6502 Program Example 03

Multiplying Two Numbers

Here is a program which is designed to multiply together two eight bit numbers. There is no multiply instruction hardwired into the processor circuitry, so we have to use repeated addition. This means that we will be using branch instructions for the first time.

The basic algorithm is to add the first number to a running total repeatedly using a loop. We will decrement the second number until it reaches zero, which is when we will know that we have calculated the correct answer.

```
; Program to multiply two numbers together
; Multiply.65s


        .ORG $0200

loop:   LDA total   ; Load the running total
        CLC         ; Initialise the carry flag to 0 before doing the add
        ADC num1    ; Add 4 to the running total
        STA total   ; Store back in memory

        LDA num2    ; Using num2 as our loop counter
        SEC         ; Initialise carry flag to 1 before doing the subtract
        SBC #$01    ; Subtract 1 from the count
        STA num2    ; Store back in memory

        BNE loop    ; If subtraction did not set the zero flag, do it again

        BRK

num1:   .DB $04     ; Can initialise variables using the .DW directives
num2:   .DB $03
total:  .DB $00
```

Exercises

Write out the machine code instructions that the assembler would produce for this program. Check your answer against the simulator.

Trace through the program and watch the processor do the work.

Try to make this code more efficient – can you do it with shorter instructions, or less instructions? Might you be able to use the X or Y registers?