

Which Logic?

A coin is tossed in the air five times and each time it lands heads' - what will happen when it is tossed the sixth time? The answer is logical isn't it? But which kind of logic? Here are some possible 'logical' approaches, but they all give different answer:

Inductive Logic

This is based on recognizing patterns and then assuming that the pattern is going to continue. In this case the pattern is obvious, the coin when tossed comes down 'heads' so therefore it will probably come down 'heads' the next time.

Inductive logic is the type of reasoning that, in spite of what Popper said, most of our scientific progress is based upon. Not only this, we tend to rely on it throughout our daily lives - when our foot hits the brake pedal we expect the car to stop, not because we understand about the levers, hydraulics and friction involved, but because it has always caused the car to stop in the past (except of course for the time when there was a truck coming at the intersection and the cylinder was empty of fluid!!). Still inductive logic seems to work most of the time so it will obviously be heads.

Deductive Logic

Now deductive logic is the one that gives us certain answers based on forms of argument like the syllogism:

Premise 1) When an evenly weighted coin is randomly spun in the air the probability of it landing heads and tails are equal.

Premise 2) This coin is evenly weighted and is being randomly spun in the air.

Conclusion Therefore the chances of its landing 'heads' and 'tails' are equal.

The result of tossing a coin does not depend in any way on the previous results an unlikely occurrence is just made up of a chance encounter of such events so that settles that - or does it?

A correctly reasoned syllogism only guarantees a valid answer - whether it is true or not is a very different matter. It depends on the truth of the premises (if we started with all things with hair are monkeys, what does that make you and me!). So how are these premises arrived at? Usually they are assumptions (i.e. guesses!) or they result from inductive logic, which, as we know, is never certain, so ... Say what proof do we have that it is evenly weighted, maybe the guy tossing it is a conjurer of some sort? (Now would we be more or less skeptical if a machine were tossing it?). How certain are we really that past events don't affect probabilities? etc. etc.

This is superstitious, non-scientific claptrap! The chances are obviously 50:50.

Folk Logic

Or plain old common sense. The gut reaction of the average, uneducated (by which we presumably mean not brainwashed into accepting our current obsession with scientific methodology?) Joe in the street. Well you just go and ask a sample of such specimens what the answer is and they will no doubt tell you that by the law of averages it's about time it came down tails, so there is a greater probability of this.

Gut reaction is the same as intuition, which we have acquired as a result of generations of evolution and natural selection. How many times have our instincts proved to be right in the past (Oops - inductivism again!) and what would be the use of having such instincts if we can't rely on them? The more mathematically minded might also point out that the chances of five successive heads are 1 in 32 and this would increase to 1 in 64 if it landed heads the sixth time. Therefore 31 times out of 32 it will come down tails on the sixth toss! There seems little doubt it will land tails.

So what is the right answer? Logic can't help at all unless we can decide which logic to use and it is fairly certain that each and every one of us has applied all of these types of logic to some situation in the past. Maybe the only sensible way to decide between them is to toss a coin?

John Crew