

1. For the JACKPOT, you need to match all 6 winning numbers.
  - a) How many ways are there of choosing six numbers from 49?
  - b) How many ways are there of ordering 6 numbers?
  - c) How many different lines of 6 numbers are there?
  
2.
  - a) What are the odds of winning the jackpot if you buy just one line of six numbers?
  - b) How much would it cost to buy all the possible lines of numbers?  
Is this a possible legal way of making money?
  
3. For the second prize, you need to match exactly 5 out of the 6 winning numbers, plus the bonus number.
  - a) In how many different ways could you match 5 out of 6 numbers?
  - b) How many ways are there of matching the bonus number?
  - c) How many ways are there of winning the second prize?
  - d) What are the odds of winning the second prize?
  
4. You are guaranteed a £10 prize if you match exactly 3 out of the 6 winning numbers.
  - a) How many ways are there of matching 3 out of 6 numbers?
  - b) What are the odds of winning this prize?
  - c) If you buy one line of the same six numbers for both the Wednesday and the Saturday draws, how many times should you expect to win the £10 prize during one year?

Here are a number of suggested projects based on the National Lottery.

National Lottery data can be found at

<http://lottery.merseyworld.com>

- (1) Are the numbers being chosen at random? In the long run, the frequency of the 49 numbers should be about the same, but how much variation could be tolerated without rejecting the hypothesis that they are chosen randomly?
- (2) Similar to (1) above, the total sum (or mean value) should be distributed normally about  $150(6 \times 25)$ . Is this the case?
- (3) From the number of people winning particular jackpots, can you conclude anything about the numbers chosen by the public? For example, it has been suggested that many people use birth-dates, which, if true, means fewer people winning when the numbers are high.
- (4) Over a period of a year, if you stick to the same numbers, you should win £10 on average at least once. Check whether this actually happens.
- (5) Design different strategies – for example, choose 12 different numbers, and buy all the lines so that every combination of 4 of these numbers appears on a ticket. Does this improve your chances of winning?
- (6) Compare the chances of winning with other forms of gambling (e.g., horses, football pools) or investments (e.g., premium bonds).
- (7) Investigate other lotteries such as  
European, Californian, Irish