COSC 600
Class Exercises #2

1. What is $2^{50}\ (mod\ 5)$? what is $2^{100}\ (mod\ 3)$? What is $3^{135}\ (mod\ 2)$?

2. Prove the following formula by induction
   a. $\sum_{i=0}^{n} \frac{1}{(i+1)(i+2)} = \frac{n+1}{n+2}$ where n ≥ 0 .

   b. $\sum_{i=1}^{n}(2i-1) = n^2$ where n ≥ 1 .

3. For all integers n >= 1,

   1*3 + 2*5 + 3*7 + …… + n*(2n + 1) = ?????

   Rewrite this formula using Σ symbol and simplify it using mathematical series formula discussed in class.

4. Rewrite the following formula using summation and calculate it using mathematical **series formula** discussed in class.

   a) 8 + 12 + 16 + ……. + 104 =

   b) 6 + 18 + 54 + …… + $2*3^n$ = ????

   c) $\lim_{n\to\infty}(\frac{1}{5}+\frac{1}{5^2}+\frac{1}{5^3}+\frac{1}{5^4}+\ \ldots\ldots+\frac{1}{5^n})$ = ????

   d) $\sum_{i=1}^{n}(i+\sum_{j=1}^{i}\ 2n)$

   e) $\sum_{i=1}^{n}(i+\sum_{j=1}^{i}\ 2j)$ = ?????

5. Hanoi tower problem discussed in class can be solved by using recursive function. The following program is a solution program in pseudo codes. When n is 5, what is the output of this program? Also what is the number of disk movements?

```
void towerOfHanoi(int n, char from_rod, char to_rod, char aux_rod)
{
    if (n == 1)
    {
        print << "Move a disk from rod " << from_rod << " to rod " <<
            to_rod<<endl;
        return;
    }
    towerOfHanoi(n - 1, from_rod, aux_rod, to_rod);
    print << "Move a disk from rod " << from_rod <<" to rod " << to_rod <<
          endl;
    towerOfHanoi(n - 1, aux_rod, to_rod, from_rod);
}

// Driver code
int main()
{
    int n = 4; // Number of disks
    towerOfHanoi(n, 'A', 'C', 'B'); // A, B and C are names of rods
    return 0;
}
```