Week 5 - Assembly Assignment

Write an assembly program to check whether a given number in an array of elements is divisible by 9

```
.data
   array: .word 18, 27, 34, 45, 50  # Array of elements
   len: .word 5                     # Length of the array
   result: .word 0                  # To store the result (0 = not divisible by 9, 1 = divisible by 9)

.text
   la x5, array                  # Load address of array into x5
   la x6, len                    # Load address of array length into x6
   lw x7, 0(x6)                  # Load length of array into x7
   li x8, 0                      # Initialize index to 0 (x8 will be our loop counter)

check_divisibility:
   bge x8, x7, exit              # If index >= length, exit the loop

   lw x9, 0(x5)                  # Load current element of array into x9
   li x10, 9                     # Load divisor 9 into x10
   div x11, x9, x10              # Divide x9 by 9, quotient in x11, remainder in x12
   mfhi x12                      # Move remainder (hi register) into x12

   beq x12, x0, divisible_by_9   # If remainder is 0, number is divisible by 9

not_divisible:
   addi x8, x8, 1                # Increment index
   addi x5, x5, 4                # Move to the next element in the array (4 bytes)
   j check_divisibility          # Repeat the loop

divisible_by_9:
   li x13, 1                     # Set result to 1 (indicating divisible by 9)
   la x14, result                # Load address of result
   sw x13, 0(x14)                # Store the result in memory
   j not_divisible               # Continue checking other numbers

exit:
   j exit            # Exit the program (infinite loop)
```

(ii) write the assembly for the given c code

```
main() {
   unsigned short int a[11] = {0x1234, 0x5678, ...}; // Array a
   unsigned short int b[11] = {0x1234, 0x5678, ...}; // Array b
   unsigned short int c[11] = {0x1234, 0x5678, ...}; // Array c
   int i;

   for(i = 0; i < 10; i++) {
      c[i] = a[i] * b[i] + c[i-1];
   }
```

}

```
.data
a: .half 0x1234,0x5678,0x12,23,45,21,23,78,98,35,11
b: .half 0x1234,0x5678,624,223,45,09,56,54,23,22,55
c: .half 1,1,1,1,1,1,1,1,1,1,1

.text
la x10,a
la x11,b
la x12,c

addi x13,x0,10
lhu x22,0(x12) #keeoing c[-1]=c[0]

loop:
   lhu x20,0(x10) #a[i]
   lhu x21,0(x11)  #b[i]

   mul x25,x20,x21
   add x25,x25,x22
   sh x25,0(x12)

   addi x10,x10,2
   addi x11,x11,2
   addi x12,x12,2
   addi x13,x13,-1  #decreement
   beq x13,x0,exit
   jal x1,loop

exit: nop
```