Have you heard of the saying: one step forward but two steps back? A "random walk" in mathematics is a numerical simulation of an actual walk where at each step the person takes a step either forward or backward. Numerically, one always starts in position zero (the origin). When a step forward is taken, one is added to the total sum. When a step backward is taken, one is subtracted from the total sum. For example, if you take one step forward and two steps back, the sequence would be: {0 1 0 -1}. The first zero in the sequence represents the starting position.

Now you will perform a random walk yourself by tossing a fair coin 2400 times. (Don't worry, the computer is going to do this for you.) Landing on heads will correspond to a step forwards (positive one), while tails will correspond to a step backwards (negative one). For example, if your tosses result in the sequence {H T T H H H T T T H}, the successive random walk positions starting from the origin would be {0 1 0 -1 0 1 2 1 0 -1 1}. The first zero again represents the starting position. Click ten times on the Realize button to get ten random walk realizations over 2400 steps. Each graph is plotted on your screen. As +1 and -1 are equally likely in each step we may anticipate that the walks will cross the x-axis frequently. Each time a walk comes back to the x-axis corresponds to a return to the origin of the walk when its position is back to 0; this occurs at every moment when the number of +1s and -1s are in balance. Where did you observe the last return to the origin of these walks? The average time at which the last return to the origin occurred for your walks is computed for you. Select the radio button answer corresponding to what you discovered. Did you find your answer surprising? Examine the graph carefully. Does anything else surprise you?

Realize!

Number of realizations: 10

Average time of last return to the origin: 1410.6