

# Robert\_S2\_L02

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## SUMMARY KEYWORDS

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## SPEAKERS

Robert McKeown

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Robert McKeown 00:05

Welcome back. In the previous video, we looked at the mean, you did some calculations of the mean. Now I'd like to talk to you a little bit more about how to interpret the mean and what its strengths and weaknesses are. One thing we'll start off by focusing on is this idea of the mean as the fulcrum of a seesaw in balance. And I want to return to our example, the Toronto Maple Leafs to illustrate what we mean when we say that. Now, the mean is the average or the most central score. So if we want to describe what the central tendency of a series of values is, you might say the mean, you might say the average player salary is \$3.2 million per year. Or you might say, the average length is 12 centimeters. Now one little housekeeping item, sometimes we see that this little  $n$  is identified with a capital  $N$ . And other times it'll be a small and just sort of something for you to keep in mind when you're applying stats to other disciplines. Now, previously, I described specifically, the mean, as being the fulcrum fulcrum is right here, have a seesaw where the weight of the values below the mean is equal to the weight of the values above the mean. And I want to show you an illustration of what I mean when I say this. And we're going to go back and look at our Toronto Maple Leafs example, here's the histogram that we have. And it tells us how many players make are within a certain bucket or bin, or range of values. So if we've got zero to one here, one to two, here, we've got a players making less than a million dollars. And we've got seven players making between one and \$2 million. And if we keep going along we can see all the players, how many players make, what range of salaries and the ban of our histogram. I showed you in stem and leaf plot. So you can see that the values are right here another way of illustrating this time with a stem and leaf, it's illustrated through a table rather than a histogram, or graph, the mean is 3.2 3 million. So if I go back to our graph here, and I had a four here, and a three here are mean is going to be where I've drawn these diagonal lines that are values below the mean, and the clear purple area is above the mean. And if we add up all these players, we've got eight players here, seven here. And it's kind of hard to take a fraction of a player, but maybe we've got well, we've got two here. And I don't know maybe one player here. Question mark? Not sure the mean doesn't have to be one of the values that we observe. Those 17 or 18 players make as much together as these nine players make above the mean. So the mean is going to balance the earnings of these lower players, how much do how many of them do we have to group together such that their total earnings is equal to those players that are above the mean. Now a strength and a weakness of the mean is that the mean is sensitive to extreme values. Let me illustrate with an example.

This time we'll look at the Toronto Raptors, an NBA team National Basketball Association team. If we look at the players salary, at least the salary that counts towards the salary cap in the NBA, we can see a histogram of the player salaries. So we've got a whole bunch of players, making less than \$1 million And we've got one player making between something like 32 or \$33 million. And a bunch more players clumped towards the left part of the distribution and then we've got four players in the middle. And if I tell you what the mean is, we calculated the mean. We find that the average salary of a Toronto Raptors basketball player is \$8.5 million. So if anyone asks you whether you want to play hockey or basketball, and you can do both, I guess maybe you should choose basketball teams to have a higher salary. Now what happens if What if we remove the Raptors highest paid player? So the Raptors, highest paid player is Pascal Siakam also known as spicy P. And what would their average salary look like or their mean salary look like? If Pascall Siakam was not included. And actually without Pascal Siakam, the Raptors mean salary would be \$5.67 million. And so notice that we've removed Pascal Siakam-spicy P, no spicy P. And this is what we mean when we say that the mean is sensitive to outliers or its sensitive to extreme values. Pascal Siakam makes quite a bit more money than anyone else on the team. And he makes so much money that he actually pulled up the average by quite a bit. Let's continue our analysis of the main with a little bit exercise. We've got a stem and leaf diagram here with the Toronto Raptors five highest paid players. And we want to calculate the mean of the five highest paid NBA players on the Toronto Raptors. And then we've got a second question that's gonna ask us, if we add a six NBA player, what salary would he need to earn for the mean to become 6 million \$16 million? So let's start off with the first question we've got in this case, this is 10s of millions have dollars. And so I'll write this as 16 million plus another 16 million plus 19 million plus 20 million plus 33 million, and we want to divide this by five. What's the answer? I'll call this  $\bar{x}$  for the main. Using my calculator, I get \$104 million divided by five. And that gives me \$20.8. million. Now the next question is saying suppose we add another player. So there'll be six players, what salary would he need to be earning in order for the mean to become 16 million instead of 20 point 8 million? Well, we could rewrite this as 104 plus the six value the  $6x$ , six player or maybe just call it  $x_i$ , and now we're going to divide by five plus one. And all we have to do is solve for  $x_i$ . And that should give us the answer when we set this thing equal to the 16 million that we're looking for. Solving this we have 104 plus five is equal to six times 16 is going to give us 96 and  $x_i$  is going to be equal to negative 8. So what happened here? Well, to get an average of \$16 million, if we add an extra person, their salary actually have to be negative. So there's no way that we could add an additional player and have an average salary of \$16 million. Without doing something without making them pay. Maybe I would have to pay 8 million dollars if I wanted to play in the NBA, that's entirely possible, probably, maybe more. But we're not going to be able to have a positive number, a positive salary, in order to have a mean salary of 16 million