

EXPLAINING THE LAW OF AVERAGES / LARGE NUMBERS

This maths-focused activity supports young people to learn the meaning of odds, chance and probability through a visual and practical example. It connects to CfE Benchmarks MNU 2-22 a, 3-22a, 4-09a and 4-22a.



TIME:
5-10min



RESOURCES:
A coin, flip-chart, a felt-tip pen

METHOD

1

Take a coin and show it to the group.

2

Ask: what are the chances of getting heads? And tails?

Answer: 50%

3

Then ask: so what are the odds?

Answer: 1:2 (just a different way of writing 50%)

4

If I toss the coin 3 times only, could I get 3 heads in a row?

Answer: Yes.

5

If I toss the coin 300 times, could I get 300 heads in a row?

Answer: Almost certainly no (e.g. flipping 12 heads in a row has 1:4,096 odds, so 300 heads in a row is extremely unlikely!)

6

So, if I toss the coin 300 times, what will my results be, most likely?

Answer: 50% heads and 50% tails, so about 150 heads and 150 tails.



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7 Highlight that in the short term (e.g. flipping the coin 3 times only) we could get a result that does not show the odds behind the game, but the more we play the more the results will actually show the odds of the game. In other words, the more time we flip the coin the more the overall results will be 50% heads and 50% tails, as the odds for every coin are 1:2. In math this is called the 'law of averages'.

8 Explain that this applies to all gambling games in casinos, bookmaker shops, lotteries, bingo halls etc.

- Do such places have fair games? No! Their games never give the player 50% (or higher) chances of winning. Why? Because the gambling industry is a business, so to keep running it needs an income, and the income comes from people who play and lose their money.
- It is in the interest of the gambling business to make the player have more losses than wins. This is ensured by creating games with odds that make players more likely to lose. So, gambling businesses always have an advantage against players, and this advantage is called 'the house edge'.
- In other words, gambling games give the player only between the 25% and 49% chances of winning, which means that you have between 51% and 75% chances of losing!
- As for the coin, when playing on a gambling game I could win at the beginning (e.g. in the short term), but as the odds are against me (the player), then the more I play the more the results will show those odds, so the more I play the more I am going to lose (e.g. it's impossible to win in the long term).

This means that in the short term people may experience some winnings, but in the long term they are going to lose and there's nothing they can do to change that.

So, as it is not possible to win in the long term, chasing losses is a strategy that does not work.

Alternative options:

Between steps 6 and 7: to make this concept more visual, pass the coin around the group and ask each participant to toss it once or twice (or more if it's a small group, ideally you want the coin to be tossed approximately 30 times in total):

- take a note on the flip-chart of how many heads and tails participants get, and of their order;
- count the results: it should show that at times they got a few heads or a few tails in a row, but overall the totality of the results should have a quite even split of heads and tails - the results are showing the 1:2 odds of the coin game, 50% heads and 50% tails.

Alternative notes:

Please remember that the house edge and the improbability of winning in the long term are present in all games where there is a house (e.g. in casinos, bookmaker shops, lotteries, bingos etc.).

This activity may not be appropriate for those who find numeracy or statistics challenging - use your judgement as to whether it will be suitable for your group.