

Problem Set 8

Due: 10:00 a.m. on Thursday, November 7

Instructions: Submit solutions to all of the following exercises. A subset of the problems will be graded. Be sure to adhere to the expectations outlined on the sheet *Guidelines for Problem Sets*. You may submit your solutions either in-class or to the Department of Mathematics (*with date and time of submission noted*).

Exercises: Be sure to show all of your work and fully justify your answers and reasoning.

1. Suppose you are making a gift basket to welcome a new neighbour to the community. You are nearly done with the work! To finish, you can select one object from the following possible items to be included: 5 boxes of chocolate, 3 jars of jam, 2 tins of coffee, 5 containers of crackers. How many ways can you complete the gift basket?
2. How many possible outcomes are there from rolling one die and tossing one coin?
3. A lock has a disk with 36 numbers written around its edge. The combination to the lock is made up of three numbers (such as 12-33-07 or 19-19-08). How many different possible combinations are there for this lock?
4. A band is planning a tour with a concert in each of six cities. In how many different orders could the band visit the cities?
5. Your car stereo can be programmed to hold six radio stations of your choice. There are nine stations you really like. How many different ways can you program your six buttons with different collections of your favourite stations? Here, we will use the convention that a different ordering of the same stations counts as a different programming.
6. The **complete bipartite graph** $K_{m,n}$ has vertex set $V = V_1 \cup V_2$ where $|V_1| = m \neq 0$, $|V_2| = n \neq 0$ and $V_1 \cap V_2 = \emptyset$. Further, every vertex in V_1 is adjacent to every vertex in V_2 , but none of the vertices in V_i are adjacent to another vertex in V_i for $i = 1, 2$.
 - (a) What is the size of $K_{m,n}$?
 - (b) How many spanning subgraphs are there of $K_{m,n}$?