1. (a) $82_{10} = 1010010_{2}$

(b) $101111110_2 = 0111111111_2$ (base 2)

2. # Answer to Exam 1, Problem 2

```assembly
.globl main
main:   add     $s7, $0, $ra    # save return address
.data
A:.word  4, 9, 25, 49, 121, 169, 289  # squares of first 7 primes
.text

# Answer to Problem 2 ##########################
la$s1, A          # start address of A
addi    $s2, $0, 0      # running sum
addi    $s3, $0, 0      # array index of A
addi    $s4, $0, 7      # constant 7
Loop:  lw      $t1, 0($s1)     # $t1 = A[$s3]
     add     $s2, $s2, $t1   # $s2 = sum of A[] so far
     addi    $s1, $s1, 4     # $s1 += 4
     addi    $s3, $s3, 1     # $s3 += 1
     bne     $s3, $s4, Loop  # branch back to Loop until $s4 == 7
     add     $v0, $0, $s2   # print the sum
     addi    $v0, $0, 1      # print the sum
     syscall

# End of Answer to Problem 2 ############
```

3. # CS 2734, Computer Organization II, Fall 2002

```assembly
.globl main
main:   addu    $s7, $zero, $ra
.data
A:      .word   4, 9, 25, 49, 121, 169, 289  # squares of first 7 primes
.text

# Second answer to Question 3 (first part) #
addi    $sp, $sp, -4  # room for $ra on stack
sw      $ra, 0($sp)   # save $ra
lw      ... $ra from stack
addi    $sp, $sp, 4  # restore stack
jr      $ra

# Second answer to Question 3 (second part) #
al Avals           # call Avals

# Finish main###############
```

4. Use

(a) add    $s1, $s2,   $0    or  addi $s1, $s2, 0
(b) addi   $s3, $0,   200
(c) beq    $0,  $0,  Loop

5. (a) Assume $A$ is 1 and $B$ is 0. So upper switch connected to $A$ is open (doesn't conduct), while the upper switch connected to $B$ is closed. Since these are connected in series and one is open, no voltage goes to $C$ from the source. In the lower switches, $A$ grounds the right switch, while $B$ does not ground the left switch, but the grounds are connected in parallel, so $C$ is grounded. Thus the value at $C$ is 0. If $C$ is 0, this makes the upper switch conduct, giving voltage to $D$, while the lower switch does not conduct, so $D$ is 1.

(b) This is a NOR gate (the output at $C$ is 1 unless both $A$ and $B$ are 0) connected to an inverter, so the two form an OR gate.