

Week 4 Monday

Review

1. About 30% of human twins are identical, and the rest are fraternal. Identical twins are necessarily the same sex — half are males and the other half are females. One-quarter of fraternal twins are both male, one-quarter both female, and one-half are mixes: one male, one female.

You have just become a parent of twins and are told they are both girls. What is the probability that they are identical?

2. Suppose that, over during the past month, you've been carrying around a 10-euro bill and a 5-pound bill in your wallet. The average exchange rate from euros to dollars during this time was 1.074 dollars per euro, with a standard deviation of 0.012 dollars per euro. The average exchange rate from pounds to dollars during this time was 1.213 dollars per pound, with a standard deviation of 0.021 dollars per pound. Assume for simplicity that these two exchange rates varied independently during this period.

What were the expected value and standard deviation of the amount of money in dollars in your wallet during this period?

3. Suppose that a survey suggests that about 75% of the population of Brussels speaks French (possibly alongside another language), and about 20% speaks Dutch (possibly alongside another language).

- (a) What can be said about the percentage of people in Brussels that speak either French or Dutch (or both)?
- (b) If speaking French and speaking Dutch are independent, what percentage of people in Brussels speak either French or Dutch (or both)?

4. The distant planet of Chiisai is home to a race of aliens whose height in centimeters varies continuously between 0 and 1 according to the probability model $f(x) = 2 - 2x$.

What is the probability that a randomly chosen inhabitant of Chiisai is between 0.25 and 0.75 cm tall?

5. A standard deck of cards is evenly divided between four suits, two of which are red (hearts and diamonds) and the other two are black (spades and clubs).

You are given the chance to play a game where you draw a card. If it is red, you win \$1. If it is a spades, you lose \$3. Otherwise, nothing happens. Are you expected to win money playing this game?