

What are my chances...really?

Topics: Quantitative Literacy, Probability

NCTM Standards: Measurement; Data Analysis and Probability;
Number and Operation; Problem Solving; Connections

NH GLE's: Number and Operations; Geometry and Measurement; Data, Statistics, and Probability;
Problem Solving, Reasoning, and Proof; and Communication, Connections, and Representations

Introduction: The Powerball® Lottery is a game that costs \$1.00 to play. For one dollar, you get five numbers (from a group of 59 numbers) and another number (called the “Powerball”) from a separate group of 39 numbers. To win the jackpot, you must match all five numbers and the Powerball.

The probability that this actually occurs is $\frac{1}{195,249,054}$.

That is, one out of one hundred ninety-five million, two hundred forty-nine thousand, fifty four.

This probability is a very small number. The denominator of the fraction, 195,249,054, is a very large number! It is difficult to get a feel for exactly how small (or large) the numbers are. So, let us try a few demonstrations to help us understand.

I. An example using time:

1. To begin the activity, please fill in the blanks below:

a. There are _____ seconds in one minute.

b. There are _____ seconds in one **hour**. (How do you know?)

c. There are _____ seconds in one **day**. (How do you know?)

d. We know that there are _____ different “ways” you can choose numbers for the Powerball® ticket (hint: it is the denominator of the fraction above).

2. Suppose that you were able to buy one (unique) Powerball® ticket for every second of a day.

a. How much money would you be spending each day?

b. How many total **days** would it take before you bought every possible Powerball® ticket? Show your work below.

- c. Suppose you start buying tickets on January 1st, 2010 at 12:00 sharp at midnight. What **date (year, month, day)** would it be by the time you had each possible Powerball® ticket?
- d. Suppose you decide to only buy a ticket every 10 seconds instead of every second. So, now you are spending “only” _____ dollars per day.
- e. How many days (and years) will it take before you purchase all possible Powerball® tickets?
- f. In this last example, how old would you be before you purchased even half the tickets?

II. An example using Distance

- 1. Suppose you were in Boston and decided to travel south and west across the USA. You decided that you would travel exactly 195,249,054 inches.
 - a. How many miles is that?
 - b. So, approximately where do you think you would end up? (List a few possibilities)
 - c. And in that entire travelled distance, what “distance” represents the winning Powerball® ticket?

III. Wrap-up

Do these two illustrations help you understand “how small” the actual numerical probability, $\frac{1}{195,249,054}$, is? Explain your thoughts below.