# Preclass

## Pre-class work

### 1. Barber Exercise

**Exercise 7.1.** *You play a game in which you have a probability p of winning. If you win the game you gain an amount £S and if you lose the game you lose an amount £S. Show that the expected gain from playing the game is £(2p − 1)S.*

### 2. Playing the Lottery

You see that a lottery is advertising that it has a record-breaking payout of $100,000,000. To win the lottery you need to correctly pick 6 numbers from 49 possibilities (without replacement). It costs $10 to enter, and if you enter now then you can daydream about all the things that you would do with the money.

Alternatively, you can go and watch a movie with the money instead. You estimate that the movie will be 10% more enjoyable than the daydreaming, but winning the lottery will be one million times better than the movie.

- Should you play this lottery? Explain your reasoning (and/or calculations)
- What is the expected financial impact if you play this lottery?

Write up short solutions and upload to your personal repository before class. Be prepared to discuss your solutions during the class.

1. Expected value = p*s + (1-p) (-s) = 2ps -1

2. Probability of winning C(49 6) = 1/13,983,816

   - Expected value of winning = 100000000*1/13,983,816 = 7.15

   Since 7.15 < 10. You shouldn't play the lottery. Go watch movie! (Wanna watch Dune)