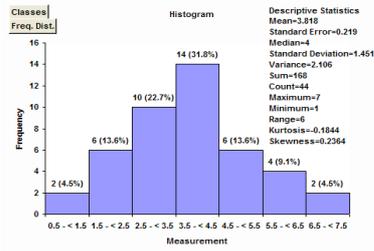


14.2 Measures of Central Tendency



1

A measure of center is a single value used to represent the “average” of the data.

There are 3 types of center:
 Mean Median Mode

2

Mean: (arithmetic average)

COMPUTING THE MEAN If a data set contains n data values, the mean \bar{x} of the data set is

$$\bar{x} = \frac{\sum x}{n}$$

Here we use the Greek letter Σ to represent a sum.

Ex. Data = { 3, 8, 5, 2 }
 $\Sigma x = 3 + 8 + 5 + 2 = 18$

$$\bar{x} = \Sigma x / n = 18 / 4 = 6.5$$

3

Sample mean = \bar{x} (x bar)
 Population mean = μ (Greek mu)

Example:
 Sample Data = 2, 7, 5, 3, 4, 8, 1
 Find the mean

4

Example:
 Sample Data = 2, 7, 5, 3, 4, 8, 1
 Find the mean

$$\frac{2+7+5+3+4+8+1}{7} = 4.286$$

5

Given a frequency table,
 - find the total number of data points, which is the sum of the frequencies
 So find Σf
 - find the sum of all values, if freq f occurs x times it contributes xf
 So find Σxf

COMPUTING THE MEAN OF A FREQUENCY DISTRIBUTION We use a frequency table to compute the mean of a data set as follows:

1. Write all products $x \cdot f$ of the scores times their frequencies in a new column of the table.
2. Represent the sum of the products you calculated in step 1 by $\Sigma(x \cdot f)$.
3. Denote the sum of the frequencies by Σf .
4. The mean is then $\frac{\Sigma(x \cdot f)}{\Sigma f}$.

Example: What is the mean temperature?

Temperature (°F), x	Frequency, f
52	4
53	6
54	3
55	8
56	4
57	5
Total	30

7

Example: What is the mean temperature?

Temperature (°F), x	Frequency, f	Product, $x \cdot f$
52	4	$52 \cdot 4 = 208$
53	6	$53 \cdot 6 = 318$
54	3	$54 \cdot 3 = 162$
55	8	$55 \cdot 8 = 440$
56	4	$56 \cdot 4 = 224$
57	5	$57 \cdot 5 = 285$
Totals	$\Sigma f = 30$	$\Sigma(x \cdot f) = 1,637$

sum of frequencies sum of products

The mean is:

$$\frac{\Sigma(x \cdot f)}{\Sigma f} = \frac{\text{sum of scores}}{\text{number of scores}} = \frac{1,637}{30} \approx 54.6^\circ\text{F.}$$

8

The **median** of a set of data is the number in the middle of the list when the numbers are ordered.

If there is no single middle number, average the two middle numbers.

9

Example:

3 5 3 4 1 3 2 5 4

Example:

2 4 1 3 5 3 2 4 5 3

10

Example:

3 5 3 4 1 3 2 5 4

Ordered: 1 2 3 3 4 4 5 5
Mean 3

Example:

2 4 1 3 5 3 2 4 5 3

Ordered: 1 2 2 3 3 3 4 4 5 5
Mean = $(3+3)/2 = 3$

11

The **mode** is the data value which occurs most frequently.

Example:

2 4 1 3 5 3 2 4 5 3

12

Weirdness:

If more than one value occurs most frequently, each is a mode.

Ex 2 4 5 3 4 3

If no value is repeated, there is no mode.

Ex 8 6 3 4 7

13

Two ways of representing data by more than just a single number:

Five Number Summary

Box and Whisker Plot

14

Five Number Summary

1. Order the data
2. Find the smallest, largest and median.
3. Find the median of the lower half, Q_1
4. Find the median of the upper half, Q_3
5. The Five Number Summary is:
smallest, Q_1 , median, Q_3 , largest

Example:

3 4 5 5 6 7 8 8 9 9 9

16

Example:

3 4 5 5 6 7 8 8 9 9 9
Lower half Median Upper half

17

Example:

3 4 5 5 6 7 8 8 9 9 9
Lower half Median Upper half

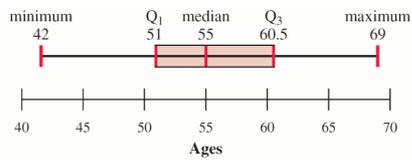
Smallest = 3
 $Q_1 = 5$
Median = 7
 $Q_3 = 9$
Largest = 9

Summary: 3, 5, 7, 9, 9

18

The Box and Whiskers Plot is a visual representation of the Five Number Summary

Example: Summary = 42, 51, 55, 60.5 69



19

Full example:

38 38 52 40 48 48 31 37 40 36 37 37 49 39 47

20

Full example:

38 38 52 40 48 48 31 37 40 36 37 37 49 39 47

Ordered:

31 36 37 37 37 38 38 39 40 40 47 48 48 49 52

Smallest = 31

Q₁ = 37

Median = 39

Q₃ = 48

Largest = 52

21