CS 61C Midterm #1 — September 26, 1994

Your name _____

login cs61c–_____

Discussion section number _____

TA's name _____

This exam is worth 25 points, or 18.7% of your total course grade. The exam contains six substantive questions, plus the following:

Question 0 (1 point): Fill out this front page correctly and put your name and login correctly at the top of each of the following pages.

This booklet containsfive numbered pages including the cover page. Put all answers on these pages, please; don't hand in stray pieces of paper. This is an open book exam.

Our expectation is that many of you will not complete one or two of these questions. If you find one question especially difficult, leave it for later; start with the ones you find easier.

0	/1
1	/1
2	/2
3	/4
4	/4
5	/6
6	/7
total	/25

Question 1 (1 point): Convert the following number from base 2 to base 16:

`1010101110111010`

Question 2 (2 points): Given these MIPS declarations:

```
        .data
a:      .word   0
b:      .word   1:2
c:      .byte   3:4
```

If the address of `a` is `0xff00` what is the address of the last element of the memory allocated for `c`?

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Question 3 (4 points): Find and fix the errors in the following MAL program. It's supposed to add 1 and 2, and store the result in `array[2]`.

```
        .data
array:  .word   0:5

        .text
__start:li      $8, 1
        li      $9, 2
        add     $0, $8, $9
        la      $10, array
        lw      2($8), $0
        done
```

Question 4 (4 points): Why is twos complement a better representation for integers than both ones complement and sign magnitude? Give two reasons; one sentence should be enough for each reason.

Question 5 (6 points): Translate the following C procedure into MIPS assembler. Assume that the arguments to procedures are kept in $4–$7, and that local variables are kept in $16–$23.

```
int foo(int a, int b) {
    int x, y, z;

    y = fun(a << 6);
    z = fun(b);
    x = (a + z) * (b + y);

    return x;
}
```

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Question 6 (7 points): Pascal's triangle is defined by the mathematical formula

$$\text{pascal}(n, r) = \begin{cases} 1, & \text{if } r = 0; \\ 1, & \text{if } r = n; \\ \text{pascal}(n-1, r-1) + \text{pascal}(n-1, r), & \text{otherwise.} \end{cases}$$

Write a MAL procedure to implement this function of two arguments. Use the algorithm given above, even though more efficient ways are possible.