2/28/2023

Built in Formulas – last week
Exponential Growth
Descriptive Statistics
Weighted Averages
Review for Exam #1

Exponential growth: the same as exponential decay. The only difference is whether the sequence is increasing or decreasing. We will focus on exponential growth.

For a sequence of numbers to growing exponentially, there is a common ratio where if you divide the present value by the previous value, you always get the same number. **Common ratio**. Growth: ratio will be bigger than 1. (in the decay case: the only difference is the number is less than 1.) Every pair of sequential values, when divided (in the same order), produce the same ratio.

If the ratio is not the same all the time, then the sequence is not (strictly) exponential.

Sometimes exponential growth is called a geometric sequences.

In contrast, another kind of growth is linear growth. In this case, linear growth increases by the same quantity every time. Increases by exactly the same amount. If I take the later value and subtract the prior value, I get the same amount every time. These numbers have a **common difference**.

(linear decay subtracts a common amount each time.)

Sometimes linear growth examples are described as arithmetic sequences.

Other sequences can grow in other ways (square each time, or behave randomly…)

See examples in Excel

Descriptive Statistics (overview) and Weighted Averages (not built-in to Excel).

Some common descriptive statistics:
Mean = average
Median = middle of the ordered list of values (50% of the data is below or equal to the median, and 50% is above or equal the median).
Mode = the most common value in the dataset, but this can be hard to find if there is a lot of data, or the data is continuous. The mode may not exist, or you may identify more than one mode. If there are more than two modes, you say “no mode”.
These are described as measures of central tendency or “typical” values.

Measure of position:
Quartiles, deciles, percentiles… maxima and minima
Quartiles are the ¼ marks of the data. First find the median, and the split the data at the median, and the find the media of the two halves. The median of the bottom half is the first quartile : ¼ of the data is below that value. The median of the top half is the third quartile: ¾ of the data is below that value.

Deciles divide the data into 10 groups (instead of 4 like quartiles).

Percentiles: they divide the data into roughly 100 groups. 1st percentile has 1% below that value and 99% above it. 90th percentile has 90% of the data below that value (and 10% above it).

Measures spread/variability
Standard Deviation: approximately the average distance from the mean
Variance: take each value, subtract the mean, square the result, then essentially "average" the squares. The standard deviation is the square root of the variance.

There are two versions of the variance and standard deviation: one is for "populations" when you are sure you have all the data; and one for samples when you have only a subset of all the possible data.

Always use the sample version of both unless the problem specifically says to use the population version.

Range: the difference between the maximum and minimum values
IQR (Interquartile Range) = middle 50% of the data: the difference between the third quartile and the first quartile.

5-number summary:
Minimum, 1st quartile, Median, 3rd quartile, maximum

Weighted Average: we'll also calculate this in Excel.

Exam #1