

Specific Objectives

Students will understand that

- each statistic—the mean, median, and mode—is a different summary of numerical data.
- conclusions derived from statistical summaries are subject to error.
- they can use the measures of central tendency to make decisions.

Students will be able to

- make good decisions using information about data.
- interpret the mean, median, or mode in terms of the context of the problem.
- match data sets with appropriate statistics.

Specific Language and Literacy Objectives

Students will be able to

- read and comprehend the problem situation.
- complete annotation and summarization with quantitative and information technology information from the problem situation.
- demonstrate understanding of mathematics through writing complete and correct responses to mathematics problems.
- demonstrate ability to describe, analyze, and synthesize information using measures of central tendency to look at patterns of data.
- use appropriate quantitative and information technology vocabulary to discuss mathematics in this lesson.

[Student Handout]

For this lesson, you will learn a skill called annotation. Annotation is a reading comprehension tool that helps readers read, and understand what they read. To annotate, you will underline the **key concepts** in the problem situation and circle the **key quantitative information**. Use the annotation symbols in Figure 1. Your instructor will annotate the first sentence or two with you, as a whole class. Then you will be asked to annotate the remainder of the problem situation on your own as you read.

Figure 1. Annotation Symbols

1. Underline Key Concepts in the Problem Situation

2.

Circle key quantitative information in the problem situation

Problem Situation: How Do Students Text?

You are the Director of Information Technology at White Oak Community College (WOCC). Recently, students and faculty have been complaining to you about the online campus platform. It can be difficult to communicate about assignments and school events on the platform. Most students at WOCC do not have laptops or computers at home. Instead they use smartphones or tablets to do school work. Students also complain that it takes instructors too long to answer messages about homework assignments. Instructors complain that students do not check their messages often enough, or do not receive information about course work.

The Committee for Virtual Learning (the Committee) proposes to install a mass text messaging system on campus. You believe that this is a good idea. This system, called EducText, would allow students and faculty to text about assignments, course work, and anything school related for free. It would help instructors provide quick responses to students, and send text messages to the entire class at one time. EducText would allow the school to communicate time-sensitive information, using text messages, to students and staff about urgent safety issues, school closings, and weather alerts.

Given the significant costs of implementing EducText, the Committee has decided that implementation is only cost-effective if most students send or receive text messages at least 20 times a day. You assume that most students are active texters, but you must conduct research to understand how students at WOCC use text messaging in their daily lives. This will help you determine if EducText is worth the cost. You conduct this research during the 2014-2015 school year.

2. Please answer, in one to two sentences, the following questions about the problem situation.

- a) What problem is the White Oak Community College faculty and students trying to solve?
- b) EducText, would allow students and faculty to text about assignments, course work, and anything school related for free. Why is this important to the faculty and/or students?
- c) Why is it important for the Committee to know whether the students send or receive at least 20 text messages each day?

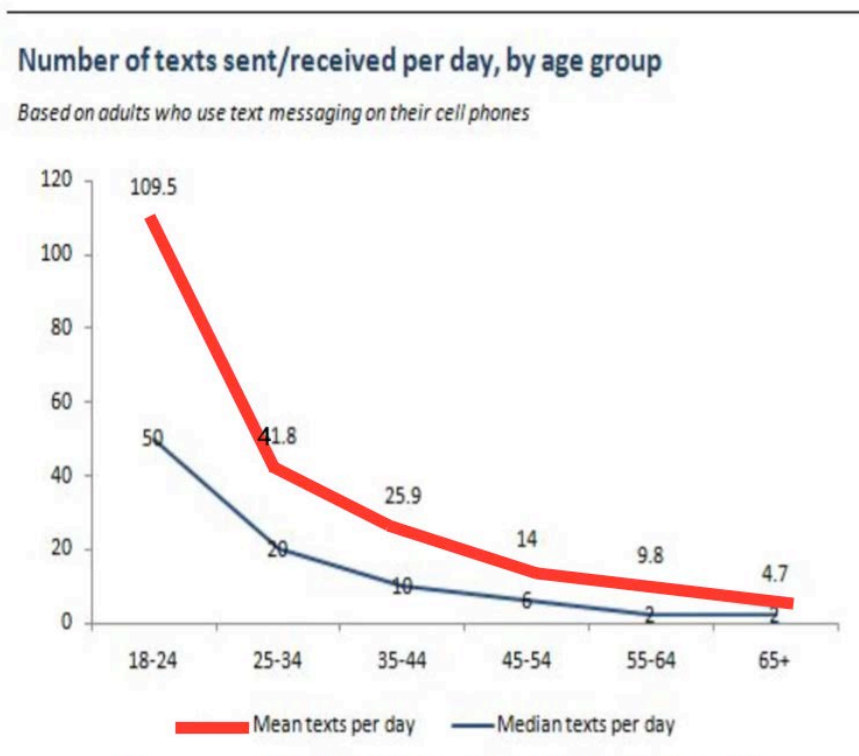
Now, let's collect data about how often students in this class text message!

3 a) What is the typical number of texts that students in this class send and receive each day? Discuss with your group the best way to approach this question. Try to find a number. Think about how you got that number.

b) Based on the results of your class, would it be worth buying EducText at WOCC? Should the college purchase EducText?

Figure 1 below shows national data about the number of texts adults send and receive. These results are organized by age group.

Figure 1: Number of texts/sent received per day, by age group in the U.S. during 2011



*Based on national data. Source: <http://www.pewinternet.org/2011/09/19/how-americans-use-text-messaging/>

(4) Examine Figure 1. Make sure to take note of the labels in the figure.

a) Write at least two factually precise statements about the data. That is, write two statements that are based on information that is in the data chart above. Write your answer in 1-2 complete sentences. (It is important to write complete sentences because it helps your instructor better understand your mathematical thinking.) Be sure your answer is precise and complete.

Writing Tip!

Writing precise and complete answers in complete sentences can be challenging. Here is an example of a possible answer to this question:

Twenty-five to thirty-four year-old students at WOCC send or receive an average of 41.8 texts per day and a median of 29 texts per day.

[Student Handout]

b) Now, using *Figure 1* to draw one conclusion about texting and age. Write your answer in 1-2 **complete sentences**.

c) If the texting data shown in *Figure 1* for 18-24 year olds is representative of the texting habits of WOCC's students, would the EducText system be worth the expense?

(5) Why do you think the mean number of texts sent and received is significantly greater than the median? Again, write your answer in 1-2 complete sentences.

(6) For the 45- 54 year olds, their mean is 14 and their median is 6. Construct a sample of six individuals to illustrate what data set might look like which has a mean of 14 and median of 6. As you are working, think about the process you use to determine this set of numbers.

(7) What will generally be true for a data set with a significantly greater mean than median?

(8) Write an example set of five data points for which the mean is significantly *less* than the median.

(9) In your research, you decided to learn more about different uses of information technology. You wanted to understand the possible options that might be available for staff and students to communicate at White Oak Community College. You found the following statistics:

- A. Approximately half of all Americans between 18 and 24 send and receive at least 50 texts a day
- B. On average, American 18-29-year-olds send fifty more texts per day than 30-49 year olds.
- C. The best hour of the day to post on Twitter (measured by re-tweets) is at 5pm.
- D. The average amount of time spent per Facebook visit is 20 minutes.
- E. 49% of 18-24-year-olds go to Facebook when they wake up.
- F. Among all social media sites Facebook has the most users.
- G. The average Facebook user is 40.5 years old.
- H. Half of all Facebook users age 18-29 have at least 300 Facebook friends.

For each of the above statistics, decide whether the mean, median, mode is being used. If neither the mean, median, or mode is being used, write “neither.”

9 (A):

9 (B):

9 (C):

9 (D):

9 (E):

9 (F):

9 (G):

9 (H):

Making Connections

Record the important mathematical ideas from the discussion.

Further Applications

Broadband Speeds

Net neutrality refers to the idea that information should be processed through the Internet in the order received, rather than allowing companies to pay more to let their traffic move through the Internet more quickly. This is an issue because the Internet is limited in how much information it can deliver, and how fast. Some people are frustrated by slow download speeds for media, such as Netflix streaming.

In studying this issue, you found some surprising information. You found following statistic:

The median Internet usage in the U.S. is less than 2 gigabytes per month per person, while the mean usage was over 9 gigabytes per month per person.

(1) Does this suggest that people are consuming approximately equal amounts of the Internet, or are some people consuming much greater amounts than others? Explain your answer in one or two complete sentences.

(2) Construct a scenario of five download speeds in which the median of the five speeds is 2 gigabytes and the mean is 9 gigabytes.

Website Analytics

Your company maintains a website to sell its products. You wish to analyze the activity your website has received. You measure the activity in terms of “visits” to your site. You want to report to the president of the company about the activity of the website. You find that on most days, your site received between 8,000 and 12,000 visits. However, there were 8 days during the year in which the website was offline due to construction. Also, during the first month, the website had not yet been advertised on Google searches, so the number of visits was very small.

(3) Which will be greater, the mean or the median number of visits per day? What would offer the better representation of how active the website has been over the last year - the mean or the median number of visits per day? Explain your answer in one or two complete sentences.

(4) Construct a scenario of 5 values in which the median is 10,000 visits but the mean is 8,000 visits.

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