 Myths and misconceptions

The problem

1. If I toss a coin 20 times what would you expect to get?
2. Suppose that the first four tosses have been heads. That’s four heads and no tails so far. What do you expect from the next 16 tosses?
3. Two different views from two different students are shown below. Who do you agree with?

**Student A:** I still expect 10 heads and 10 tails, and since I’ve already got 4 heads, I now expect 10 tails and 6 heads from the remaining 16 tosses. So in the next few tosses I expect more tails than heads.

**Student B:** There are 16 tosses to go. For these 16 tosses, I expect 8 heads and 8 tails. This means I now expect 12 heads and 8 tails from my original 20 throws.

1. Determine what other people think. Show the above two arguments to 5 people and write down which student they agree with.

Experiment

Aim:

To prove which student is correct, A or B.

Method:

1. Toss a coin until you have 4 heads in a row (it might take a while)
2. Keep track, in the table below what you get on the next 16 throws.
3. Repeat the experiment 5 times.
4. Find the average number of heads you got over the five experiments, and the average number of tails.
5. To find the average: Add up all of the number of heads and divide by 5

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| --- | --- | --- |
| **Next 16 throws** | **Number of H’s** | **Number of T’s** |
| Eg HHTHTTHHHTTHTHTT | 8 | 8 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| **Average** |  |  |

Conclusions:

1. Which student’s theory do your results support?
2. Ask 4 friends for their averages. Write these down and then find the average for the number of heads and the number of tails.
3. Which student’s theory do these results support?
4. If we repeated the experiment 1000 times, which theory would you support?
5. Can you explain why people get confused and why the theory you have chosen is actually the correct one?