Week 3

Exercise 31   Suppose that in 6-person families, every person has an equal chance of being male, female or non-binary independently of one another. Which would be more common:

- families with exactly 3 females

- families without exactly 3 females?

Exercise 32   Say I flip a coin 8 times and 3 of them turn out to be heads. What are the chances that 2 of the heads appeared in the first 6 flips?

Exercise 33   A human is playing darts and has super good aim. They're able to hit the red bullseye with probability 0.7. Assume each throw is independent and that he makes 8 throws in total.

(1) Given that they hit the bullseye at least twice, what is the chance that they hit the bullseye exactly four times?

(2) Given that the first two throws hit the bullseye, what is the chance that they hit the bullseye exactly four times in the 8 throws?

Exercise 34   A battle for the royal dice thrower is about to begin. Two humans are sat in front of one another with a fair eight sided die in front of them. Each round, the two humans roll the die. If one person scores higher than another, they win the round; if the score is even, it's a tie. There are five rounds in this tournament. What are the chances that the first player wins at least four out of five rounds?

Exercise 35   Roughly 65% of Toronto have received their adulting cards in the mail. Say that we randomly select a sample of 20 individuals from Toronto.

(1) What is the most likely number of people with adulting cards in the sample?

(2) What is the chance of getting this many people with adulting cards?

Exercise 36   In a hospital, there are 300 patients waiting to get an untested treatment. The patients have (independently) a $\frac{1}{3}$ chance of surviving the treatment. Using the normal approximation, calculate the probability that more than 120 people will live after receiving treatment.

Exercise 37   You decided to gamble away your life savings of $25 and so you went to a casino and decided to play roulette. You don't want to lose your savings to fast, so instead you decide to bet a dollar on red 25 times. If the ball lands on red, you get $2. The probability of getting a red is $\frac{18}{38}$. Find the normal approximation that after 25 bets, you will have $25 or more.

Exercise 38   Suppose that you're looking at reviews of a product that you just released. You know that roughly 45% of the people who have bought the product actually enjoyed it. You took a poll and 200 people responded back (independently and randomly and equally likely).

(1) Estimate the chance that exactly 90 of the people who responded back actually enjoyed the product.

(2) Estimate the chance that over 50% of the people who responded back actually enjoyed the product.

(Use normal approximation)

Exercise 39   Using the normal approximation, find the chance of getting 100 sixes in 600 (fair) dice rolls (of a six sided die).

Exercise 40   Suppose we ran a test with 30 individuals in which we had them flip a (fair) coin 200 times. What (approximately) are the chances that none of the individuals flip exactly 100 heads?