Instructor’s Manual Materials to Accompany

EXPLORING MICROSOFT® OFFICE 2013, VOLUME 1

## EXCEL CHAPTER 8: STATISTICAL FUNCTIONS

### Available Instructor Resources

|  |  |  |
| --- | --- | --- |
| **Resource** | **File Name** | **Found** |
| **Student Data Files** | various | Online Instructor Resource Center |
| **Solution Files** | various | Online Instructor Resource Center |
| **Answer Keys** |  | Online Instructor Resource Center |
| Matching | e08\_answerkey\_match |
| Multiple Choice | e08\_answerkey\_mc |  |
| Concepts Checks | e08\_answerkey\_concepts |  |
| **Scorecards** | e08b1Tips\_scorecard | Online Instructor Resource Center |
| **Scoring Rubrics** | e08b1Tips\_rubric | Online Instructor Resource Center |
| **Annotated Solution File** | e08b1Tips\_annsolution | Online Instructor Resource Center |
| Scripted Lecture (Script) | e08\_script | Online Instructor Resource Center |
| Scripted Lecture Solution | e08\_script\_solution |
| Scripted Lecture Data | e08\_script\_data |  |
| **PowerPoint Presentation** | e08\_powerpoints | Online Instructor Resource Center |
| **Testbank** | e08\_testbank | Online Instructor Resource Center |
| **Instructor's Manual (lesson plans incl.)** | e08\_instructormanual | Online Instructor Resource Center |
| **Assignment Sheet** | e08\_assignsheet | Online Instructor Resource Center |
| **Prepared Exam (Chapter & App)** |  | Online Instructor Resource Center |
| Prepared Exam-Chap instruction | e08\_exam\_chap\_instruction |
| Prepared Exam-Chap solution | e08\_exam\_chap\_solution |
| Prepared Exam-Chap Data | e08\_exam\_chap\_data |
| Prepared Exam-Chap Annotated Sol. | e08\_exam\_chap\_annsolution |
| Prepared Exam-Chap Scorecard | e08\_exam\_chap\_scorecard |
| Prepared Exam-App instruction | e08\_cumexam\_instruction |  |
| Prepared Exam-App solution | e08\_cumexam\_solution |  |
| Prepared Exam-App Data | e08\_cumexam\_data |  |
| Prepared Exam-App Annotated Sol. | e08\_cumexam\_annsolution |  |
| Prepared Exam-App scorecard | e08\_cumexam\_scorecard |  |
| **File Guide** | e08\_file\_guide | Online Instructor Resource Center |
| **Instructor Resource Card** | e08\_ircard | Online Instructor Resource Center |
| **Objective Map** | e08\_objectivesmap | Online Instructor Resource Center |
| **Online Chapter Review** | e08\_chapt\_checklist | Companion Website for Students |
| **Grader Project** |  |  |
| Grader-instruction | e08\_grader\_instruction | Online Instructor Resource Center |
| Grader-solution | e08\_grader\_solution |
| Grader-data | e08\_grader\_data |
| Grader-annoted. Solution | e08\_grader\_annsolution |  |
| Grader-scorecard | e08\_grader\_scorecard |  |
| **Additional Projects (Practice & Mid Level)** |  | Online Instructor Resource Center |
| Additional Proj-Practice instruction | e08\_p\_addproject\_instruction |
| Additional Proj- Practice solutions | e08\_p\_addproject\_solution |
| Additional Proj-Practice Data | e08\_p\_addproject\_data |
| Additional Proj-Practice Ann Sol. | e08\_p\_addproject\_annsolution |
| Additional Proj-Practice Scorecard | e08\_p\_addproject\_scorecard |
| Additional Proj-Mid Level instruction | e08\_ml\_addproject\_instruction |  |
| Additional Proj-Mid Level solutions | e08\_ml\_addproject\_solution |
| Additional Proj-Mid Level Data | e08\_ml\_addproject\_data |
| Additional Proj-Mid Level Ann Sol. | e08\_ml\_addproject\_annsolution |  |
| Additional Proj-Mid Level Scorecard | e08\_ml\_addproject\_scorecard |  |

### CHAPTER OBJECTIVES

#### When students have finished reading this chapter, they will be able to:

* Use conditional math and statistical functions
* Calculate relative standing with statistical functions
* Measure central tendency
* Load the Analysis ToolPak
* Perform analysis using the Analysis ToolPak
* Perform analysis of variance (ANOVA)
* Calculate COVARIANCE
* Create a histogram

### CHAPTER OVERVIEW

#### The major sections in this chapter are:

1. **Math and Statistical Functions:** Using conditional math and statistical functions; calculating relative standing with statistical functions
2. **Descriptive Statistical Functions:** Measuring central tendency
3. **Inferential Statistics:** Loading the Analysis ToolPak; performing analysis using the Analysis ToolPak; performing analysis of variance (ANOVA); calculating COVARIANCE; creating a histogram

### CLASS RUNDOWN

1. Have students turn in homework assignments.
2. Talk about chapter using discussion questions listed below.
3. Use PowerPoint presentation to help students understand chapter content.
4. Demonstrate Excel 2013.
5. Run through Scripted Lectures for chapter.
6. Have students complete Capstone Exercise for Excel Chapter 8.
7. Use MyITLab for in-class work or to go over homework.
8. Give students Homework Handout for next class period.

### LEARNING OBJECTIVES

#### At the end of this lesson students should be able to:

* Use SUMIF, AVERAGEIF, and COUNTIF functions
* Enter SUMIFS, AVERAGEIFS, and COUNTIFS functions
* Calculate salary ranks
* Identify salary ranges by quartile
* Calculate standard deviation and variance
* Calculate correlation coefficient
* Determine frequency distribution
* Load the Analysis ToolPak add-in
* Perform analysis of variance
* Calculate covariance
* Create a histogram

### KEY TERMS

**Analysis ToolPak –** An add-in program that contains tools for performing complex statistical analysis, such as ANOVA, Correlation, and Histogram.

**ANOVA –** ANOVA stands for Analysis of Variance and is a statistical tool that compares the means between two data samples to determine if they were derived from the same population.

**AVERAGEIF function –** A statistical function that calculates the average of values in a range when a specified condition is met.

**AVERAGEIFS function –** A statistical function that returns the average (arithmetic mean) of all cells that meet multiple criteria.

**CORREL function –** A statistical function that calculates the correlation coefficient of two data series.

**COUNTIF function –** A statistical function that counts the number of cells in a range when a specified condition is met.

**COUNTIFS function –** A statistical function that applies criteria to cells across multiple ranges and counts the number of times all criteria are met.

**Covariance –** Measure of how two sample sets of data vary simultaneously.

**FREQUENCY function –** A statistical function that determines the number of occurrences of numerical values in a data set based on predetermined bins.

**Histogram –** A tabular display of data frequencies organized into bins.

**PERCENTILE.EXC function –** A statistical function that returns the percentile of a range excluding the 0th or 100th percentile.

**PERCENTILE.INC function –** A statistical function that returns the percentile of a range including the 0th or 100th percentile.

**PERCENTRANK.EXC function –** A statistical function that identifies a value’s rank as a percentile, excluding 0 and 1, of a list of values.

**PERCENTRANK.INC function –** A statistical function that identifies a value’s rank as a percentile, between 0 and 1, of a list of values.

**Population –** A dataset that contains all the information you would like to evaluate.

**Quartile –** A value used to divide a range of numbers into four equal groups

**QUARTILE.EXC function –** A statistical function that identifies the value at a specific quartile, exclusive of 0 and 4.

**QUARTILE.INC function –** A statistical function that identifies the value at a specific quartile.

**RANK.AVG function –** A statistical function that identifies the rank of a value, providing an average ranking for identical values.

**RANK.EQ function –** A statistical function that identifies the rank of a value, omitting the next rank when tie values exist.

**Sample –** A smaller portion of the population that is easier to evaluate.

**Standard deviation –** A statistic that measures how far the data sample is spread around the mean.

**SUMIF function –** A statistical function that calculates the total of a range of values when a specified condition is met.

**SUMIFS function –** A statistical function that adds the cells in a range that meet multiple criteria.

**Variance –** A descriptive statistics tool that determines the summation of the squared deviations divided by the amount of the sample (*n* – 1).

### DISCUSSION QUESTIONS

* What does “relative standing” mean?
* Does correlation equal causation? Why or why not?
* How does a histogram differ from a simple bar chart?

### WHEN USING SCRIPTED LECTURE IN CLASS, DEMONSTRATE HOW TO:

* Use SUMIF, AVERAGEIF, and COUNTIF functions
* Enter SUMIFS, AVERAGEIFS, and COUNTIFS functions
* Calculate salary ranks
* Identify salary ranges by quartile
* Calculate standard deviation and variance
* Calculate correlation coefficient
* Determine frequency distribution
* Load the Analysis ToolPak add-in
* Performing analysis of variance
* Calculate covariance
* Create a histogram

### CONNECTIONS PRACTICAL PROJECTS AND APPLICATIONS

* Have students collect data on tornados or hurricanes from the NOAA website, and use the data to show the incidence of storms. This data is already available on NOAA, but it has more impact if students calculate it themselves.
* Collect stock data online, and use the Analysis ToolPak to produce a histogram of a favorite stock’s performance.

### TEACHING NOTES

#### Math and Statistical Functions

*While the term statistics may sound intimidating, people rely on statistics to make routine decisions every day.*

1. Using Conditional Math and Statistical Functions

* Rounding values in Excel can sometimes return results that look incorrect. Excel will calculate mathematical operations on the stored values, not the displayed values—but it may be confusing to users.
* Avoid using constants in spreadsheet design—in a small spreadsheet, it may not matter, but in a large one, it can create a significant potential for error and be very time consuming—and costly—to resolve.
* It’s worthwhile to spend the time to go over the difference between absolute and relative referencing, even if you covered it earlier in the class.
* **Teaching** **Tip**: When using the SUMIF, AVERAGEIF, and COUNTIF functions, you can create an input range to specify the condition and then simply use a cell reference as the criteria argument in the function. This allows the user the flexibility to change the criteria and receive instant calculation updates.
* **Teaching Tip**: Whereas the syntax shows only two criteria for SUMIFS, AVERAGEIFS, and COUNTIFS, you can continue adding criteria ranges and criteria. If you type the function in a cell, separate criteria ranges and criteria with commas. If you use the Function Arguments dialog box, it expands to display another Criteria box as you enter data in existing boxes, or you can press Tab within the dialog box to see additional criteria ranges and criteria boxes.

1. Calculating Relative Standing with Statistical Functions

* Enabling fixed decimal mode means that any input value will automatically be assigned decimal places—for instance, if you enter 234, Excel will display it as 2.34. Discuss with students when you might want to enable fixed decimal mode.
* **Teaching Tip**: When entering criteria that contain text, a date, or an operator such as <, you must surround the criteria with quotation marks. If you enter the criteria using the insert function box, Excel will automatically add quotation marks. If you type the function from scratch instead of using the insert function, you must type the quotation marks manually.
* **Teaching Tip**: If you misspell criterion text, the results will be inaccurate. Always check the criterion text to make sure it matches text in the respective column.

#### Descriptive Statistical Functions Descriptive statistics provide the tools that help analyze and describe large datasets into pockets of manageable and usable information.

1. Measuring Central Tendency

* One way to remember what descriptive statistics are is “a way to describe data.” Descriptive statistics calculate properties students may be familiar with, such as mean, median, and so forth, and then presents it in a way that makes it more meaningful.
* Spend some time discussing the accuracy of functions, and the appropriate use of statistical functions.
* Excel’s charting capability, often used for statistical purposes, is somewhat biased toward business users.
* SUMIF, AVERAGEIF, and COUNTIF are all *aggregate functions.* These functions act on values that meet a specific condition. Discuss when students might want to use these functions.
* **Teaching** **Tip**: The frequency function will not return values that are higher than the highest number in the bins\_array. If you are interested in documenting the numbers that fall outside the predefined bins\_array, select one additional cell to the return range. This cell will populate with a count of the numbers that fall outside the highest number in the bins\_array.
* **Teaching Tip**: Make sure you add the right parenthesis after the Bins\_Array but before adding /50. This will complete the frequency function before dividing the results by 50 to calculate the percentage.

#### Inferential Statistics

1. Loading the Analysis ToolPak

* Inferential statistics let you make inferences based on experimentally observed data—they are not descriptions of data. Its important students understand that inferences are not 100% certain—but are probabilities.

1. Performing Analysis Using the Analysis ToolPak

* Remind students that Excel still only handles dates after January 1, 1900, and discuss how this could affect data in worksheets.

1. Performing Analysis of Variance (ANOVA)

* Students must understand the results given by Excel functions, or they may draw the wrong conclusions.

1. Calculating COVARIANCE
2. Creating a Histogram

* **Teaching Tip:** The Analysis ToolPak offers 19 total tools. To further explore the possibilities, click the ? icon in the Data Analysis start screen. Furthermore, Excel 2013 has added six new statistical functions that can be used outside the Analysis ToolPak. See Table 8.4 for more details.

### ONLINE CHAPTER REVIEW

To find an online chapter review to help your students practice for tests, visit the Companion Website at <http://www.pearsonhighered.com/exploring/>.

### ADDITIONAL WEB RESOURCES

1. What's new in Excel 2013—<http://office.microsoft.com/en-us/excel-help/what-s-new-in-excel-2013-HA102809308.aspx>
2. Online Excel Help—[www.mrexcel.com](http://www.mrexcel.com)
3. Microsoft Tech Support—<http://support.microsoft.com>

### PROJECTS AND EXERCISES

|  |  |  |
| --- | --- | --- |
|  | **Data file** | **Save As** |
| Hands-on Exercise 1 | e08h1Assessment.xlsx | e08h1\_Assessment\_LastFirst.xlsx |
| Hands-on Exercise 2 | e08h1Assessment\_LastFirst.xlsx | e08h2\_TestScores\_LastFirst.xlsx |
| Hands-on Exercise 3 | e08h2TestScores\_LastFirst.xlsx | e08h3\_Analysis\_LastFirst.xlsx |
| Practice Exercise 1 | e08p1Books.xlsx | e08p1Books\_LastFirst.xlsx |
| Practice Exercise 2 | e08p2WaitTime.xlsx | e08p2WaitTime\_LastFirst.xlsx |
| Practice Exercise 3 | e08p3Spa.xlsx | e08p3Spa\_LastFirst.xlsx |
| Mid-Level Exercise 1 |  | e08m1Stocks\_LastFirst.xlsx |
| Mid-Level Exercise 2 | e08m2Stats.xlsx | e08m2Stats\_LastFirst.xlsx |
| Mid-Level Exercise 3 | e08m3Portfolio.xlsx | e08m3Portfolio\_LastFirst.xlsx e08m3PortfolioReview\_LastFirst.xlsx |
| BYC 2 Research | e08b2MarketResearch.xlsx | e08b2MarketResearch\_LastFirst.xlsx |
| BYC 3 Disaster Recovery | e08b3Survey.xlsx | e08b3Survey\_LastFirst.xlsx |
| BYC 4 Collaboration | e08b4Performance.xlsx | e08b4Performance\_LastFirst.xlsx |
| Capstone | e08c1Satisfaction.xlsx | e08c1Satisfaction\_LastFirst.xlsx |

### CHAPTER REVIEW/ANSWERS TO END OF CHAPTER MATERIAL

**Key Terms Matching Answer Key**

1. A **Histogram (H)** is tabular display of data frequencies organized into bins.

2. **Covariance (F)** is the measure of how two sample sets of data vary simultaneously.

3. **ANOVA(B)** is astatistical tool that compares the means between two data samples to determine if they were derived from the same population.

4. The **Analysis ToolPak (A)** is an add-in program that contains tools for performing complex statistical analysis.

5. **Variance (S)** is a descriptive statistics tool that determines the summation of the squared deviations divided by the amount of the sample (*n* – 1).

6. **Standard Deviation (Q)** measures how far the data sample is spread around the mean.

7. The **FREQUENCY function (G)** determines the number of occurrences of numerical values in a dataset based on predetermined bins.

8. The **CORREL function (D)** calculates the correlation coefficient of two data series.

9. The **SUMIF function (R)** calculates the total of a range of values when a specified condition is met.

10. The **RANK.EQ function** **(P)** identifies the rank of a value, omitting the next rank when tie values exist.

11. The **RANK.AVG function (O)** identifies the rank of a value, providing an average ranking for identical values.

12. The **QUARTILE.INC function (N)** identifies the value at a specific quartile.

13. The **QUARTILE.EXC function (M)** identifies the value at a specific quartile, exclusive of 0 and 4.

14. The **PERCENTRANK.INC function (L)** identifies a value’s rank as a percentile, between 0 and 1, of a list of values.

15. The **PERCENTRANK.EXC function (K)** identifies a value’s rank as a percentile, excluding 0 and 1, of a list of values.

16. The **COUNTIF function (E)** counts the number of cells in a range when a specified condition is met.

17. The **AVERAGEIF function (C)** calculates the average of values in a range when a specified condition is met.

18. The **PERCENTILE.INC function (J)** identifies the kth percentile of a specified value within a list of values, including the 0th and 100th percentiles.

19. The **PERCENTILE.EXC function (I)** identifies a value at a specified percentile; however, the .EXC excludes 0th or 100th percentiles.

**Multiple Choice Answer Key**

1. A workbook contains a list of university students. You want to identify the total number of students who are seniors and who are majoring in biology. Without modifying the original student dataset, what function can you use to find the answer to your question?  
**(d) COUNTIFS**

2. What function would you use to identify a values rank as a percentile, excluding 0 and 1?  
**(b) PERCENTRANK.EXC**

3. A worksheet contains a list of traffic stops over the past 12 months. The police chief wants to determine the total dollar amount of all traffic tickets written in the ZIP code 46208. What function derives the correct answer?  
**(a) SUMIF**

4. A worksheet contains test scores for students in an aviation class. The scores are 95, 90, 90, 85, 80, 75, 75, 70, and 60. Using the RANK function that is considered a best practice, what is the rank of the second student who scored 90?  
**(c) 2.5**

5. What function would you use to calculate the spread of data around the mean in a data sample?  
**(a) STDEV.S**

6. You hypothesize that there is a relationship between lack of regular exercise and illness. To research this theory, you have compiled a sample set of data that contains numbers of days in which an hour or more of exercise is completed as well as numbers of days sick within a calendar year. What tools in Excel could you use to investigate the relationships between the data? Select all that apply.  
**(a, c) CORREL, COVARIANCE**

7. Which of the following tools is not a part of the Data Analysis ToolPak add-in?  
**(d) RANK.EQ**

8. What is the difference between STDEV.S and STDEV.P?  
**(a) STDEV.S calculates standard deviation of a sample; STDEV.P calculates the standard deviaition of a population.**

9. What is the difference between a sample and a population?  
**(b) A population contains all data possible for evaluation, while a sample contains a portion of the data.**

10. What keystroke combination is required to calculate a Frequency data array?  
**(c) CTRL+Shift+Enter**