2.1 Frequency Distributions and Histograms with work

2.1 Frequency Distributions, Histograms, and Related Topics

Focus Points:

- Organize raw data using a frequency table.
- Construct histograms, relative-frequency histograms, and ogives.
- recognize basic distribution shapes: uniform, symmetric, skewed, and bimodal.
- interpret graphs in the context of the data setting.

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A frequency table partitions data into classes or intervals of equal width and shows how many data values are in each class.

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Example 1: Downtown Dallas

A task force to encourage car pooling did a study of one-way commuting distances of workers in the downtown Dallas area. An SRS of 60 workers was taken. The commuting distances of the workers in the sample is given below. (Do 6 classes)

13	47	10	3	16	20	17	40	4	2
7	25	8	21	19	15	3	17	14	6
12	45	1	8	4	16	11	18	23	12
6	2	14	13	7	15	46	12	9	18
34	13	41	28	36	17	24	27	29	9
14	26	10	24	37	31	8	16	12	16

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First: determine how many classes (5 - 15) then find the width of the class using the formula below.

$$\frac{\text{largest data value - smallest data value}}{\text{Desired number of classes}} = \frac{47-1}{6} = \frac{46}{6}$$

The formula above helps determine the lower and upper class limit. The lower class limit is the lowest data value that can fit in a class. The upper class limit is the highest data value that can fit in a class. The class width is the difference between the lower class limit of one class and the lower class limit of the next class.

1-8, 9-16 ≈ 7. ~ 8

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13	47	10	3	16	20	17	40	4	2
7	25	8	21	19	15	3	17	14	6
12	45	1	8	4	16	11	18	23	12
6	2	14	13	7	15	46	12	9	18
34	13	41	28	36	17	24	27	29	9
14	26	10	24	37	31	8	16	12	16

How many classes? 6 width of 8

What are our class limits? 1-47

14 21 11 6 4 4

1-8, 9-16, 17-24, 25-32, 33-40, 41-48

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Second: Tally the frequency (number of data entries) in each class

- The class frequency for a class is the number of tally marks corresponding to that class.
- The class midpoint is the center of each class determined by the formula below.

$$\text{Midpoint} = \frac{\text{lower class limit + upper class limit}}{2}$$

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Third: To create the boundaries for your classes add 0.5 to the upper class limit and subtract 0.5 from the lower class limit. 0.5 - 8.5, 8.5 - 16.5

What would the class boundaries be? [0.5 - 8.5) (8.5 -

≤ <

% relative frequency of a class is the proportion of all data values that fall into that class.

$$\text{Relative frequency} = \frac{f}{n} = \frac{\text{Class frequency}}{\text{Number in sample size}}$$

[1 - 8] $= \frac{14}{60} \approx 23\%$ [9 - 16] $= \frac{21}{60} \approx 35\%$

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HOW TO MAKE A FREQUENCY TABLE

1. Determine the number of classes and each class width [5 - 15]
2. Create the distinct classes. Lower and Upper class limit
3. Tally the data into classes. Each data value should fall into exactly one class. Total class tally for class frequency.
4. Compute the midpoint for each class. (Average)
5. Determine the class boundaries. (± .5)

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RELATIVE-FREQUENCY TABLE

Follow steps 1 - 5 then do step 6.

6. To turn the table into a relative-frequency table compute the $\frac{f}{n}$, where f is the class frequency and n is the total sample size.

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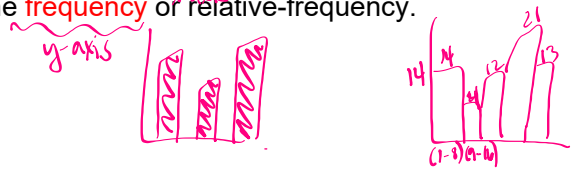
Histograms and relative-frequency histograms provide effective visual displays of data organized into frequency tables. Histograms are like bar charts but the bars touch. Each bar represents a class and the height of the bar is the frequency or relative-frequency.



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HOW TO MAKE A HISTOGRAMS

1. Make a frequency table with the designated number of classes
2. Place class boundaries on the x-axis and frequencies (or relative-frequencies) on the y-axis.
3. For each class of the frequency table, draw a bar whose width extends between corresponding class boundaries.

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Example 2: Downtown Dallas Histogram

Make a histogram using the data we used in Example 1.

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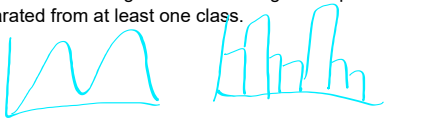
DISTRIBUTION SHAPES

Mound-shaped symmetrical: both sides of the histogram are basically the same. If folded vertically down the middle it will match.

Uniform: every class in the histogram has the same frequency. bars are the same height.

Skewed: a histogram can be skewed left or right based on the way the tail stretches out long towards.

Bimodal: two classes in the histogram have the largest frequencies and they are separated from at least one class.



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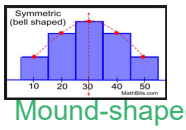
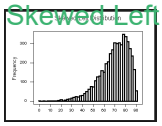
TYPES OF HISTOGRAMS

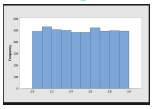


Mound-shaped

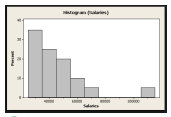


Skewed Left

Bimodal
Mound-shaped

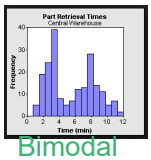


Uniform



Skewed Right

Uniform
Skewed Left
Skewed Right



Bimodal

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When describing histograms be sure to include the center (median), spread (range), shape (symmetric, skewed, etc.), and unusual features (gaps/clusters, outliers, etc)!

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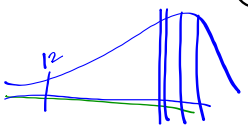
Outliers in a data set are the data values that are very different from other measurements in the data set.

Grades in a class: 87, 89, 93, 91, 85, 12



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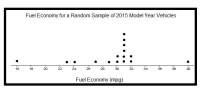
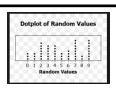
HOW TO MAKE A DOTPLOT





1. Display the dots on a horizontal axis (like a number line)
2. Plot each data value with a dot or point above the corresponding value on the horizontal axis.
3. For repeated data values, stack the dots.

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HW: pg. 52: 1 - 7, 15, 19, 24

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