

1. Find the expected value for the sum of 100 draws at random with replacement from the box –
 - (a) that has four tickets: one labeled “0”, two labeled “1”, and one labeled “6”
 - (b) that has four tickets: one labeled “-2”, one labeled “-1”, one labeled “0”, and one labeled “2”
 - (c) that has three tickets: one labeled “-2”, two labeled “-1”, and one labeled “3”
 - (d) that has three tickets: one labeled “0” and two labeled “1”.
2. Find the expected number of squares moved on the first play in Monopoly.
3. Someone is going to play roulette 100 times, betting a dollar on the number 17 each time. The bet pays 35 to 1 and there are 1 in 38 chances to win. Find the expected value for the net gain.
4. You are going to play roulette 100 times, staking \$1 red each time. The bet pays even money (i.e. if it lands red, you win \$1; if it does not land red you lose \$1) and there are 18 in 38 chances to win. Find the expected value for your net gain.
5. Repeat the above exercise for 1000 plays.
6. A game is *fair* if the expected value for the net gain equals 0. A generous casino would offer a bit more than \$1 in winnings if a player staked \$1 on red in roulette and won. How much should they pay to make it a fair game?
7. One hundred draws are going to be made at random with replacement from a box with seven tickets labeled “1” through “7”.
 - (a) Find the expected value and standard error for the sum.
 - (b) The sum of the draws will be , give or take or so.
 - (c) Suppose you had to guess what the sum was going to be. What would you guess? Would you be expect to be off by around 2, 4, or 20?
8. You gamble 100 times on the toss of a coin. If it lands heads, you win \$1. If it lands tails, you lose \$1. Your net gain will be around , give or take or so. Fill in the blanks.
9. Fifty draws are made at random with replacement from a box with five tickets labeled “1” through “5”; the sum of the draws turns out to be 157. The expected value for the sum is , the observed value is , the chance error is , and the standard error is . Fill in the blanks.

10. Tickets are drawn at random with replacement from a box of numbered tickets. The sum of 25 draws has expected value equal to 50, and the standard error is 10. If possible, find the expected value and standard error for the sum of 100 draws. Or do you need more information?
11. One hundred draws are going to be made at random with replacement from a box with five tickets labeled “0”, “2”, “3”, “4”, and “6”. True or false, and explain.
- The expected value for the sum of the draws is 300.
 - The expected value for the sum of the draws is 300, give or take 20 or so.
 - The sum of the draws will be 300.
 - The sum of the draws will be around 300, give or take 20 or so.
12. One hundred draws will be made at random with replacement from a box six tickets; two labeled “1”, three labeled “2”, and one labeled “4”.
- The smallest the sum can be is hspace2cm, the largest is hspace2cm.
 - The sum of the draws will be around hspace2cm, give or take hspace2cm or so.
 - The chance that the sum will be bigger than 250 is almost hspace2cm%.
13. One hundred draws will be made at random with replacement from a box with four tickets: one labeled “1”, two labeled “3”, and one labeled “9”.
- How large can the sum be? How large?
 - How likely is the sum to be in the range from 370 to 430?
14. You can draw either 10 times or 100 times at random with replacement from a box with two tickets: one labeled “-1” and one labeled “1”. How many times should you draw –
- To win \$1 when the sum is 5 or more, and nothing otherwise?
 - To win \$1 when the sum is -5 or less, and nothing otherwise?
 - To win \$1 when the sum is between -5 and 5, and nothing otherwise?
- No calculations are needed, but explain your reasoning.
15. There are two options:
- One hundred draws will be made at random with replacement from a box with six tickets: two labeled “1”, one labeled “5”, one labeled “7”, and two labeled “8”.
 - Twenty-five draws will be made at random with replacement from a box with five tickets: one labeled “14”, one labeled “17”, one labeled “21”, one labeled “23”, and one labeled “25”.

Which is better, if the payoff is –

- (a) \$1 when the sum is 550 or more, and nothing otherwise?
 - (b) \$1 when the sum is 450 or less, and nothing otherwise?
 - (c) \$1 when the sum is between 450 and 550, and nothing otherwise?
16. Suppose that in one wheel at a certain casino, there are 25000 independent plays at roulette. On each play, the gamblers stake \$1 on red. Is the chance that the casino will win more than \$1000 from these 25000 plays closest to 2%, 50%, or 98%? Explain briefly.
 17. Suppose that one person stakes \$25000 on one play of roulette, betting all on red. Is the chance that the casino will win more than \$1000 from this play closest to 2%, 50%, or 98%? Explain briefly.
 18. A gambler plays once at roulette, staking \$1000 on each number (including 0 and 00). So this person has staked \$38000 in all. What will happen? Explain briefly.
 19. A box contains 10 tickets. Each ticket is marked with a whole number between -5 and 5. The numbers are not all the same; their average equals 0. There are two choices:
 - 100 draws are made from the box, and you win \$1 if the sum is between -15 and 15.
 - 200 draws are made from the box, and you win \$1 if the sum is between -30 and 30.

Choose one of the four options below; explain your answer.

- (a) The first choice gives a better chance of winning.
- (b) the second choice gives a better chance of winning.
- (c) Both choices give the same chance of winning.
- (d) Can't tell without the standard deviation of the box.