

# Design Assignment 1B

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Primary Github address: [https://github.com/portig1/submissions\\_E](https://github.com/portig1/submissions_E)

Directory: submissions\_E/DA/LAB1B/

Submit the following for all Labs:

1. In the document, for each task submit the modified or included code (only) with highlights and justifications of the modifications. Also, include the comments.
2. Use the previously create a Github repository with a random name (no CPE/301, Lastname, Firstname). Place all labs under the root folder ESD301/DA, sub-folder named LABXX, with one document and one video link file for each lab, place modified asm/c files named as LabXX-TYY.asm/c.
3. If multiple asm/c files or other libraries are used, create a folder LabXX-TYY and place these files inside the folder.
4. The folder should have a) Word document (see template), b) source code file(s) and other include files, c) text file with youtube video links (see template).

## 1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

Atmel Studio 7

## 2. INITIAL/MODIFIED/DEVELOPED CODE OF TASK 1/A

```
;
; LAB1B.asm
;
; Created: 2/16/2019 1:06:49 PM
; Author : gausp
;

.include<m328pdef.inc>

.cseg
.org 0x00

.DEF ZERO = R10           ;Will be to add cary for the upper 8-bits of the sums
.DEF COUNTER = R25        ;R25 will be used as the counter
.DEF COPYVALUE = R20
.DEF NUM = R21            ;Defined variable for the division segment of code
.DEF DENOMINATOR = R22
.DEF QUOTIENT = R23

    CLR ZERO
    CLR R16               ;Clearing Registers R16:R19 since they will be used for the
sum results
    CLR R17
    CLR R18
    CLR R19
    LDI COUNTER,0x63      ;COUNTER = 99
    LDI COPYVALUE,0x0A    ;R20 = 10(initial value to be copied), will be
incremented in till it is 109 but the last stored value will be 108

    LDI XL,LOW(0x200)     ;load the low byte of X with value STARTADS = 0x0200
    LDI XH,HIGH(0x200)    ;load the high byte of X with value STARTADS = 0x0200
    LDI YL,LOW(0x400)     ;load the low byte of Y with 0x0400
    LDI YH,HIGH(0x400)    ;load the high byte of Y with 0x0400
    LDI ZL,LOW(0x600)     ;load the low byte of Z with 0x0600
    LDI ZH,HIGH(0x600)    ;load the high byte of Z with 0x0600

L1:
    ST X+, COPYVALUE      ;Store R20 to memory location X
    MOV NUM, COPYVALUE    ;Copy R20 to NUM
    LDI DENOMINATOR, 3
DIVLOOP1:
    INC QUOTIENT
    SUB NUM, DENOMINATOR
    BRCC DIVLOOP1
    DEC QUOTIENT
    ADD NUM, DENOMINATOR
DIVCHECK:
```

```

CPI NUM, 0
BRNE NOTDIV3      ;If NUM = 0, R20 is divisible by 3 and will be stored
in Y

ST Y+, COPYVALUE
ADD R16, COPYVALUE ;Adds value that's divisible by 3 to the appropriate
sum

ADC R17, ZERO
RJMP NEXT

NOTDIV3:           ;Stores value of R20 at Z since it is not divisible by 3
ST Z+, COPYVALUE
ADD R18, COPYVALUE ;Adds value that's not divisible by 3 to the
appropriate sum
ADC R19, ZERO

NEXT:
INC COPYVALUE      ;Increment value to store
DEC COUNTER        ;decrement the counter
BRNE L1            ;loop until counter = zero

END: RJMP END

```

### 3. DEVELOPED MODIFIED CODE OF TASK 2/A from TASK 1/A

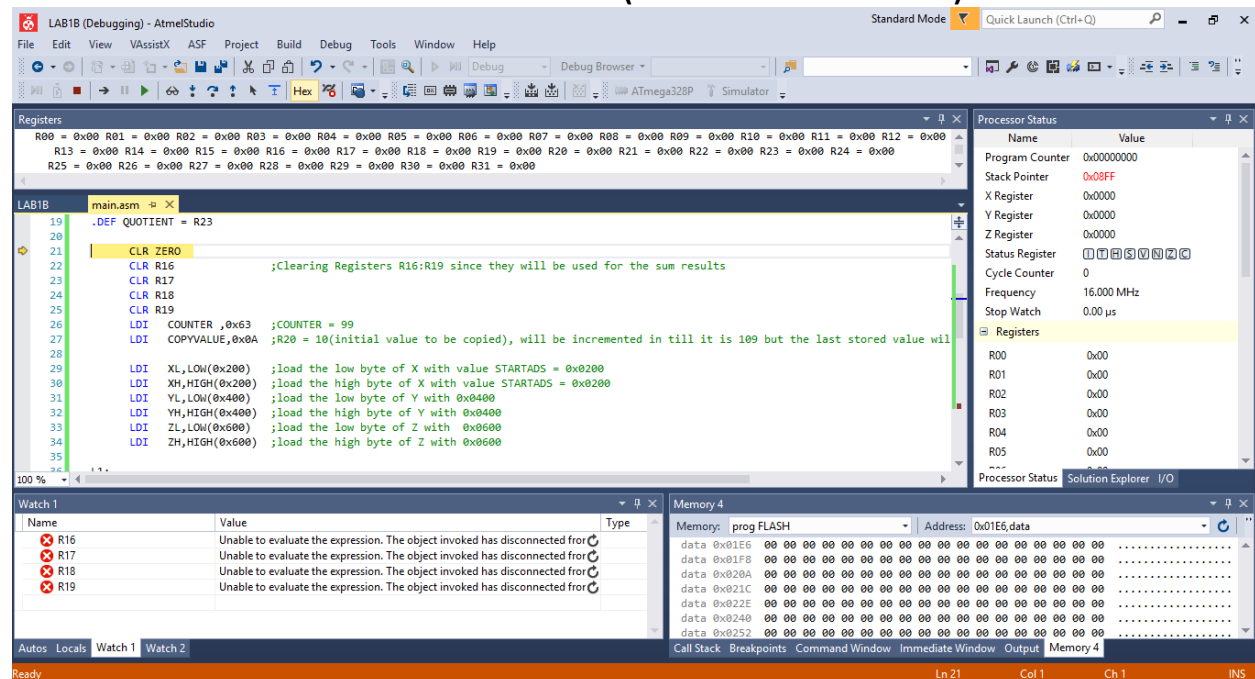
Verified results using google sheets @

<https://docs.google.com/spreadsheets/d/131Yni3C4D0n44uFcH8fwElzPeHHAXc-zYhx5vDc3qxU/edit?usp=sharing>

### 4. SCHEMATICS

No schematics

### 5. SCREENSHOTS OF EACH TASK OUTPUT (ATEL STUDIO OUTPUT)



Values at start of debugging are shown. All registers are in their initial states.

The screenshot shows the Atmel Studio IDE with the 'Registers' window open. The registers are listed with their initial values: R00 = 0x00, R01 = 0x00, R02 = 0x00, R03 = 0x00, R04 = 0x00, R05 = 0x00, R06 = 0x00, R07 = 0x00, R08 = 0x00, R09 = 0x00, R10 = 0x00, R11 = 0x00, R12 = 0x00, R13 = 0x00, R14 = 0x00, R15 = 0x00, R16 = 0x0C, R17 = 0x07, R18 = 0x15, R19 = 0x0F, R20 = 0x6D, R21 = 0x00, R22 = 0x83, R23 = 0x7A, R24 = 0x00, R25 = 0x00, R26 = 0x63, R27 = 0x02, R28 = 0x21, R29 = 0x04, R30 = 0x42, R31 = 0x06. The 'Processor Status' window shows the Program Counter at 0x00000021, Stack Pointer at 0x08FF, X Register at 0x0263, Y Register at 0x0421, Z Register at 0x0642, Status Register at 0x00000000, Cycle Counter at 9680, Frequency at 16.000 MHz, and Stop Watch at 605.00 µs. The 'Registers' window shows R00 through R05 all at 0x00. The 'Memory' window shows the program flash memory starting at address 0x01E6.

Name	Value
Program Counter	0x00000021
Stack Pointer	0x08FF
X Register	0x0263
Y Register	0x0421
Z Register	0x0642
Status Register	0x00000000
Cycle Counter	9680
Frequency	16.000 MHz
Stop Watch	605.00 µs

Name	Value
R00	0x00
R01	0x00
R02	0x00
R03	0x00
R04	0x00
R05	0x00

Name	Value	Type
R16	0x0C	byte/reg
R17	0x07	byte/reg
R18	0x15	byte/reg
R19	0x0F	byte/reg

The values stored for X are shown as well as the total clock cycles of 9680 @ 16MHz with a time of 605us.

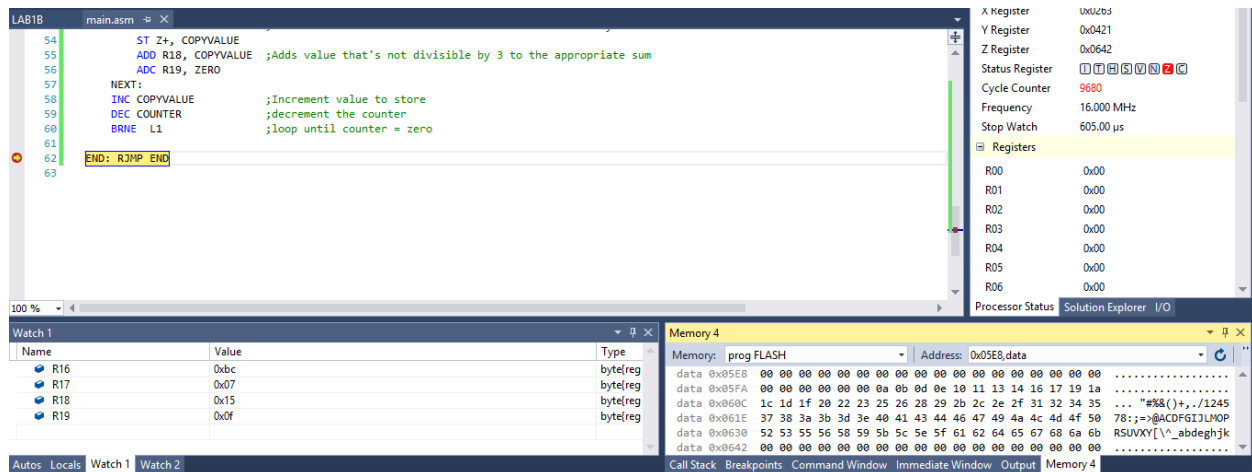
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Name	Value
Program Counter	0x00000021
Stack Pointer	0x08FF
X Register	0x0263
Y Register	0x0421
Z Register	0x0642
Status Register	0x00000000
Cycle Counter	9680
Frequency	16.000 MHz
Stop Watch	605.00 µs

Name	Value
R00	0x00
R01	0x00
R02	0x00
R03	0x00
R04	0x00
R05	0x00
R06	0x00

Name	Value	Type
R16	0x0C	byte/reg
R17	0x07	byte/reg
R18	0x15	byte/reg
R19	0x0F	byte/reg

Values stored for Y are shown in the lower right-hand corner.



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## 6. SCREENSHOT OF EACH DEMO (BOARD SETUP)

## 7. VIDEO LINKS OF EACH DEMO

## 8. GITHUB LINK OF THIS DA

[https://github.com/portig1/submissions\\_E/tree/master/DA/LAB1B](https://github.com/portig1/submissions_E/tree/master/DA/LAB1B)

## Student Academic Misconduct Policy

<http://studentconduct.unlv.edu/misconduct/policy.html>

*"This assignment submission is my own, original work".*

NAME OF THE STUDENT