

Homework #5

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Problem #1

Letter	Ascii Hex
R	52_{16}
o	$6F_{16}$
l	$6C_{16}$
l	$6C_{16}$
a	61_{16}
Σ	$1FA_{16}$

Because we ignore carries, we consider FA_{16} .

$$\begin{aligned}FA_{16} &= 1111\ 1010_2 \\1's\ comp &= 0000\ 0101_2 \\2's\ comp &= 0000\ 0110_2 \\&= 06_{16}\end{aligned}$$

The checksum value is 06_{16} . Performing the checksum, we get $FA_{16} + 06_{16} = 100_{16}$. Because we ignore carries, the check is correct.

Problem #2

```
ORG 200H
STRING: DB 'Missouri S&T'
ORG 0H

REPEAT: MOV R0, #12D           ; Size of 'Missouri S&T'
        MOV DPTR, #STRING
        ACALL BLINK
```

```

LOOP:  MOV P1, #0H                ; P1 = output port
        CLR A
        MOVC A, @A+DPTR
        MOV P1, A                ; P1 = string
        INC DPTR                ; DPTR++
        ACALL DELAY

        DJNZ R0, LOOP

        ACALL BLINK
        ACALL BLINK
        ACALL DELAY
        ACALL DELAY
        SJMP REPEAT

DELAY:  MOV R7, #118D            ; 256 / 1.085 = 235.9269 * 1/2 (djnz) = 118
HERE:   DJNZ R7, HERE
        RET

BLINK:  MOV P0, #0H              ; Make output port
        CLR P0.1                ; Low
        SETB P0.1               ; To High
        CLR P0.1                ; To low
        RET

        END

```

Problem #3

```

ORG 0H

/*
PORTS
R0: Loop counter
R1: Holds hundreds, tens, ones
R2: Hold the additive value
*/

MOV P1, #0FFH                ; P1 = Input Port
MOV P2, #0H                  ; P2 = Output Port
MOV P1, #32H

```

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REPEAT: MOV R0, #3D          ; Number to read in
        MOV R1, #100D
        MOV R2, #0D

        CLR A
        CLR C

LOOP:   MOV A, P1
        ANL A, #0FH          ; By and-ing with 0F, upper bits are cleared.
                                ; This way, goes from ascii to a hex number

        MOV B, R1
        MUL AB                ; Multiply by hundreds, tens, one+

        ADD A, R2             ; Add to the values we have received so far
        MOV R2, A             ; R2 = Sum value

        ACALL SWAPAB
        JC BIG                ; if this additive value sum is > 255, Carry
        JNZ BIG               ; if there was something in b, Carry

        MOV A, R1             ; A = Tens, hundred, ones
        MOV B, #10D
        DIV AB                ; So now, we have values for tens, ones
        MOV R1, A

        ACALL DELAY1
        DJNZ R0, LOOP

        MOV P2, R2

        SJMP SKIP
BIG:     ACALL DELAY2
SKIP:    LJMP REPEAT

        ACALL REPEAT

DELAY1:  MOV R7, #118D        ; 256 / 1.085 = 235.9269 * 1/2 (djnz) = 118
HERE1:   DJNZ R7, HERE1
        RET

```

```

DELAY2: MOV R6, #4D
HERE2:  ACALL DELAY1           ; 1.024 ms = 1024 us = 4*Delay1
        DJNZ R6, HERE2
        RET

```

```

SWAPAB: MOV R5, A
        MOV A, B
        MOV B, R5
        RET

```

```

END

```

Problem #4

```

        ORG 250H
MYDATA: DB 3, 9, 6, 9, 7, 6, 4, 2, 8
        ORG 0H

        ACALL R2R
        ACALL ADDV
        ACALL AVG

        ACALL DONE

R2R:    MOV R0, #30H
        MOV DPTR, #MYDATA
        MOV R1, #9D           ; Size of 'MYDATA'

LOOP1:  CLR A
        MOVC A, @A+DPTR
        MOV @R0, A

        INC R0
        INC DPTR
        DJNZ R1, LOOP1

        RET

```

```

ADDV:  MOV R0, #30H           ; Where values are stored
      MOV R1, #9D             ; Size of 'MYDATA'
      CLR A
LOOP2:  ADD A, @R0
      INC R0

      DJNZ R1, LOOP2

      MOV 70H, A
      RET

AVG:    MOV R0, #30H           ; Where values are stored
      MOV R1, #0D             ; Counter
      MOV R2, #0D             ; Sum

      CLR A
      /*
      So.. not entirely sure how to do this part, so here's my guess..

      I don't write to ROM anywhere past 30H, so it should theoretically be 0
      So keep reading and adding until I hit an 0 in RAM
      */
LOOP3:  MOV A, @R0
      JZ LDONE

      ADD A, R2
      MOV R2, A

      INC R0
      INC R1
      SJMP LOOP3

LDONE:  MOV B, R1
      MOV A, R2
      DIV AB

      MOV R7, A

      RET

DONE:   NOP

```

END

Problem #5

```
ORG 0

/*
R0 = x

R1 = 2x^2
R2 = 3x
R3 = 1
*/

MOV P1, #OFFH      ; P1 = input port
MOV P2, #0H        ; P2 = output port

MOV R0, P2          ; R0 = P2

CLR C               ; CY = 0
CJNE R0, #4D, NEXT  ; if CY = 0, outside of range (by CJNE)
NEXT: JC SKIP        ; R2 = 0, if outside of 0 <= x <= 3
MOV P2, #0H         ; Finish
ACALL DONE

SKIP: /* 2x^2 */

MOV A, R0            ; A = x
MOV B, R0            ; B = x
MUL AB              ; A = x^2, but the lower value. However,
                    ; x will always be in the lower bit, as in A

MOV B, #2D           ; A = 2x^2
MUL AB              ; R1 = 2x^2
MOV R1, A

/* 3x */
MOV A, R0            ; A = x
MOV B, #3D           ; B = 3
MUL AB              ; A = 3x

MOV R2, A            ; R2 = 3x
```

```

/* 1
I know this is kinda wasting MC, but
it's easier to manipulate the equation this way
*/
MOV R3, #1D      ; R3 = 1

MOV A, R1
ADD A, R2
ADD A, R3          ; A = 2x^2 + 3x + 1

MOV P2, A          ; P2 = 2x^2 + 3x + 1

DONE:  NOP
      END

```