

Ch 6. Describing Data with Numbers

6.1 Mean and Median

The mean of a data set is more commonly known as the average.

A population mean is written μ .

A sample mean is written \bar{x} .

Ex: Find the mean of:

a) the population 1, 1, 2, 8, 12, 15

$$\mu = \frac{1+1+2+8+12+15}{6} = 6.5$$

b) the sample 1, 2, 15

$$\bar{x} = \frac{1+2+15}{3} = 6$$

The median is the middle value when measurements are ordered. If the number of measurements is even, we average the middle two measurements.

Ex: Find the median of =

a) 12, 2, 9

Ordered: 2, 9, 12

median = 9

b) 12, 8, 2, 9

Ordered: 2, 8, 9, 12

median = $\frac{8+9}{2} = 8.5$

Ex: Salary of 5 people (in thousands of dollars):

35, 45, 47, 60, 2400

a) Find the mean

mean = $\frac{35+45+47+60+2400}{5} = 517.4$

b) Find the median

Ordered ✓

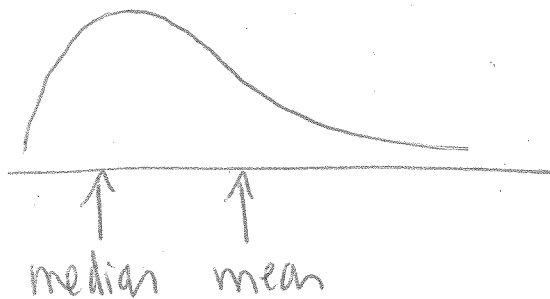
median = 47

c) Which is more representative?

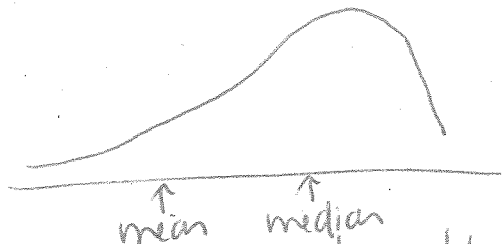
The median.

The mean is pulled in the direction of the outliers.

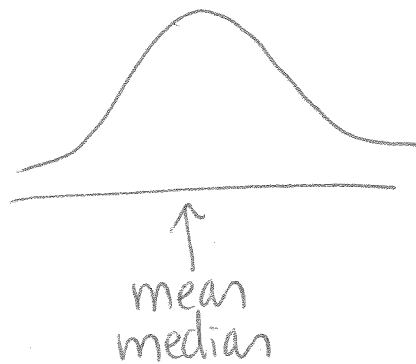
If data is skewed to the right then
 $\text{mean} > \text{median}$.



If data is skewed to the left then
 $\text{mean} < \text{median}$.



If data is symmetric then $\text{mean} = \text{median}$.



Ex: The mean of four measurements is 14.
The mean of three of the measurements is 13.
Find the fourth measurement.

Call the measurements x_1, x_2, x_3, x_4 .

$$\frac{x_1 + x_2 + x_3 + x_4}{4} = 14$$

$$x_1 + x_2 + x_3 + x_4 = 56 \quad (1)$$

$$\frac{x_1 + x_2 + x_3}{3} = 13$$

$$x_1 + x_2 + x_3 = 39 \quad (2)$$

$$(1) - (2): \quad x_4 = 17$$

Ex: Consider 130, 170, 180. The mean is 160.
The median is 170. Find the new mean
and median if every measurement is:

a) increased by 10

+10 : 140, 180, 190

$$\text{mean} = \frac{140 + 180 + 190}{3} = 170 \quad \text{median} = 180$$

Note both increased by 10.

b) increased by 10%

Multiply by 1.1 : 143, 187, 198

$$\text{mean} = \frac{143 + 187 + 198}{3} = 176 \quad \text{median} = 187$$

Notice both increased by 10%.