

The student is working on the following problem:

Table 1. shows the number of goals that each football player striker scored between 2007 and 2011. Who is the most consistent player? Immagine a measure of "consistency" and justify why you think your method is correct.

Year	Mike Arwen	Dave Backhand	Ivan Right
2007	13	12	14
2008	12	14	10
2009	15	16	18
2010	17	15	18
2011	13	13	15

The solution of this problem is:

The concept of standard deviation is the usual way to measure consistency but it is not expected that the student knows it. Any measure proposed by the student to measure consistency is acceptable as long as it can be justified.

Example of canonical solution: computing the variance (or standard deviation) for each player: First, compute the mean:

Mean number of goals for Mike: 14

Mean number of goals for Dave: 14

Mean number of goals for Ivan: 15

Then, compute the sum of square deviations from the mean for each player.

Then devide by the number of data points to get the variance:

Variance for Mike: $12/5 = 3.2$

Variance for Dave: $10/5 = 2$

Variance for Ivan: $44/5 = 8.8$

So according to the variance, Dave is the most consistent player.



Hello! I am your tutor. Can you walk me through your solution?

Hey! So I'm a bit confused about how to start. I think we need to figure out who's the most consistent, but I'm not sure what exactly "consistent" means in this case or how to calculate it. Got any tips?



Certainly! Consistency generally means how stable or regular someone's performance is. Think about what you would expect from a player's performance if they were consistent over the years and how you might represent this mathematically. If you were to put it into your own words, how would you describe a consistent performance based on the goal numbers you have?

So I guess if a player is consistent, it means they would score around the same number of goals each year, right? So their goal numbers shouldn't be all over the place - they should be kind of similar every year. Maybe we could look at how much the goal numbers change each year for each player? Is that a good start?



Absolutely, that's a very good start! You're thinking along the lines of measuring how much each player's goals vary from year to year. How might you represent these changes numerically so that you can compare the players against one another?

Hmm, maybe we could find the difference in goals scored from one year to the next for each player and see who has the smallest differences? So like take the goal number from one year and subtract the goal number from the previous year to get the change, and then do that for each year and player. That way we can see who's got smaller changes?



That's a logical approach to assess consistency. How would you use this to compare the players? What sort of calculation or formula could you apply to these yearly differences to arrive at a single measure of consistency for each player?

I guess we could add up all the differences in goals for each player over the years, but since sometimes they might score more and other times less, maybe we should ignore whether the changes are positive or negative. So maybe we could add up the absolute values of the differences for each player? Then the player with the smallest total change would be the most consistent?





That's a thoughtful approach. Would you mind expressing your idea mathematically? How would you define the total change for a player, using the absolute differences in goals scored from one year to the next?

Sure, for each player, I would take the number of goals they scored in one year and subtract the number of goals they scored the previous year, and then take the absolute value of that. So if we're doing it for Mike Arwen, it would look something like this:



$$\text{Total Change for Mike} = |13 - 12| + |12 - 15| + |15 - 17| + |17 - 13|$$

We would do the same for Dave Backhand and Ivan Right and then compare the totals. The player with the smallest total would be the most consistent based on this measure.



This is a good illustration of measuring consistency. Once you have calculated this Total Change for each player, how would you interpret the results in terms of the players' performance consistency? What does the number you've calculated represent in the context of the players' scoring history?

The Total Change number kind of tells us how much a player's goals vary from year to year. A smaller Total Change would mean that the player's goals didn't jump around too much, which means they were more consistent. The bigger the Total Change, the more the number of goals they scored jumped around from year to year, so less consistent. So basically, we're looking for the player with the smallest Total Change to give the "The Most Consistent Player for the Past 5 Years" award to.



That's a clear explanation. Now, would you feel comfortable extending that logic and finding the Total Change for Dave and Ivan using your method? After you've done that, how would you then summarize the finding and make a decision for the award?

Alright, let's do the math for Dave and Ivan.



For Dave Backhand, it would be:

$$\text{Total Change for Dave} = |12 - 14| + |14 - 16| + |16 - 15| + |15 - 13|$$

For Ivan Right, it would be:

$$\text{Total Change for Ivan} = |14 - 10| + |10 - 18| + |18 - 18| + |18 - 15|$$

After I'd calculate these, I'd compare the Total Change numbers for Mike, Dave, and Ivan. The player with the smallest number is the most consistent, and I'd suggest he should get the award.

Should I calculate these?



Your understanding is correct. You've outlined the steps needed to calculate the Total Change for each player. Go ahead and perform these calculations. Remember to carefully add the absolute values of the yearly differences for each player. Once you've done that, consider how the results reflect each player's consistency.

Okay, doing the math:



For Dave Backhand:

$$\text{Total Change for Dave} = |12 - 14| + |14 - 16| + |16 - 15| + |15 - 13|$$

$$= |-2| + |-2| + |1| + |2|$$

$$= 2 + 2 + 1 + 2$$

$$= 7$$

For Ivan Right:

$$\text{Total Change for Ivan} = |14 - 10| + |10 - 18| + |18 - 18| + |18 - 15|$$

$$= |4| + |-8| + |0| + |3|$$

$$= 4 + 8 + 0 + 3$$

$$= 15$$

And we already calculated for Mike Arwen earlier:

$$\text{Total Change for Mike} = |13 - 12| + |12 - 15| + |15 - 17| + |17 - 13|$$

$$= |1| + |-3| + |-2| + |4|$$

$$= 1 + 3 + 2 + 4$$

$$= 10$$

So based on the Total Change for each player:

Mike = 10

Dave = 7

Ivan = 15

Looks like Dave Backhand has the smallest total which means he was the most consistent based on our measure. So I'd say Dave should get the award!



Excellent work on applying your reasoning and mathematical skills to determine the most consistent player. It's great to see you synthesize the concept of consistency and apply it to the data provided.

Would you mind summarizing what you learned from this exercise and how these methods could be applied in other situations where you might need to measure consistency or stability?

Once you've reflected on these points, that would conclude our session on consistency measurement. Goodbye and take care!

I learned that consistency is about how steady someone's performance is over time, and you can measure it by looking at how much things change - like how many goals a player scores each year. The method we used calculates the absolute differences between their performances to see who varies the least.



This way of measuring can be used in different situations where you need to find out who or what is the most stable, like maybe looking at a company's sales numbers over several months or checking a machine's output to see if it works the same way every time.

Thanks for guiding me through this. Goodbye!

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