



Massachusetts Lottery Scandal

1 Grade Levels and Time

- Grades:10-12
- Time: This lesson will take about 90-minutes.

2 Objectives and Topics

- Objectives:
 - Give the students a better understanding of calculating probabilities and expected values and how to apply them to real life situations.
- Topics:
 - Expected Value
 - Using Combinations and permutations to calculate probabilities

3 Introduction

In 2005 Massachusetts' lottery system changed from an unbounded jackpot to a bounded jackpot of \$2,000,000. This new system made it so that once the jackpot reaches \$2,000,000 then all the money that should have gone into the jackpot would move down to the lower prizes. This created situations where the smaller prizes would explode to huge dollar amounts, increasing the expected value to be higher than the price of the ticket.





4 Procedure and Discussion

1. First, you should discuss with the students how the lottery works. How the lottery works is that there are 46 unique numbered balls from 1 to 46 and they take out 6 balls in total. Tell the students that order doesn't matter; If 1-2-3-4-5-6 was pulled then 1-2-3-4-5-6 is a winning ticket, 6-5-4-3-2-1 is a winning ticket, 1-3-6-2-4-5 is a winning ticket, etc...
2. Next you can have the students play a 7 ball 3-pick lottery. So for example there are 7 balls labeled 1 to 7 and each lottery ticket has 3 picks (1-2-3, 4-1-7, -3-2-6, 4-7-3, etc...).
3. Get the students into groups of 4 and have them come up with 10 tickets as a group and have them fill out the worksheet (see next page). Then have them look at the payouts for lottery 1 and lottery 2 (see worksheet on next page) and then have 2 of the people in the group play lottery 1 and two people play lottery 2.
4. Now go to Random.org's Random integer set Generator and start to play the lottery with your students.
5. For each round, the students will see the number you pull, for example let's say the winning ticket for round 1 is **2-3-7**. So as a group, the students will compare their 10 tickets to the jackpot number, **2-3-7**, and see which tickets are winners. Then they will add up the total profit that they made that round. Remind them that each ticket is \$10, so every round they are spending \$50.
6. After 4 or 5 rounds, each group should calculate their total profits from lottery 1 and 2 and share them with the class. You could have each group come up to the board and write their profits for each lottery. At the end, it should be obvious which lottery is better.
7. The back of the worksheet has follow up questions, which should explain to the students why one lottery was better than the other.





Let's Play the Lottery!

Price per ticket: \$5

Lottery 1

Matches	Prize
0 of 3	\$0
1 of 3	\$0
2 of 3	\$15
Jackpot!!	\$25

Lottery 2

Matches	Prize
0 of 3	\$0
1 of 3	\$0
2 of 3	\$5
Jackpot!!	\$100

Ticket 1	___	___	___
Ticket 2	___	___	___
Ticket 3	___	___	___
Ticket 4	___	___	___
Ticket 5	___	___	___
Ticket 6	___	___	___
Ticket 7	___	___	___
Ticket 8	___	___	___
Ticket 9	___	___	___
Ticket 10	___	___	___

Profits	Lotto 1	Lotto 2
Round 1	___	___
Round 2	___	___
Round 3	___	___
Round 4	___	___
Round 5	___	___
Total	___	___





- 1) If you had one ticket, what is the probability that:
 - i. You won the lottery?
 - ii. You matched 2 of 3 numbers?
 - iii. You win nothing?
 - iv. Does having 10 tickets per lottery increase your odds of winning the jackpot? If so, what is the probability of you winning the lottery when you have 10 different tickets.
- 2) What was the expected profit per ticket in lottery 1 and lottery 2?





5 Discussion

6 Materials

- "Let's Play the Lottery!" Worksheet.
- Random.org's Random integer set Generator

7 Discussion

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