how to scatter diagram. I'd recommend starting with the By Hand solution video so you understand how it is created (and therefore you will understand what it shows us). Next watch the StatCrunch solution video so you learn how to speed the process up while creating a more accurate graph. (You can open the data in StatCrunch by clicking on the icon next to the table of data.)

Screen 3: This problem is based on Example 1.
In part a) you will only get one attempt so be sure you understand which variable is the independent variable and which variable is the dependent variable. In general, the dependent variable is the one we are trying to predict.
Use StatCrunch to construct the scatter diagram for part b).

Screen 4: Carefully read this paragraph on how to identify the explanatory (independent) variable and the response (dependent) variable. This is important step in each problem in Chapter 4.

Screen 5: Carefully read through the information on interpreting scatter diagrams. We use scatter diagrams to determine the type of relation between two variables, if a relation even exists.

Screen 6: Definitions of ***positively associated variables*** and ***negatively associated variables***. You will find that the concept is related to slope from your algebra class. Watch the In Other Words video for more information on positive and negative associations.

Screen 7: This problem is based on the information on screens 5 and 6. Be sure you understand that information before trying the problem.

Objective 2: Describe the Properties of the Linear Correlation Coefficient

Screen 1: Read through this screen to understand that a scatter diagram alone is not sufficient to conclude that two variables are related. A quick read should be good enough here.

Screen 2: Definition of the ***linear (or Pearson) correlation coefficient***, ***r***. Do not worry about memorizing the formula – we will use StatCrunch to compute it. However it might be a good idea to click on the link to see the explanation of the formula.

Screen 3: You can watch the 3-minute video to gain more conceptual understanding of the formula, but you will not be responsible for this material.

Screen 4: Click the link to start Activity 1. Follow the directions for all 5 parts and you will gain a greater understanding of the linear correlation coefficient *r* and its interpretation.

Screen 5: Watch this 6-minute video for a summary of the main points from Activity 1 on the previous screen.

Screen 6: Read through the 8 properties of the linear correlation coefficient. I'd recommend making note cards for each property, or at the very least to print out the list of properties.

Screen 7: This problem is based on the material on screens 4 through 6.

Objective 3: Compute and Interpret the Linear Correlation Coefficient

Screen 1: An explanation of why we will do one calculation of the linear correlation coefficient *r* by hand even though we will be using StatCrunch to compute it.

Screen 2: Example 2 shows how to compute the linear correlation coefficient *r* by hand – you can watch the video if you'd like but I suggest you skip it.

Screen 3: A follow up to Example 2 on the previous screen – I'd skip this too.

Screen 4: This problem asks you to compute the linear correlation coefficient *r* even though we have not yet learned how to do it using StatCrunch. I'd suggest watching the StatCrunch video solution for Example 3 on the next screen, then come back and try the problem using StatCrunch.

Screen 5: Example 3 shows you how to compute the linear correlation coefficient using technology. Watch the StatCrunch solution video.

Screen 6: In this problem use StatCrunch to compute the linear correlation coefficient.

Objective 4: Determine Whether a Linear Relation Exists between Two Variables

Screen 1: This screen lists the 3 steps for testing for a linear relation. We ignore the sign of *r*, and if it is greater than the critical value from Table II then we say that there is an association. If *r* is positive then there is a positive association; if *r* is negative then there is a negative association.

There is a second way for determining if there is an association in Section 4.2 using p-values. I will explain that more streamlined approach in my Pointers for Section 4.2.

Screen 2: Example 4 shows how to determine if a linear relation (or association) exists. In this example, *r* has already been calculated in a previous example. In general, we will start with a scatter diagram, then

compute *r*, then compare *r* to the critical value from Table II.
Watch the By Hand video solution.

Screen 3: This problem is based on Example 4 on the previous screen. As in that example, the value of *r* has already been computed – you just have to look up the critical value and make the decision.

Objective 5: Explain the Difference between Correlation and Causation

Screen 1: Read through all of this information and watch the Caution video. Correlation does not imply causation when working with observational data. You must have experimental data to conclude that there is causation. Also, beware of lurking variables because they have an implication on the existence of causation as well.

Screen 2: Example 5 shows that data from an observational study cannot be used to claim causation, only correlation. It also lists some lurking variables which can confound the relation. Watch the By Hand video solution.

Screen 3: This example is based on Example 5 on the previous screen.

Screen 4: End of Section