MMA 863 – Team Assignment 2

This assignment includes material from Sessions 1 to 4 inclusive (with one problem from 6!)

The results should be provided in a single ‘main’ document (probably a PDF) that is print-ready with a single supporting Excel file if required. You should assume that any supporting documentation will not be reviewed, so your entire answer should be in the main document. The main document may contain scanned versions of hand-drawn diagrams / formulas if you like.

Hint: You should be sure you have read 7.1.2 of the textbook before getting too far into this…

1. I run a pizza restaurant that is only open on Thursday, Friday and Saturday evenings from 5:30 to 9:30. Over that time, orders for pizza come into the restaurant randomly with a distribution that is approximately normal with mean 20 and standard deviation of 5 pizzas per hour. A pizza requires 1 kg of dough, 250 g of cheese and a mix of other ingredients depending on the order.

On Thursday AM I have 100 kg of dough on hand and am placing an order for more dough. The order will arrive the morning of the next day (Friday) on a truck from the bakery. This order is intended to last two weeks when the next order will arrive, also on a Friday morning.

* 1. How likely is it that I will run out of dough before the end of day Thursday?
  2. Suppose that I actually have 200kg of dough on hand on the start of day Thursday. How much dough should I order to have no more than a 1% chance of stocking out by the time the next delivery arrives? (With 200kg of dough on hand, you can assume you make it through Thursday.)
  3. Not many customers order double cheese. In fact, of the last 49 pizzas that were ordered, only 7 had double cheese. With this information, calculate the 95 % confidence interval on the proportion of customers who order double cheese.

1. CBC: I was listening to CBC radio as I drove in to the other day. They were speaking about results of a recent survey of 2000 from a population of people who owned five major appliances (fridge, oven, dishwasher, washer and dryer). Apparently only 300 of the people they contacted actually responded, but among them, 80% claimed that major appliances did not last as long as they used to, nor did they last as long as the 10 year average that appliance manufacturer’s association claimed.

Suppose that appliances actually last, on average 10 years, as the manufactures’ association claims. Assume that this has an approximately normal distribution with standard deviation of 3 years. What percentage of the survey population should have experienced a major appliance failure in fewer than 2 years?

1. Lots of parking lots

There are two parking lots at the college: A and B. Lot A is small with only 50 spots, B is much larger with 200 spots. If I get there after 8:15 AM, there is a 5% chance that A has space and a 10% chance that lot B has space. If lot A is has space then there is a 30% chance that lot B also has space.

* 1. If I show up at 8:15 AM, what is the probability I can get a parking spot?
  2. Assuming I drive all over the college and find the last remaining spot. What is the probability it is in lot A?

1. Some random problems – problems tend to be more difficult when they are removed from context. This is one reason why exams are perceived as more difficult than problems in textbooks. These are deliberately mixed around (as are real-world problems!) Provide details in your answer (e.g. parameters, number lines, pictures, functions) as appropriate to support your work.
2. Which is more likely: rolling 6 standard dice and getting either a 5 or 6 on at least 3 of them; or rolling 5 standard dice and getting a 4, 5 or 6 on at least 4 of them?
3. During a thunderstorm, you see a lightning strike about once every 5 minutes. During a 20 min storm, what is the probability of their being between 5 and 7 strikes (inclusive)?
4. How many words would you have to pick, at random, from a dictionary, to know the proportion of words with the letter R in them within 1% with 95% confidence?
5. I need to have $100,000 in 5 years’ time. I am certain I can achieve 3% continuous growth if I invest in XYZ today. How much do I have to invest?
6. Pretend I am your manager. I am thinking of replacing a machine with a new one because I suspect the defect rate with the machine is too high.
   * 1. Explain to me how I could set up a test to do this.
     2. Would it be OK to start with an assumption that I should change the machine and look for evidence that I should not? What would the implications be?