

Re: A Gambling Math Question

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- *From:* Dave Seaman <dseaman@xxxxxxxxxxxx>
 - *Date:* Tue, 23 Jan 2007 18:38:36 +0000 (UTC)
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On 23 Jan 2007 09:54:18 -0800, C6L1V@xxxxxxx wrote:

Dave Seaman wrote:

On 23 Jan 2007 08:46:35 -0800, JyBrdnj@xxxxxxxxxx wrote:

I was looking over an old post of mine, and I just want to see if someone can clarify something for me. Someone posted that after 100 trials in a 50/50 game, you would have a return of between -15 and 15, and after 1,000,000 trials you would have a return of between -1500 and 1500. They said there's a function D that can be applied to the number of trials to show you how far away you would be from zero, and this function D is monotonical, or always increasing. My question is why is there a function D , where did this come from?

Let p be the probability of success and $q = 1-p$ = probability of failure. If N is the number of trials, the expected number of successes is obviously $N*p$. The standard deviation is approximately $\sqrt{N*p*q}$.

This is **exact**, not at all an approximation.

Ok, you're right. But the approximation comes in replacing the binomial distribution with a normal distribution having the same mean and standard deviation.

This comes from the well-known normal approximation to the binomial

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distribution, which you can easily read about using a Google search.

In the case $N=100$, $p=q=1/2$, we get a standard deviation of $\sqrt{100 \cdot 1/2 \cdot 1/2} = 5$, and there is a >99% probability that the observed number of heads will lie within 3 standard deviations of the mean, or between 35 and 65.

Agreed. But the OP seems to be saying that getting more than 65 is impossible. He seems to be mixing up 'impossible' with 'improbable'.

Very likely, he is just repeating what he was told.

If we substitute $N=10^6$, then the S.D. is $\sqrt{25 \cdot 10^4} = 500$, and thus the observed number of heads should lie between 498,500 and 501,500 with probability >99%.

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