

## Unit 2.1.1

### The Statistical Analysis Process

---

#### NEXT STEPS

The task you have just completed with the astrology example illustrates the **statistical analysis process**, or what scientists call the scientific method. Described below as a four step process.

#### Steps in a Statistical Investigation

1. Ask a question that can be answered by collecting data.
2. Decide what to measure and then collect data.
3. Summarize and analyze the data.
4. Draw a conclusion and communicate the results.

A statistical investigation is an ongoing process. Often, researchers analyze results of one study and this leads them to think of other research questions. Then they conduct more research. Also, researchers start to think more carefully about how they collect data and this may also lead them to think of ways to improve the data collection process.

18 Identify each step of the Statistical Analysis Process for the astrology investigation below.

Steps in Statistical Analysis	For the Astrology Investigation
1. Ask a question that can be answered by collecting data.	
2. Decide what to measure and then collect data.	
3. Summarize and analyze the data.	
4. Draw a conclusion and communicate the results.	

## Unit 2.1.1

### The Statistical Analysis Process

---

- 19 Look at the study descriptions on the next two pages. For each study, identify the four steps of the statistical investigation process to complete the tables.

#### Study 1 – A Study about a Population

A group of researchers studied women who visit a fertility clinic. The researchers wondered if less than half of women who visit the clinic would want to choose the gender of their future child.

They mailed a survey to women who had visited the clinic. The survey asked women if they would choose the gender of their future child, if they were able to do so. Five hundred sixty one women responded to the survey. Of these 561 women, 229 said that they wanted to choose the gender of their future child.

The researchers did a statistical analysis of the data. Based on their statistical analysis of these data, the researchers concluded that there is **convincing evidence** that *less than half* of women who visit the clinic would choose the sex of a future child. The researchers based this conclusion on this fact:

*In a sample of 561 women, it would be very unusual to observe a percentage as low as  $229/561 \approx 41\%$ . This would be unusual if, in reality, at least half of women would like to choose the gender of a future child.*

Now that you know the details from Study 1, complete the four steps of the statistical analysis process in the table below.

Steps in Statistical Analysis	Study 1
1. Ask a question that can be answered by collecting data.	
2. Decide what to measure and then collect data.	
3. Summarize and analyze the data.	
4. Draw a conclusion and communicate the results.	

Language

Convincing

inform

very st

conclu

beyon

expect

variati

## Unit 2.1.1

### The Statistical Analysis Process

---

#### Study 2 – A Study about an Experimental Treatment

Researchers wanted to know if people think a task will be hard to accomplish when the instructions are difficult to read. To answer this question, researchers randomly divided twenty student volunteers into two groups of 10 students each. Researchers gave instructions to each group of students using different fonts (see below). Instructions for one group were written in a large upright font. The other group was given the *same* instructions but in a font that used *hard-to-read italics*. Researchers asked students to read the directions and say how many minutes they thought the task would take. Researchers did this in order to figure out if the fonts used for the instructions made a difference.

This is the easy-to-read upright font that was used in the study.

This is the hard-to-read italic font that was used in the study.

The first group of students, those that read the instructions printed in the easy font, had an average time estimate of 8.23 minutes. The other group, the group that read the instructions in the *hard-to-read italic* font, had an average time estimate of 15.1 minutes.

Researchers concluded that such a large difference between the averages was not likely to have occurred by chance. There was evidence that people think a task will be harder when instructions are difficult to read.

Steps in Statistical Analysis	Study 2
1. Ask a question that can be answered by collecting data.	
2. Decide what to measure and then collect data.	
3. Summarize and analyze the data.	
4. Draw a conclusion and communicate the results.	

20 These two studies both follow the same general process but they are different in some ways. What are two ways that these studies are different?

## Unit 2.1.1

### The Statistical Analysis Process

---

#### TAKE IT HOME

In the lesson, your class looked at two different sets of data:

- **Hypothetical Data:** These were the data collected from match card activity and the applet, where you were given three cards (2 cards that had “no match” and 1 that had “match”). These were *hypothetical* data because we used a computer to create much of the data. The dot plot the class looked at showed the data on a graph. The hypothetical data allowed us to see what the proportion and dot plot would look like when there was *no relationship* between personality traits and zodiac sign. We saw that if there is no relationship between zodiac sign and personality traits then about  $\frac{1}{3}$  (or 0.33) of the class will be picking the matching traits.
- **Actual Data:** These were the data collected from when you had to read three sets of personality traits that were under your birthday.

You compared the *hypothetical* results to the *actual* result for the class. You did this to see whether the proportion in the class was consistent with that **chance variation**. If the class result was unlikely to occur by chance alone, this gave some evidence to the astrological theory.

- 1 Imagine the investigation had given each student a choice of *four* sets of personality characteristics for each sign instead of three. If there is *no relationship* between personality characteristics and sign, about what fraction of the students in the class do you expect to pick the description that astrologists say matched their sign?
- 2 Why do you think this? (Remember, the “matching set” is the set of traits that astrologists say matches a person’s zodiac sign.)

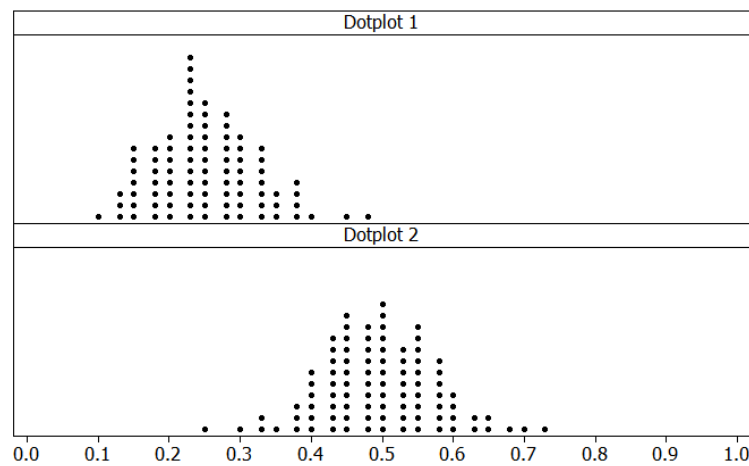
## Unit 2.1.1

### The Statistical Analysis Process

---

- 3 There are two dot plots below. One of the dot plots was made by asking 40 students to pick one of four cards at random. Each card had a set of traits written on it. Researchers computed the proportion of students that chose the card with the set of traits that matched their zodiac signs by chance. This process was repeated a large number of times to generate the data used to construct this one dot plot. Out of the two dot plots below, which dot plot do you think is the one that was constructed this way?

Why did you pick this dot plot?



- 4 Imagine that each of these 40 students then made their choices from the list of four personality types. What proportion of the 40 students needs to match correctly to provide convincing evidence that there is a connection between sign and personality type? Explain your reasoning. (Helpful hint: Use your answer from Question 2.)