CS3311 Homework 2 Due date: Wednesday, January 25, 2017, by class time, 12:05pm
Submission: Typed, on Canvas (scanned submissions are not allowed)

The answers must be the original work of the author. While discussion with others is permitted and encouraged, the final work should be done individually. You are not allowed to work in groups. You are allowed to build on the material supplied in the class. Any other source must be specified clearly.

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1. *(50 points)* Use induction to prove the following: The sum of the arithmetic series with the first term a_1 and increment d is $a_1 + a_2 + \ldots + a_n = \sum_{i=1}^{n} a_1 + d(i-1) = \frac{1}{2}n[2a_1 + d(n-1)]$

A term of the arithmetic series is computed using: $a_k = a_{k-1} + d$. We can compute that $a_k = a_{k-1} + d = a_{k-2} + 2d = \ldots = a_1 + d(k-1)$. This is where the above formula comes from.

Clearly label the **basis**, **inductive hypothesis**, and **inductive step**.

2. *(50 points)* Consider the following Python program and use induction on the number of iterations of the `for` loop to prove that the program always prints the following line.
`True: y is equal to z.`

You must present the proof based on the code and on the number of iterations of the `for` loop. Clearly label the **basis**, **inductive hypothesis**, and **inductive step**. The loop is an implementation of the above question.

```
import operator
a1 = input('Pick the starting number: ')
print ('You entered a1 = %s. \n' % a1)
d  = input('Pick the increment: ')
print ('You entered d = %s. \n' % d)
n = input('Pick a number greater than 0: ')
print ('You entered %s. \n' % n)

y = 0
x = a1
for i in range (1,n+1):          # executes for i = 1, 2, ..., n
  y = y + x                      # Sum of the terms so far is in y.
  print ('y is %s. \n' % (y))
  x = x + d                      # Compute the next term
  print ('x is %s. \n' % (x))

z = (n * (( 2 * a1) + d * (n - 1))) / 2
print ('z is %s. \n' % (z))

if operator.eq (y,z):
  print "True: y is equal to z."
else:
  print "False: y is not equal to z."
```