Section 2.1: Measures of Centre:

Thursday, October 24, 2019 10:13 AM

Mean and Median

numerical measure - another way to summarize a data set

(graphs → visual summary)

- particularly useful when comparing data sets whose values are very similar

numerical measures are quantities (numbers) that describe a data set

→ called parameters for populations

called statistics for samples

we'll look at three types of numerical measures:

- measures of centre
  - where most of the data points are located

- measures of variability
  - is there a lot of spread in the data?

- measures of relative standing

- where is this data point located in comparison to all the others

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measures of centre:

mean (average) - add all of the values of the data points together and divide by the number of points

population mean:

$$\mu = \frac{\sum_{i=1}^{n} x_i}{n}$$

Greek letter "mu"

where x_i is the i^{th} measurement and n is the size of the population

sample mean:

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

"x-bar"

one problem: mean is greatly affected

by outliers

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median - if you write your data in an ordered list, it's the middle value

→ if you have an even number of points, it's the average of the two middle points

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example: starting salary of ICS graduates*

*totally made-up data

$35,000

$45,000

$37,000

$60,000

$2,400,000

find the mean and median of this data set

answer: mean = $515,400

median = $45,000

the mean value can be misleading because the outlier has dragged the mean in that direction

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for the median, if there are lots of data points, how do you determine the position of the middle value?

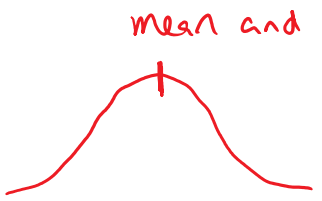
$$\text{position} = \frac{1}{2}(n+1)$$

for 75 points, the median is the 38th point

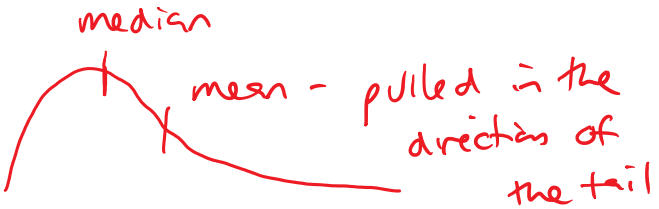
for 76 points, the median is the 38.5th point

↗ the average between the 38th and 39th points

mean and median for skewed distributions:



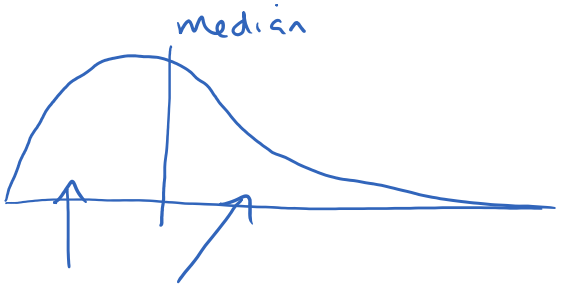
symmetrical



skewed to the right

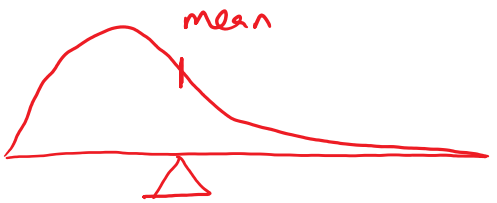
note: where is the median located on an

asymmetrical graph?



these two areas are equal

where is the mean located?



balance point

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weighted average:

suppose you have the following data set:

1, 1, 1, 1, 1, 2, 2, 3, 3, 3, 3

you could summarize this data in a frequency table

x	f
1	5
2	2
3	4

values of x

number of times this value occurs in the data set

calculating the mean:

for a sample, $\bar{x} = \frac{\sum x_i \cdot f_i}{n} = \frac{\sum x_i \cdot f_i}{\sum f_i}$

a note on rounding means:

- you generally can report the mean of a set of measurements to <u>at least</u> one more decimal place than the measurements themselves

25, 37, 42, ... → can report the mean as 32.3 = one more decimal place

(to do it properly, need to calculate the standard deviation first)