Math 215 – Fall 2017

Practice Homework – Assigned September 11th, due September 14th

Note: Remember that you must show your work to get full credit for a problem.

1. I have a bookshelves with 4 shelves on it each shelve is labelled. I have 7 blue books labeled volumes 1 to 7. I have 8 red books labeled volumes 1 to 8. I have 10 green books labeled volumes 1 to 10.

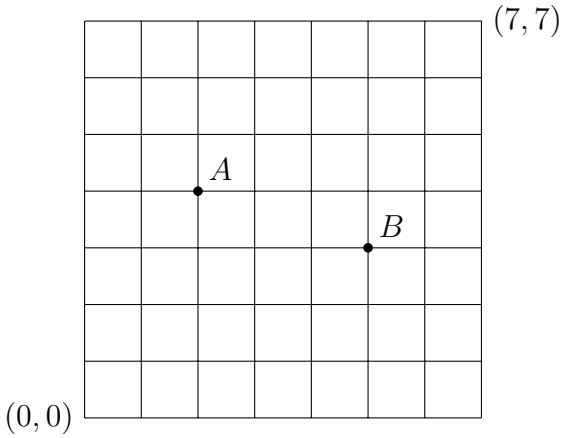
   (a) How may ways are there to arrange the books so that they are all on the top shelf?

   (b) Suppose I want each color of book to go on its own bookshelf, how many way are there to do that?

   (c) How may ways are there to arrange the books on the bottom shelve where I only shelf the first two blue books, the first three red books, and the first 5 green books?

   (d) How may ways are there to arrange the books on the top shelve where I only shelf two random blue books, three random red books, five random green books and shelve all the blue books before the other and shelve all the red books before the green?

2. Suppose we have a square lattice of height 7 and length 7. Then we can consider the bottom left corner of the square lattice to be the origin and label it $(0, 0)$.



   Suppose you start at $(0, 0)$ and want to end at $(7, 7)$ and can only move up and right.

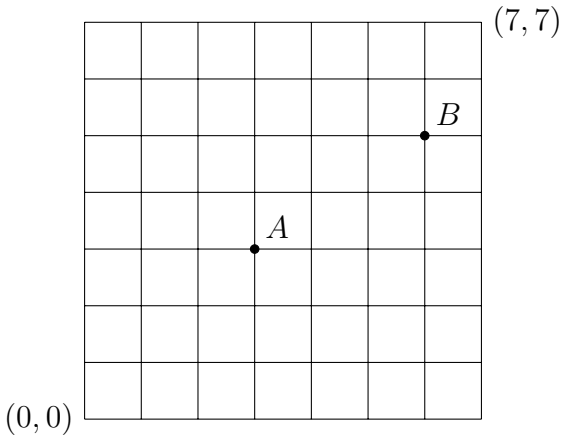
   (a) How many paths are there that go through point A?

   (b) How many paths are there that go through point B?

   (c) How many paths are there that go through point A and B? Explain your answer.

(d) How many paths are there that go through A **or** B? Explain your answer.

3. Suppose we have a square lattice of height 7 and length 7. Then we can consider the bottom left corner of the square lattice to be the origin and label it $(0, 0)$.



Suppose you start at $(0, 0)$ and want to end at $(7, 7)$ and can only move up and right.

(a) How many paths are there that go through point A?

(b) How many paths are there that go through point B?

(c) How many paths are there that go through point A and B?

(d) How many paths are there that go through point A and **not** through B?

(e) How many paths are there that go through point B and **not** through A?

(f) How many paths are there that go through A **or** B (possibly both)?

(g) Using a computing device, reduce the answer you got in 3f to a single number.

(h) From your answers take the number of paths that go though A add the number of paths that go through B and subtract the number of paths that go though both A and B and reduce to a single number using a computing device. Is there anything interesting about this number? Why do you think you got it?