

Smart Money

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This is a puzzle¹ from Futility Closet.



Mr. Smith goes to Atlantic City to gamble for a weekend. To guard against bad luck, he sets a policy at the start: In every game he plays, he'll bet exactly half the money he has at the time, and he'll make all his bets at even odds, so he'll have an equal chance of winning and of losing this amount. In the end he wins the same number of games that he loses. Does he break even?

My Solution

This is the same as my post, "The Percentage Trap".² Let P be the initial amount than Mr. Smith started with. Then a win means he has $P(1 + \frac{1}{2})$ and a loss means he has $P(1 - \frac{1}{2})$. Since he wins and loses the same number of times, we can pair each win with each loss so that at the end Mr. Smith has

$$P(1 + \frac{1}{2})(1 - \frac{1}{2}) \dots (1 + \frac{1}{2})(1 - \frac{1}{2}) = P(1 - \frac{1}{2}^2) \dots (1 - \frac{1}{2}^2) < P.$$

So he does not break even, but loses.

Futility Closet Solution

Futility Closet solution is the same as mine.

No. Every win multiplies Smith's holdings by 1.5, and every loss multiplies them by 0.5. One win and one loss (the order is immaterial) leaves him with 0.75 times his initial holdings, and n wins and n losses leaves him with 0.75^n his initial assets. Ten such blows will leave him with only about 5 percent of his initial stake.

From David L. Book, *Problems for Puzzlebusters*,³ 1992.

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¹ 4 October 2024 (<https://www.futilitycloset.com/2024/10/04/smart-money/>)

² "Percentage Trap" (<https://josmfs.net/2020/10/31/the-percentage-trap/>)

³ <https://archive.org/details/problemsforpuzzl0000book/page/184/mode/2up?view=theater>