1. For the following C array,

```c
int a[3][2];
```

assume you are working with a 32-bit little-endian processor with the usual alignment rules (e.g., a Pentium) and

(a) Show how its elements are laid out in memory.
(b) Write the address expression for accessing `a[i][j].`
(c) Verify parts a) and b) by writing a small C program that contains and accesses such an array and looking at the assembly language output with the C compiler's `-S` flag (e.g., `gcc -O -S array.c`). Turn in a copy of your C program and an annotated version of the assembly listing. Make sure the assembly listing is no more than 40 lines.

2. In an assembly-language-like notation (e.g., use MIPS or a pseudocode of your own choosing), write what an optimizing compiler would produce for the following two switch statements.

```c
switch (a) {
  case 1: x = 7; break;
  case 2: x = 1; break;
  case 3: x = 8; y = 42; break;
  case 4: y = 17; break;
  case 5: z = 18; break;
  default: z = 3; break;
}
```

```c
switch (b) {
  case 1: a = 3; break;
  case 10: a = 9; break;
  case 100: b = 14; c = 12; break;
  case 1000: c = 23; break;
  default: c = 20; break;
}
```

3. For a 32-bit little-endian processor with the usual alignment rules, show the memory layout and size in bytes of the following three C variables.

```c
union {
  int a;
  struct {
    char b; /* 8-bit */
    int c; /* 32-bit */
  } s;
} u1;
```

```c
struct {
  char a;
  short c;
  char b;
  int d;
} s1;
```

```c
struct {
  char a;
  short b;
  char d;
} s2;
```

4. Consider the following C-like program.

```c
int w = 5;
int x = 6;

int incw() { return ++w; }
int incx() { return ++x; }

void foo(y, z){
  printf("%d\n", y + y);
  x = 1;
  printf("%d\n", z);
}

int main() {
  foo(incw(), incx()); return 0;
}
```

What does it print if the language uses

(a) Applicative-order evaluation?
(b) Normal-order evaluation?