4-2 Automobile Transactions

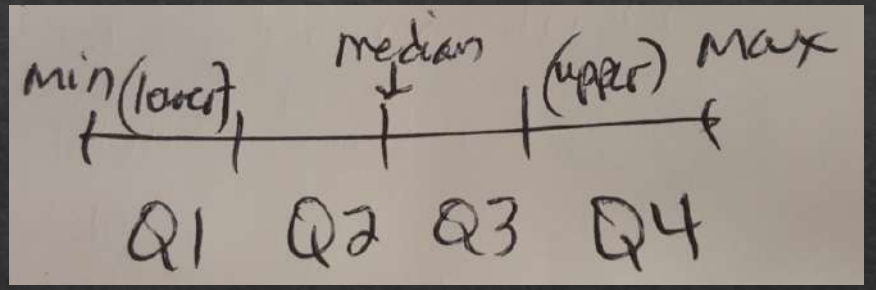
Advanced Financial Algebra

How can statistics help you negotiate the sale or purchase of a car?

- The Kelley blue book (www.kbb.com) and Edmunds (www.Edmunds.com) are two sources on the internet you can use to find the value of a used car.
- Compile a list of advertised prices for the cars you want.
- Then you can use statistics to help analyze the numbers (data).
- Measures of central tendency represent "typical" values for the prices and can give you an idea of what is a fair offer.

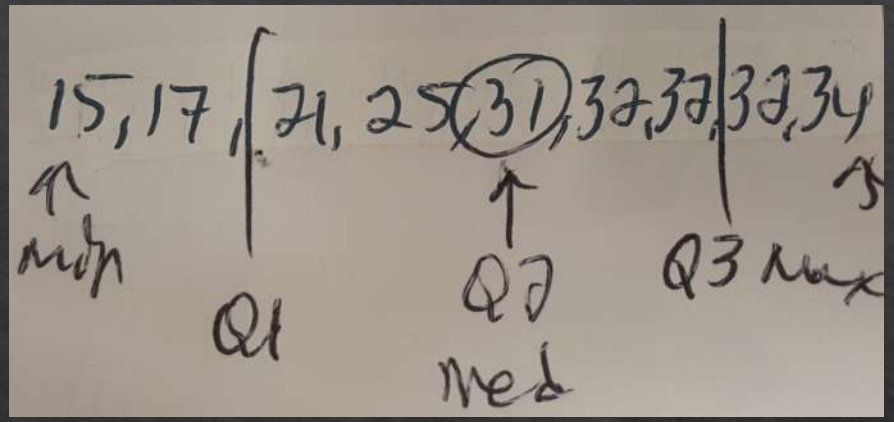
Quartiles

- Data can be split into quartiles (4 chunks) to help measure dispersion or spread.
- Quartile 1 is the middle of the first half of the data. If you have an even number of results, you must average the two middle numbers.
- Quartile 2 is the median (middle).
- Quartile 3 is the middle of the second half of the data. If you have an even number of results, you must average the two middle numbers.
- Quartile 4 is the maximum.
- Interquartile range = $Q_3 - Q_1$



Example 1 – find quartiles

- Find the quartiles for tire pressures at an auto clinic if the pressures were 15, 17, 21, 25, 31, 32, 32, 32, 34 psi (pounds per square inch).



- SOLUTION:
- Always list data in order first. Note: there were 9 cars at the clinic.
- The minimum was 15 psi and the maximum (Q_4)was 34 psi. The median (middle Q_2) was 31 psi.
- $Q_1 = \frac{17 + 21}{2} = 19$ psi $\qquad Q_3 = \frac{32 + 32}{2} = 32$ psi

Example 2 – interquartile range

What is the interquartile range for the data in Example #1?

SOLUTION:

Remember,

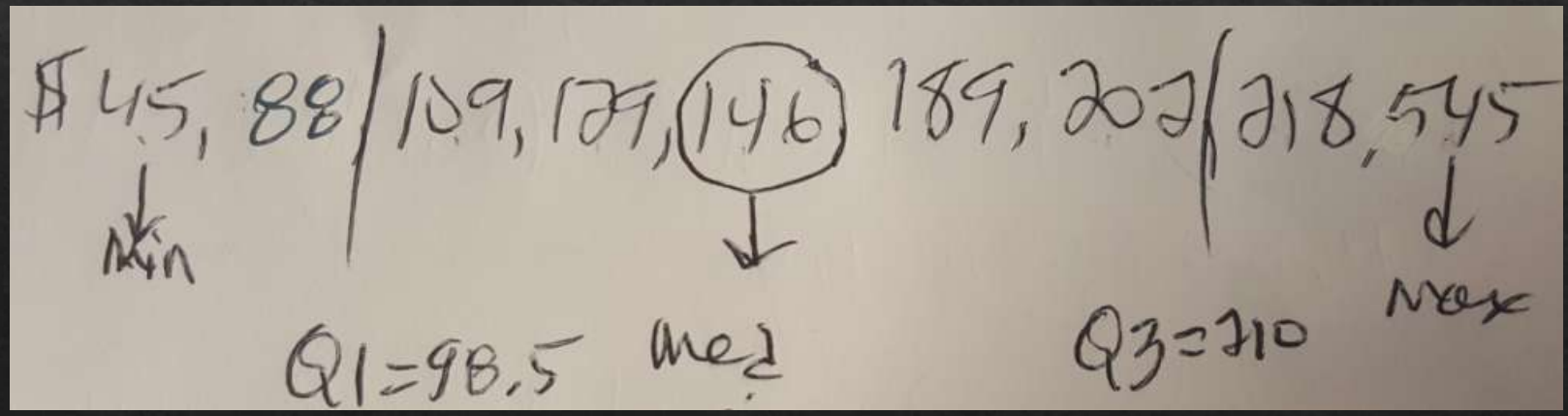
Interquartile range = $Q_3 - Q_1$

$Q_3 - Q_1 = 32 - 19 = 13$ psi

Example 3 (2 slides) – outliers

- Find the outliers for these tire prices that were quoted by different tire shops: $45, 88, 109, 129, 146, 189, 202, 218, 545

- SOLUTION:
- Always list data in order first.
- $Q_1 = \frac{88 + 109}{2} = \$98.50$ $Q_3 = \frac{202 + 218}{2} = \$210.00$
- Interquartile range = $Q_3 - Q_1 = 210 - 98.5 = \$111.50$



Example 3 continued– outliers

- Remember: Q_1 = \$98.50, Q_2 = \$146 (median), Q_3 = \$210, Q_4 = \$545 (maximum)

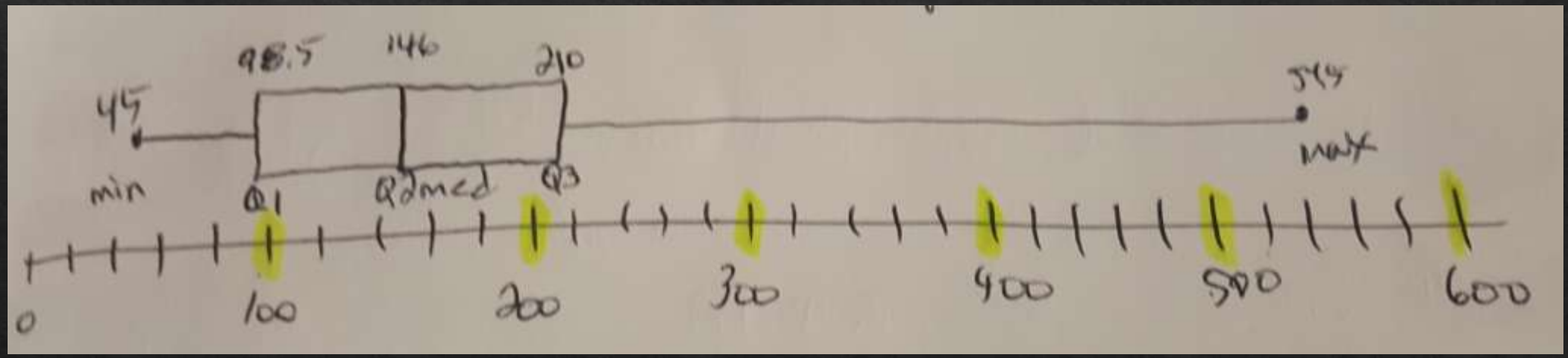
- SOLUTION continued:
- To get the boundary for outliers, these are the formulas.
- **Lower boundary = Q_1 - 1.5 * (interquartile range)** = 98.5 – 1.5 * 111.5 = -68.75
- Any price below -\$68.75 would be an outlier, but there are no prices below that.
- **Upper boundary** = Q_3 - 1.5 * (interquartile range) = 210 – 1.5 * 111.5 = 377.25
- Any price above \$377.25 would be an outlier.
- Therefore, the only **outlier is \$545**

Example 5 - box-and-whisker plot

- Create a box-and-whisker plot for the tire prices in example 3:

  $45, 88, 109, 129, 146, 189, 202, 218, 545

- SOLUTION:
- First plan out the scale of your number line so that all data #s can fit, up to 600.
- Then mark the minimum, Q_1, Q_2, Q_3, and the maximum to construct box and whiskers.



Mode and Range

- Mode = the number or numbers that appear most often.
- For example #1 data (15, 17, 21, 25, 31, 32, 32, 32, 34), the mode is 32 psi since it occurs most often.
- Range = the measure of spread of the data = maximum - minimum
- For example #1data, the range is 34 – 15 = 19

Example 6 – outliers from box-and-whisker

- The following box-and-whisker plot gives the purchase prices of the cars of 114 seniors at West High School. Are any of the car prices outliers?

- SOLUTION (follow steps from example #3):
- Interquartile range = $Q_3 - Q_1$ = 9100 – 5200 = $3,900
- **Lower boundary = Q_1 - 1.5 * (interquartile range)** = 5200 – 1.5 * 3900= -650
- Any price below -$650 would be an outlier, but there are no prices below that.
- **Upper boundary** = Q_3 - 1.5 * (interquartile range) = 9100 – 1.5 * 3900 = 14950
- **All prices above $14,950 would be outliers**.

Assignment: pg 222 # 2, 3, 6, 7

- #2

The quartiles of a data set are $Q_1 = 50$, $Q_2 = 72$, $Q_3 = 110$, and $Q_4 = 140$. Find the interquartile range.

- #3

The following list of prices is for a used original radio for a 1955 Thunderbird. The prices vary depending on the condition of the radio.

$210, $210, $320, $200, $300, $10, $340,

$300, $245, $325, $700, $250, $240, $200

a. Find the mean of the radio prices. Round to the nearest cent.

b. Find the median of the radio prices.

c. Find the mode of the radio prices. (Place in descending order)

d. Find the four quartiles.

e. Find the interquartile range for this data set.

f. Find the boundary for lower outliers. Are there any lower outliers?

g. Find the boundary for upper outliers. Are there any upper outliers?

Assignment: pg 222 # 2, 3, 6, 7 con't

- #6 Explain why you cannot find the range of a data set if you are given just the four quartiles.
- #7

Mitzi looked up prices of thirteen used Chevrolet HHR "retro" trucks in the classified ads and found these prices: $8,500, $8,500, $8,500, $9,900, $10,800, $10,800, $11,000, $12,500, $12,500, $13,000, $13,000, $14,500, and $23,000. (Your answers will not require any places after the decimal point in this question.)

a. Find the range. ____

b. Find the four quartiles.

c. Find the interquartile range. ____

d. Find the boundary for upper outliers. ____

e. Find the boundary for lower outliers. ____

f. How many outliers are there? ____