

Mathematics
Statistics
Grade 8



Lesson Plans

"A Typical Math Student"

Subject:

Mathematics: Statistics

Level:

Grade 8

Abstract:

Students will find the mean, median, mode, minimum, maximum, and lower and upper quartile of a set of data. They will make a histogram and a box-and-whisker plot for the data. This will first be performed by hand, then with the use of Microsoft Excel. Students will gather data about student height, hand span, and wrist circumference. Students will describe the class data set and display it as a histogram and a box-and-whisker plot. Finally, the students will create and present a PowerPoint presentation on the typical math student. The histograms and box-and-whisker plots from Excel will be imported into the PowerPoint presentation. This lesson requires the Analysis ToolPak to be installed in Excel. This is not done during general install. The Analysis ToolPak must be installed before doing the lesson. (See the "Step Sheet: Installing the Analysis ToolPak" attachment.)

Invitation:

You have probably heard statements like the following:

"The average family has 2.2 children."

"The average student watches 3 hours of TV a day."

"A typical adult male is 5 feet 8 inches tall."

Have you wondered how they come up with these statements? How do they know what everybody does? How does a family have 0.2 children? Who did they ask? In this lesson you will learn the answers to some of these questions. You will come up with a report on the average student in your class. You will first set up an Excel spreadsheet that finds the measures of center of data, as well as the five-number summary. You will also use the spreadsheet to create a histogram and box-and-whisker plot for the data. Next, you will determine what a typical math student is like. You will collect data about each student's height, hand span, and wrist circumference, analyze the data and then report on the typical student.

Situations

Where: The lesson will take place at school on computers in the classroom or computer lab. Some of the lesson may take place outside the school if students have access to a computer.

When: This lesson will take place during mathematics class, during the lessons on statistics. This will take place at the start of the statistics unit when learning about the measures of center, the five number summary, and how to display data. This lesson will teach and then reinforce these ideas, and show how computers can be used to analyze data. Students should have prior knowledge of basic graphing and finding the average of numbers.

How Long: This lesson will require 6-8 days to complete.

Tasks:

Task 1:

Each student will learn how to find the measures of center and the five-number summary for a data set. Each student will also learn to display data as a histogram and a box-and-whisker plot. (See the "Worksheet: Describing a Set of Data" and "Worksheet: Displaying a Set of Data" attachments.)

Task 2:

Each student will find the measures of center and the five-number summary for simple data sets. Each student will also make a histogram and a box-and-whisker plot for the data. This should be a review of the concepts from Task 1, and reinforce the students' prior learning before using the computer to analyze the data. (See the "Worksheet: Analyzing a Set of Data" attachment.)

Task 3:

Students, individually or with a partner, will create an Excel spreadsheet to perform the data analysis from Task 2. (See the "Step Sheet: Analyzing Data in Excel" attachment.) After setting up the spreadsheet, students will redo the problems from the "Worksheet: Analyzing a Set of Data" attachment. This will verify that their spreadsheet is working correctly, and it will also check the work done in Task 2.

Task 4:

Each student will measure and record his/her height, hand span, and wrist circumference. Hand span should be measured by spreading the fingers apart and measuring from the tip of the pinkie to the tip of the thumb. These should be recorded in a data chart and distributed so that each student has data for the entire class. (See the "Sample: Student Data Sheet" attachment.)

Task 5:

Students, individually or with a partner, will use their Excel spreadsheet from Task 3 to analyze the class data. The students will find the measures of

center, the five-number summary, and make histograms and box-and-whisker plots for the class heights, hand spans, and wrist circumferences.

Task 6:

Each student will create a PowerPoint presentation detailing a typical math student. (See the “Worksheet: Student Presentation” attachment.) The presentation will include definitions of the measures of center. It will report the measures of center and the five-number summary for the class data, as well as display the class data in histogram and box-and-whisker plots. The plots will be imported into PowerPoint from Excel.

Interactions:

Full Class: The teacher will initiate full-class discussions and indicate whether tasks will be discussed using a brainstorm or discussion style. The teacher will facilitate the collecting of the student data and distribution of the data to the class.

Partners: Partners will develop and use Excel in one or two tasks to analyze data and find the measures of center, and to make box-and-whisker plots and histograms.

Individual: Students will find the measures of center and five-number summary for simple data sets. They will draw a histogram and box-and-whisker plot for each data set. Both of these tasks will be done by hand. Each student will create a PowerPoint presentation detailing a typical math student.

Standards:

Mathematics: Probability and Statistics

6.0 Students know the definitions of the mean, median, and mode of a distribution of data and can compute each in particular situations.

8.0 Students organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem-and-leaf displays, scatterplots, and box-and-whisker plots.

Assessment:

- “Solutions to Worksheet: Analyzing a Set of Data:” Aids teacher in assessing student knowledge of the measures of center, the five number summary, histograms, and box-and-whisker plots.

- "Student Presentation Rubric:" Rubric filled out by teacher that assesses the student's results and knowledge in "Worksheet: Student Presentation."

Tools:

- Microsoft Excel with Analysis ToolPak
- Microsoft PowerPoint
- Yardsticks, rulers, tape measures (cloth)
- Graph Paper

Project Tips and Alternatives:

Tip #1:

Make sure the data Analysis ToolPak is installed before the lesson begins. (See the "Step Sheet: Installing the Analysis ToolPak" attachment.)

Tip #2:

Make an overhead transparency of the data sheet. The students can record their data onto the overhead transparency, which can then be displayed and copied by the students. Have the students record their data on a common data sheet, then photocopy the data sheet and distribute at the start of the next class.

Tip #3:

Small groups can be used instead of partners if the dynamic of the class or availability of technology necessitates it.

Tip #4:

Depending on whether your students have had prior experience with Microsoft Excel, you may want to walk through the step sheet with them the first time.

Tip #5:

If there is more than one mode for a data set, Microsoft Excel only gives one value for the mode. After sorting the data, students will have to check the data to see if there is more than one mode. This is an easy task when the data is sorted.

Tip #6:

Microsoft Excel does not find the lower and upper quartiles, so the data must be sorted and the median found. We then use the median function on the lower half of the data to find the lower quartile. A similar method is used on the upper half of the data to find the upper quartile. This may be confusing and you may want to explain this when the students are performing steps 23 – 28 in the "Step Sheet: Analyzing Data in Excel" attachment.

Attachments:

- "Worksheet: Describing a Set of Data"
- "Worksheet: Displaying a Set of Data"
- "Worksheet: Analyzing a Set of Data"
- "Solutions to Worksheet: Analyzing a Set of Data"
- "Step Sheet: Analyzing Data in Excel"
- "Step Sheet: Creating a Histogram in Excel"
- "Step Sheet: Creating a Box-and-Whisker Plot"
- "Sample: Data Analysis Worksheet"
- "Sample: Student Data Sheet"
- "Sample: Analysis of Class Data"
- "Worksheet: Student Presentation"
- "Student Presentation Rubric"
- "Step Sheet: Creating a PowerPoint Presentation"
- "Step Sheet: Importing Graphs from Excel into PowerPoint"
- "Sample PowerPoint Presentation: A Typical Math Student"
- "Step Sheet: Installing the Analysis ToolPak"

Web Resources – Content:

A list of [linked web resources](#) related to the content of this lesson can be found on the Lesson Page.

Web Resources – Excel:

A list of [linked web resources for Excel](#) can be found on the Excel Resources page.

Assistive Technology:

Please refer to the [Assistive Technology section](#) for information on methods and devices to help ensure that all students have access to the curricula in the least restrictive environment.