Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Business Math

5-3 Warm up Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**CCSS Warm-Up**

**Laura has grades of 88, 92, 84, and 86 on the first four math tests. Find the fifth test grade for each situation.**

**1.** She wants her average to be 90.

**2.** She wants her average to be at least 85.

 5-3 Graphing Frequency Distributions

**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.

**?** Why Are Graphs Used so Frequently in Mathematics, and in Daily Life?

**Setting up a** ***frequency distribution***

A frequency distribution is a table that gives each price and the ***frequency*** for each price

**Example 1**

Jerry wants to purchase a car stereo. He found 33 ads for the stereo he wants and arranged the prices in ascending order:

$540 $550 $550 $550 $550 $600 $600 $600 $675 $700 $700 $700 $700 $700 $700 $700 $750 $775 $775 $800 $870 $900 $900 $990 $990 $990 $990 $990 $990 $1,000 $1,200 $1,200 $1,200

He is analyzing the prices, but having trouble because there are so many numbers. Set up a frequency table (distribution) to help him sort the car prices.

**Check Your Understanding**

Use the frequency distribution from Example 1 to find the number of car stereos selling for less than $800.

**Example 2**

Find the mean of the car stereos prices from Example 1.

| Price, *p* ($) | Frequency, *f* |
| --- | --- |
|    540 |  1 |
|    550 |  4 |
|    600 |  3 |
|    675 |  1 |
|    700 |  7 |
|    750 |  1 |
|    775 |  2 |
|    800 |  1 |
|    870 |  1 |
|    900 |  2 |
|    990 |  6 |
| 1,000 |  1 |
| 1,200 |  3 |
| Total | 33 |

Create a box-and-whisker plot using the data from Example 1.

**3.** Find the mode of the distribution from Example 1.

**4.** Find the range of the distribution from Example 1.

**Check Your Understanding**

Jerry, from Example 1, decides he is not interested in any of the car stereos priced below $650 because they are in poor condition and need too much work. Find the mean of the data set that remains after those prices are removed.

**Example 3**

Rod was doing Internet research on the number of gasoline price changes per year in gas stations in his county. He found the following graph, called a ***stem-and-leaf plot*** . What are the mean and the median of this distribution?



**Check Your Understanding**

Find the range and the upper and lower quartiles for the stem-and-leaf plot shown in Example 3.

**Example 4**

Rod, from Example 3, found another graph called a ***box-and-whisker plot*** , or  ***boxplot*** . It is shown below.



Find the interquartile range of the distribution.

**Check Your Understanding**

Based on the box-and-whisker plot from Example 4, what percent of the gas stations had 55 or fewer price changes?

5.3 Classwork Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Business Math

 1. Look at the frequency table in Example 2. Imagine the 33 prices listed in ascending order. If the prices were numbered using subscripts from *p*17 to *p*33, the middle price would be price number *p*17. Use the frequency table to find the median.

**2.** Martina found the mean of the data from Example 1 by adding the prices in the first column and dividing by the number of prices she added. Her answer was incorrect. Explain what error she made.

**3.** Brian 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.

**a.** Make a frequency table for this data set.

**b.** Find the mean. Round to the nearest dollar. the median, the mode and the range.

**c.** Find the four quartiles.

**d.** Find the interquartile range.

**e.** Draw a modified box-and-whisker plot. Label it.

**8.** Megan has a friend at work who is selling a used Honda. The car has 60,000 miles on it. Megan comparison shops and finds these prices for the same car.

| **Price** |
| --- |
| $22,000 |
| $19,000 |
| $18,000 |
| $16,700 |
| $15,900 |

   View PDF

**a.** Find the mean price of the 5 prices listed.

**b.** How many of these cars are priced below the mean?

**c.** Find the median price.

**d.** How many of these cars are priced below the median?

5-3 Graphing Frequency Distributions

**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.

**?** Why Are Graphs Used so Frequently in Mathematics, and in Daily Life?

**Setting up a** ***frequency distribution***

A frequency distribution is a table that gives each price and the ***frequency*** for each price

**Example 1**

Jerry wants to purchase a car stereo. He found 33 ads for the stereo he wants and arranged the prices in ascending order:

$540 $550 $550 $550 $550 $600 $600 $600 $675 $700 $700 $700 $700 $700 $700 $700 $750 $775 $775 $800 $870 $900 $900 $990 $990 $990 $990 $990 $990 $1,000 $1,200 $1,200 $1,200

He is analyzing the prices, but having trouble because there are so many numbers. Set up a frequency table (distribution) to help him sort the car prices.

| Price, *p* ($) | Frequency, *f* |
| --- | --- |
|    540 |  1 |
|    550 |  4 |
|    600 |  3 |
|    675 |  1 |
|    700 |  7 |
|    750 |  1 |
|    775 |  2 |
|    800 |  1 |
|    870 |  1 |
|    900 |  2 |
|    990 |  6 |
| 1,000 |  1 |
| 1,200 |  3 |
| Total | 33 |

**Check Your Understanding**

Use the frequency distribution from Example 1 to find the number of car stereos selling for less than $800.

**1 + 4 + 3 + 1 + 7 + 1 + 2 = 19**

**Example 2**

| Price, *p* ($) | Frequency, *f* | Product, *pf* |
| --- | --- | --- |
|    540 |  1 |     540 |
|    550 |  4 |  2,200 |
|    600 |  3 |  1,800 |
|    675 |  1 |     675 |
|    700 |  7 |  4,900 |
|    750 |  1 |     750 |
|    775 |  2 |  1,550 |
|    800 |  1 |     800 |
|    870 |  1 |     870 |
|    900 |  2 |  1,800 |
|    990 |  6 |  5,940 |
| 1,000 |  1 |  1,000 |
| 1,200 |  3 |  3,600 |
| Total | 33 | 26,425  |

Find the mean of the car stereos prices from Example 1.

**26,425 ÷ 33 ≈ 800.76**

**The mean of the prices is $800.76.**

Create a box-and-whisker plot using the data from Example 1.



**3.** Find the mode of the distribution from Example 1.

 **The data value 700 occurs 7 times; all other data values occur less than 7**

 **times; the mode is 700, or $700.**

**4.** Find the range of the distribution from Example 1.

 **$1,200 – $540 = $660; the range is $660.**

**Check Your Understanding**

Jerry, from Example 1, decides he is not interested in any of the car stereos priced below $650 because they are in poor condition and need too much work. Find the mean of the data set that remains after those prices are removed.

**New total Number of data**

**$26,425 – ($540 + $2,200 + $1,800) = 33 – (1 + 4 + 3) =**

**$26,425 – $4,540 = $21,885 33 – 8 = 25**

 **new mean = $21,855 ÷ 25 = $875.40**

**Example 3**

Rod was doing Internet research on the number of gasoline price changes per year in gas stations in his county. He found the following graph, called a ***stem-and-leaf plot*** . What are the mean and the median of this distribution?

 The sum is 1,188. **Divide by 30 to find the mean.**

 **1,188 ÷ 30 = 39.6**

The frequency, 30, is even, so find the mean of the numbers in the 15th and 16th positions. The two middle numbers are both 39, so the **median is 39**.

**Check Your Understanding**

Find the range and the upper and lower quartiles for the stem-and-leaf plot shown in Example 3.

 **Range: 72 – 11 = 61**

**Example 4**

Rod, from Example 3, found another graph called a ***box-and-whisker plot*** , or ***boxplot*** . It is shown below.



Find the interquartile range of the distribution.

**Q3 − Q1 = 55 − 23 = 32**

**The interquartile range is 32. That means 50% of all the gas prices are within this range.**

**Check Your Understanding**

Based on the box-and-whisker plot from Example 4, what percent of the gas stations had 55 or fewer price changes?

**By definition, 75% of the values are below Q3, so 75% of the gas stations had 55 or fewer price changes.**

5.3 Classwork Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Business Math

 1. Look at the frequency table in Example 2. Imagine the 33 prices listed in ascending order. If the prices were numbered using subscripts from *p*17 to *p*33, the middle price would be price number *p*17. Use the frequency table to find the median.

**1 + 4 + 3 + 1 + 7 = 16, so the 17th value is 750. The median is $750.**

**2.** Martina found the mean of the data from Example 1 by adding the prices in the first column and dividing by the number of prices she added. Her answer was incorrect. Explain what error she made.

**The sum of the frequencies, 33, is the total number of prices. Martina did not take into account the frequency of each price.**

**3.** Brian 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.

**a.** Make a frequency table for this data set.

|  |  |
| --- | --- |
| **Price**  | **Frequency**  |
| $8,500  | 3  |
| $9,900  | 1  |
| $10,800  | 2  |
| $11,000  | 1  |
| $12,500  | 2  |
| $13,000  | 2  |
| $14,500  | 1  |
| $23,000  | 1  |

**b.** Find the mean. Round to the nearest dollar. the median, the mode and the range.

**$156,600 ÷ 13 ≈ $12,038.46. Rounded to the nearest dollar, the mean is $12,038.**

**There are 13 values, the median is the seventh-least value, which is $11,000.**

**The data value $8,500 occurs 3 times; all other data values occur 2 times or 1 time; the mode is $8,500.**

**6e. $23,000 – $8,500 = $14,500**

**c.** Find the four quartiles.

**Q2: from part a, the median is $11,000.**

**Q1: there are 6 values in the lower half of the data, so Q1 is the mean of the third-least and fourth-least values. 8500+99002 = $,184002 = $9,200**

**Q3: there are 6 values in the upper half of the data, so Q3 is the mean of the tenth-least (fourth greatest) and eleventh-least (third greatest) values. $,260002 = $13,000**

**Q4: maximum value, which is $23,000**

**d.** Find the interquartile range.

**6g. IQR = Q3 – Q1 = $13,000 – $9,200 = $3,800**

**e.** Draw a modified box-and-whisker plot. Label it.