WAMC Lesson Plan

Name(s): Bennett Kling
Lesson Title: Ch. 5, sec. 3. "Graph Frequency Distributions"
Date: Created June 24th, 2014
Text: Cengage Financial Algebra   Lesson Length: 1 period (55 mins)

Domain: Interpreting Categorical and Quantitative Date	
Big Idea (Cluster): Summarize, represent, and interpret data on a single count or measurement variable.	
Common Core State Standards: S-ID 1-4	
Mathematical Practice(s): MP3, MP6	

Content Objectives: Create a frequency Distribution from a set of data. Use box-and-whisker plots and stem-and-leaf plots to display information. Use linear regression to negotiate the purchase or sale of a used car.	**Language Objectives:** • Use measure of center vocabulary to describe the accuracy of data diagrams • Use the targeted vocabulary to describe patterns. • Debate the price of a car using evidence from a data diagram
Vocabulary: • Frequency distribution • frequency • stem-and-leaf plot • box-and-whisker plot • boxplot • modified boxplot	**Connections Prior to Learning** • Section 5.2 dealt with measures of center, and this section relies on student's understanding of mean, median, mode, range, quartiles, and interquartiles. • Section 5.1 introduced the car market, classified ads, and other concepts. This section builds upon that to help students apply their understanding to decision making.
Questions to Develop Mathematical Thinking: • What would cause a car's price to be an outlier? • If you think a used car is priced too high, would the mean, median, or mode be the most convincing to lower the price? • How is frequency related to mode? • What can you tell by looking at the shape of a stem-and-leaf plot?	**Common Misconceptions:** • When evaluating a range of values, do you include or exclude the ends of your range? What language can you use to define your boundries as you want them. • When switching between modified and regular boxplots, the "whiskers" change significance. • Even and odd amounts of data points change how you find measures of center. • Outliers are always upper outliers, since that is how they are in the book.

Assessment (Formative and Summative):

• Formative: During the explore, students will do the CCSS warm-up, and two "check your understanding" problems. Students will be discussing in pairs many answers, this will also serve as formative assessment. • Summative: Homework problems represent a summative assessment of the material covered.

Materials:

• Overhead projector with attached computer for internet access.

- Whiteboards for vocabulary lists and definitions.
- Textbooks
- Student journals

Instruction Plan:

Launch: Go to craigslist.org, and type in a make/model that the class decides, while making sure it is a common car (honda civic, ford ranger, etc.). There should be a few hundred listings, so browse a few of them to show the diversity of offers. Out of all of these listings, there are a few that are the "best deal" according to what you are looking for. This lesson will teach you how to use **math** to help you make an offer on a car and don't overspend.

Explore:
- Start on pg. 231.
- Do the CCSS warm up individually in math journals. Select a few students to share out, reviewing vocabulary describing measures of center. Write and define Mean, median, mode, quartile, interquartile range, etc… on side board.
- Lead example 1 on the overhead. Instead of a calculator, use google spreadsheets program. Pay attention to the vocab of "frequency" and "frequency distribution" – putting these on the side board.
- Students discuss the "check your understanding" on pg. 232 in pairs and then share out.
- Skipping Example 2, instead ask students to calculate the mean of the prices in example 1.
- Lead example 3 on the overhead. Skip the "check your undertanding"
- Do a formative assessment for box and whisker plots: put one on the board, have students find the interquartile range, and mean. Students will work independently and than self assess their understanding, from 0-5 (fist to five).
- Draw the boxplot from example 5 and lead students through finding the interquartile range. Review how to find outliers (definition of outlier), and ask which end point looks like an outlier (43k or 3k). Prove that 43k is an outlier by following through the example.
- Skipping what a modified boxplot is for now, have students work on "applications" on pg 236, #'s 1, 3, 4, 5, 6 (not k), 8, 10 (not m), 11, 12. The rest is completed as hw.

When I observe students: Are students recording the work they do on their calculators? Are students using their neighbors as resources to ask questions? Do students use vocabulary correctly? Do students use their calculators correctly? Are students taking complete notes? Are students showing any of the above misconceptions?

Questions to Develop Mathematical Thinking as you observe:
- What would cause a car's price to be an outlier?
- If you think a used car is priced too high, would the mean, median, or mode be the most convincing to lower the price?
- How is frequency related to mode?
- What can you tell by looking at the shape of a stem-and-leaf plot?

Answers:
- What would cause a car's price to be an outlier?
  Aftermarket mods, low miles, good body condition would all cause an upper outlier. Collision history, back maitenence, high miles would cause a lower outlier.
- If you think a used car is priced too high, would the mean, median, or mode be the most

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convinging to lower the price?

> It would depend on the shape of the data and a good argument could be made for any. For example, if the car was priced at the mode, you could say that as a buyer you have many other markets, and point to reasons why this car is below the value of other similarly listed cars.

- How is frequency related to mode?
  > The greatest frequency is also the mode.
- What can you tell by looking at the shape of a stem-and-leaf plot?
  > You can predict outliers, you can find the mode, you can find the median, you can predict the mean.

Summarize: With today's technology (internet, Craigslist), there are many options for buying a car. With so much data, you can use math to make sure you make the best purchase. Many people can visualize data better than having a long list of entries. This is why stem and leaf plots and boxplots are useful. With practice, you can apply this math to make informed purchases of used cars, to price your used car when selling appropriately, and to bargain on the sale of a car (or any other piece of capital).
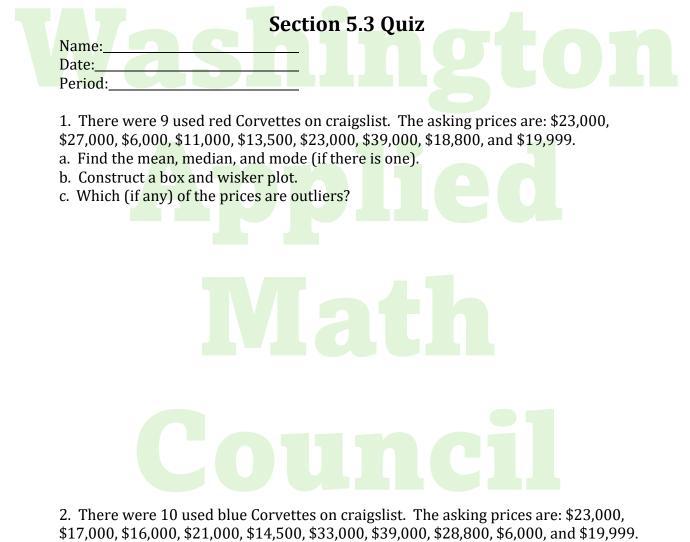
Career Application(s):

- Careers that need vehicle ownership (merchendisers, taxi/towncar, etc), Retail, automotive dealerships, managing capital purchases (industry).

21st Century Skills and Interdisciplinary Themes:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)
☐ Global Awareness   ☒ Financial/Economic/Business/Entrepreneurial Literacy   ☐ Civic Literacy
☐ Health/Safety Literacy   ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☐ Make Judgments and Decisions
☐ Solve Problems
Communication and Collaboration
☒ Communicate Clearly
☐ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
☐ Use and manage Information
Media Literacy
☒ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☐ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
☐ Be Flexible
Initiative and Self-Direction
☐ Manage Goals and Time
☐ Work Independently
☒ Be Self-Directed Learners
Social and Cross-Cultural
☐ Interact Effectively with Others
☐ Work Effectively in Diverse Teams

Productivity and Accountability
☐ Manage Projects
☐ Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
☐ Be Responsible to Others

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Section 5.3 Quiz

Name:_____

Date:_____

Period:_____

1. There were 9 used red Corvettes on craigslist. The asking prices are: $23,000, $27,000, $6,000, $11,000, $13,500, $23,000, $39,000, $18,800, and $19,999.

a. Find the mean, median, and mode (if there is one).

b. Construct a box and wisker plot.

c. Which (if any) of the prices are outliers?

2. There were 10 used blue Corvettes on craigslist. The asking prices are: $23,000, $17,000, $16,000, $21,000, $14,500, $33,000, $39,000, $28,800, $6,000, and $19,999.

a. Find the four quartiles.

b. Construct a stem and leaf plot.

c. The $28,000 listing has the best stereo and is the one you would like to make an offer on.

    Would it be best to use the mean, meadian or mode to negotiate the price down?

    Create the statement you would read over the phone to get the price lowered using your selected measure of center.

Grading Rubric and Answer Key

1. There were 9 used red Corvettes on craigslist. The asking prices are: $23,000, $27,000, $6,000, $11,000, $13,500, $23,000, $39,000, $18,800, and $19,999.
a. Find the mean, median, and mode (if there is one).
Mean: $20,144; median: $19,999; mode: $23,000
3 points – one for each correct measure of center with work shown.

b. Construct a box and wisker plot.

$6,000,	$12,250,	$19,999,	$25,000,	$39,000.
min	q1	q2	q3	max

5 points – 2 for accuracy of answers, 2 for correct construction and diagraming, 1 for labeling.

c. Which (if any) of the prices are outliers?
iqr: 25,000-12,250 = 12,250 1.5(12250)=18375
q3+1.5iqr = $43,375, so there are no upper outliers
q1 – 1.5iqr = $1,624, so no lower outliers.
4 points – 2 for finding the IQR, 1 for finding the upper outlier, 1 for showing no lower outliers

2. There were 10 used blue Corvettes on craigslist. The asking prices are: $23,000, $17,000, $16,000, $21,000, $14,500, $33,000, $39,000, $28,800, $6,000, and $19,999.
a. Find the four quartiles.
4 points - one for each of the numbers correctly labled.
In order: $6,000, $14,500 $16,000, $17,000, $19,999, $21,000, $23,000, $28,800, $33,000, $39,000

$16,000,	$20,499	$28,800,	$39,000
q1	q2	q3	q4

b. Construct a stem and leaf plot.
5 points – 4 for correct values, 1 for key
0 | 6
1 | 4.5 6 7 9.999
2 | 1 3 8.8
3 | 3 9

1 | 3 = $13,000

c. The $28,000 listing has the best stereo and is the one you would like to make an offer on. Would it be best to use the mean, meadian or mode to negotiate the price down? Create the statement you would read over the phone to get the price lowered.

(mean: $21,830, median : $20,499, Mode: none)

The mode doesn't make much sense and there is none. The median is lower than the mean, and so using the median should be a better argument.

Answers may vary, but an example statement is:

"Hello, there are 10 similar blue corvettes ranging from $6,000 to $39,000. Yours, at $28,000 is priced $7,500 higher than half of the other similar cars. I am interested in buying your car, could you consider selling at a lower price?"