

EET363 Introduction to Microcontrollers

OIT Portland West, Fall 2010

Homework Assignment #3 Due October 21

All questions refer to the 68HCS12 microcontroller we are studying in class unless otherwise specified. Variables are declared:

```
        org    DATASTART    ; the start of RAM for variables
P:      ds     1              ; remember the "1" means 1 byte
Q:      ds     1
R:      ds     1
S:      ds     1
T:      ds     5              ; This is an array of 5 bytes.
V:      ds     2              ; A word variable
W:      ds     2
```

1. Show the instruction sequence that will add (the contents of) *P*, *Q*, and *R* and store the average (arithmetic mean) in *S*. *P*, *Q*, *R*, and *S* are all signed values. Note that the sum the three values might overflow an 8 bit value, so you will need to calculate a 16 bit sum.
2. Show the instruction sequence that will multiply *P*, *Q*, and *R* together and store the product in *V*. *P*, *Q*, *R* and *V* are all signed values. Assume $P*Q*R < 65536$.
3. Show the instruction sequence that uses iteration to average all five bytes in array *T*, and stores the average in *V*. In this case, consider the bytes to all be unsigned.
4. Show the instruction sequence that takes the unsigned value in *V*, divides it by four, and stores the result in *W*. The result should be rounded so that if *V* is 5, *W* is 1, but if *V* is 6, *W* should be 2.