CSC 1300 – Problem Set 1

1. The School of Rock is planning a special three-song tribute to the Rolling Stones. They need to choose three songs out of the four that they have learned ("As tears go by", "Beast of burden", "I can't get no satisfaction", "Dead flowers").

   a) How many ways can they choose the songs to perform?
   
   b) What if for the finale they would like to perform either “Beast of burden” or “I can’t get no satisfaction”; they are also sure they don’t want to start off with “As tears go by”. How many possible ways are there to choose a three-song tribute under these restrictions?
   
   c) How do your answers change if they plan to perform the three songs as in (a) or (b) and then perform the fourth song as an “encore”?

2. There are 96 students taking Discrete Structures this semester.

   a) Prove that at least two have birthdays within 4 days of each other.

   b) Is it the case that at least three must have birthdays during the same month? ...the same week? Justify your answer.

3. Is the product of two odd numbers even or odd? Prove it.

4. Prove that if $n$ is any integer, then $3n^3 + n + 5$ is odd. (Suggestion: do one case for $n$ odd and one case for $n$ even.)