MG4F7 Summer Quiz

1. Suppose you have a dataset in which the unit of observation is the day and your variables of interest are temperature and precipitation. Which of the following observations might come from that dataset?

    a. (January 2017, $72, Yes)
    b. (20170406, 21.2, 0.01)
    c. (Germany, 64, 2)
    d. (Tuesday, 21, -1.4)
    e. All of the above
    f. None of the above

2. Suppose that you measure pollution levels and children's respiratory infections in 100 cities in the UK. Suppose the relationship is positive. Draw a scatter plot in which infections are on the y-axis and pollution on the x axis.

3. Suppose you flip a coin 100 times and you observe 40 heads (40%) and 60 tails (60%). Draw the probability distribution.

4. Suppose you flip a fair coin either 10 times or 100 times. Do you think it is more likely that you observe 40% or less heads in the 10 coin flip sample or the 100 coin flip sample?

    a. The 10 flip sample
    b. The 100 flip sample
    c. The probability of observing 40% or fewer heads is the same in the two samples

5. Draw a normal distribution centered at 0 with variance 1. Hint: approximately 95% of the distribution is between -2 and 2.

6. Draw another normal distribution centered at 0 with variance 1, and on the same graph draw another normal distribution centered at 0 with variance 3.

7. Draw another normal distribution centered at 0 with variance 1, and on the same graph draw another normal distribution centered at 3 with variance 1.

8. Draw another normal distribution centered at 0 with variance 1. Shade in the area between -3 and 3. How much of the distribution have you shaded in?

    a. More than 95%
    b. Less than 95%
    c. Exactly 95%
    d. Not enough information to say

9. Suppose you flip a fair coin 100 times and call one observation of a random variable the proportion of heads you observe. Suppose you repeat the process, flipping the coin another hundred times. Then you repeat again and again. Overall, you observe the random variable (the proportion of heads in 100 coin flips) a huge number of times. Draw the distribution of the random variable of the proportion of heads in 100 flips (the key points are the shape of the distribution and where it is centered).

10. Re-draw the distribution from problem (9) and now shade in the observations with proportions less than 0.99. Before you shade, think intuitively, should the shaded fraction be a lot of the distribution or only a little? Why?