Homework 1

Due September 21 (Wednesday)

1. Translate the following C++ statements into a) MIPS assembly language, and into b) machine code. C++ variables are all integers (*int*) and are kept in registers (x in $s0, y in $s1, z in $s2, and i in $s4). A is an integer array and its base address is in $s5. Use registers $t0 through $t9 as temporaries.

   1. \( x = (x + y) - (z \times 4); \)
   2. \( x = y; \)
   3. \( x = y + A[8]; \)
   4. \( A[i] = x + y + z; \)
   5. \( A[i] = A[i - 1]; \)

2. Translate the following C++ programs into a) MIPS assembly language, and b) machine code.

   Function:
   ```
   int max ( int g, int h, int i)
   {
      int f;
      int f1, f2;
      f1=g+h;
      f2=i+A[8];
      if ( f1> f2)
         f=f1;
      else
         f=f2;
      return f;
   }
   ```

   Call:
   ```
   x=max(y,2,3);
   ```
   x,y is in register $s0, $s1
   A is a global integer array, starting address is in $s3
   f1, f2,f use register $t0, $t1, $s0
3. Explain the functionality of the following two C++ program, and translate into MIPS assembly language. (Bonus : 1 Point)

function 1:
int bitcount(int x) {
    int c=0;
    for (int i=0;i<=sizeof(x)*8;i++) {
        c=c+(x&1);
        x=x>>1;
    }
    return c;
}

function 2:
int bitcount(int x) {
    int c=0;
    while (x!=0) {
        c++;
        x=x&(x-1);
    }
    return c;
}