Measures of Central Tendency

Mean - Median - Mode

So, let's say that we have a group of numbers, any numbers you'd like. Football scores, running times, student performances... and let's say we want to analyse them.

How do we do that?

What we must do, as students, is analyse the numbers in basic ways, to come to a conclusion. Now, there are three straightforward ways to check things, without too much trouble. These are the processes of calculating the **mean**, the **median**, and the **mode** of a data set.

Let's start with the mean.

The Mean

The mean, is the average value that we would get for a series of data. Let's say we had soccer scores of 5,6, and 7 respectively. On average, we would have a score of 6 per game.

But how do we know this?

We know this, by applying a formula. It's called the calculation of the mean, and it goes something like this:

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

What does that all mean?

Basically, for anyone that doesn't understand sigma notation, it just tell us to do two things. To get the average value of a data set, we must:

- Add together all the values in the data set.
- Divide that total by the number of values in the data set.

Let's see an example of this in action.

Example 1:

Sam rolls a pair of dice, five times, and sums the value of the two numbers. The five values are shown below.

$$4,6,9,10,11$$

Calculate the average result from the last five games.

$4,6,9,10,11$	Step 1. Write down all the values.
$\sum x = 4+6+9+10+11$	Step 2. Find the sum of all the values.
$\sum x = 40$	
$n = 5$	Step 3. Write down the number of terms.
$\bar{x} = \dfrac{\sum x}{n} = \dfrac{40}{5} = 8$	Step 4. Divide the sum of the values by the number of terms.
The average result for the last five games is 8.	Step 5. State the answer.

Now, considering we can do this with small values, we can apply this with larger numbers as well. Let's see an example of this.

Example 2:

Percy bowls with friends. For the last ten games, he has written down the scores of his games. They are written below.

$$60,64,65,66,68,72,74,75,76,90$$

Calculate the average score for his last ten games.

$60,64,65,66,68,72,74,75,76,90$	Step 1. Write down all the values.
$\sum x = 60+64+65+66+68+72+74+75+76+90$	Step 2. Find the sum of all the values.
$\sum x = 710$	
$n = 10$	Step 3. Write down the number of terms.
$\bar{x} = \dfrac{\sum x}{n} = \dfrac{710}{10} = 71$	Step 4. Divide the sum of the values by the number of terms.
Percy's average score for the last ten games is 71.	Step 5. State the answer.

The Median (or Middle Value)

Now that we've understood the mean, let's attempt to use the median.

What is the median?
The median is also known as the "middle value" of the data. We can find it, by following these steps:

- Order the data in the set from smallest to largest.
- Find the term that is approximately halfway through the sequence, that is the $\left(\dfrac{(n+1)}{2}\right)th$ value in the data set. For example, if we had five values, the median would be the 3rd value in the set.

Let's see an example.

Example 3:
John plays competitive tennis with friends. He records the number of games he has won in the last five games.
$$9,16,27,8,14$$
What is the median of the data?

$9,16,27,8,14$	Step 1. Write down all the values.
$8,9,14,16,27$	Step 2. Reorder the values, from smallest to largest.
$n=5$	Step 3. Write down the number of terms.
	Step 4. Find the median value.
$Median = \left(\dfrac{n+1}{2}\right)th$	
$Median = \left(\dfrac{5+1}{2}\right)th$	
$Median = 3rd$ value.	
$Median = 14$	
	Step 5. State the answer.
The median of John's scores is 14.	

What happens when we have an even number of values?
When we have an even number of values, the median ends up with an uneven answer. So what we have to do is consider the values that are on either side of the median.

The median, in this case, will be halfway between these numbers.

Example 4:

      Simon plays AFL competitively. For one game, he wrote the scores his team made each quarter.

$$33, 25, 53, 12$$

What is the median score for each quarter?

	Step 1. Write down all the values.
$33, 25, 53, 12$	
	Step 2. Reorder the values, from smallest to largest.
$12, 25, 33, 53$	
	Step 3. Write down the number of terms.
$n = 4$	
	Step 4. Find the median value.
$Median = \left(\dfrac{n+1}{2}\right) th$	
$Median = \left(\dfrac{(4+1)}{2}\right) th$	
$Median = \left(\dfrac{5}{2}\right) th$	
$Median = 2.5 th$	
	Step 5. Calculate the median.
$Median = \left(\dfrac{25+33}{2}\right)$	
$Median = 29$	
	Step 6: State the median.
The median score for each quarter of the game is 29.	

The Mode

Now, we've studied the mean and median. Now, we'll cover the final measure of centrality that is important - the mode.

The mode, is also known as the most common number. Basically, by comparing all of the values in the data set, we can find the mode by identifying the most common number.

Example 5:

Chris is a professional bowler, for the Australian cricket team. When the team plays against the English test team, he writes down the number of wickets he gets in each innings.

$$0,1,2,2,2,3,3,4,4,5$$

What is the mode of this data?

	Step 1. Write down all the values.
$0,1,2,2,2,3,3,4,4,5$	
	Step 2. Identify the most common value.
$Mode = 2$	
	Step 5. State the answer.
The most common amount of wickets for Chris to obtain is 2.	

Ok, so I know this now - What next?

Now, practice your skills by trying Self Help Tutorial - Mean, Median and Mode.