**Assignment 0 Solution**

**Problem 1: Prove by induction. 1^3 + 2^3 + ...+ n^3 = [n(n+1)/2]^2**

Base case

Let n = 1

13 = (1(1+1)/2)2

1 = (2/2)

1 = 1

Induction Hypothesis

Assume the result is true for n = k

13 + 23 + 33 + ….. + k3 = ([k(k+1)]/2)2

Induction Step

Prove the result is true for n = k+1

13 + 23 + 33 + ….. + (k+1)3 = ([(k+1)(k+2)]/2)2

LHS = 13 + 23 + 33 + ….. + k3 + (k+1)3

= ([k(k+1)]/2)2 + (k+1)3

= ([k2(k+1)2]/4) + 4(k+1)3/4

= [k2(k+1)2 + 4(k+1)3]/4

= (k+1)2[k2 + 4(k+1)]/4

= (k+1)2[k2 + 4k+4)]/4

= (k+1)2(k+1)2/22

= ((k+1)(k+2)/2)2

= RHS

**Problem 2: What is the sum? 7 + 12 + 17 + ...+ 1087. You  must use correct formula.**

S = a + [a+d] + [a+2d] + ….. + [a+(n-1)d]

S = [a+(n-1)d] + [a+(n-2)d] + [a+(n-3)d] + ….. + a

2S = [2a+(n-1)d] + [2a+(n-1)d] + [2a+(n-1)d] + ….. + [2a+(n-1)d]

2S = n.[2a+(n-1)d]

S = n.[2a+(n-1)d]/2

S = [a + (a+(n-1)d)]n/2

S = [a + (a+(n-1)d)]n/2

S = [first term + last term]n/2

first term = a = 7

d = 12 – 7 = 5

last term = [a+(n-1)d] = 1087

7 + (n-1).5 = 1087

(n-1).5 = 1080

n-1 = 216

n = 217

S = [first term + last term]n/2

S = [7 + 1087].217/2

S = 118699

**Problem 3: What is the sum? 1 + 1/3 + 1/9 + 1/27 + ... You  must use correct formula.**

S = a + ar + ar2 + ar3 + ………….

rs = + ar + ar2 + ar3 + ………….

S – rs = a

S(1-r) = a

S = a/(1-r)

S = 1/(1-1/3)

S = 1/(2/3)

S = 3/2

S = 1.5

**Problem 4: Simplify the expression x - 3y/8 + 5z/7 into a fraction. That is expression\_1/expression\_2 form.**

x – 3y/8 + 5z/7

56x/56 – 21y/56 + 40z/56

[56x – 21y + 40z]/56

**Problem 5: What is log 3 to the base 9. Can you find it without a calculator**

Log93 = X 🡺 3 = 9X

X = 1/2