CMSC 216 Quiz 2 Worksheet

The next quiz for the course will be on Wed, Feb 14. The following list provides additional information about the quiz:

- The quiz will be a written quiz (no computer).
- The quiz will be in lab session.
- Closed book, closed notes quiz.
- Answers must be neat and legible.
- Quiz instructions can be found at http://www.cs.umd.edu/~nelson/classes/utilities/examRules.html
- Make sure you know your section number and your TA's name.
- You must take your quiz in your assigned lab/discussion section and not show up to a random discussion section. We will not grade quizzes taken in the incorrect section.
- **Regarding Piazza -** Feel free to post questions in Piazza regarding the worksheet and possible solutions to problems.

At the end we have provided an example of a memory map so you know exactly what we are expecting while drawing maps. Take a look at the example before drawing any maps.

Exercises

1. What is the difference between a pointer and a pointer variable?

2. What is a NULL pointer?

3. Which of the following pointer variables occupies the largest number of bytes?

   ```
   int *x;
   float *y;
   double *m;
   ```

4. Why do we need to specify the type of a pointer variable? Provide an example that illustrates why we need the type.

5. How many memory locations can a pointer variable point at, at any given time?

6. When will a segmentation fault occur when we dereference NULL? For example,

   ```
   int *ptr = NULL;
   printf("%d\n", *ptr);
   ```

7. How are pointer arguments to functions passed in C? By value? By reference?

8. What is the output of the following program? Would it be possible to get a segmentation fault?

   ```
   #include <stdio.h>

   int main() {
      int *ptr;

      *ptr = 400;
      printf("%d\n", *ptr);

      return 0;
   }
   ```

9. Write a code fragment that shows that NULL is considered false in C.

10. What does the name of an array represent?

11. When do you want to use the const modifier?

12. Always lock your computer when you leave it alone (e.g., going to the restroom in lecture), otherwise bad things could happen. ☺ Do you realize that if you leave your computer open, anyone can execute submit in your project directory and steal your code?

13. Draw a memory map for the following program at the point in the program execution indicated by the comment /***HERE** */. In addition, provide the output generated by the program.

```
#include <stdio.h>

#define MAX_LEN 5

static void task(int *b, int range) {
    b[range - 1] = 200;
    range = 0;
    b = NULL;
    /* HERE */
}

int main() {
   int a[] = {2, 4, 6};
   int len = 3, i;

   task(a, len);
   printf("len %d\n", len);
   for (i = 0; i < len; i++) {
      printf("%d\n", a[i]);
   }

   return 0;
}
```

14. The following program compiles.

```
#include <stdio.h>

int main() {
  int x;
  int *p = &x;

  printf("%d", *p);

  return 0;
}
```

What would happen when we execute the program?

a. A segmentation fault will always occur.
b. The value 0 will be printed.
c. A garbage/trash value will be printed, but no segmentation fault will take place.
d. Sometimes a garbage/trash value will be printed and sometimes a segmentation fault will take place.
e. None of the above.

15. Draw a memory map for the following program at the point in the program execution indicated by the comment **/*HERE */**.

```
#include <stdio.h>

#define MAX 4

static void work(int *b, int delta) {
   int i = 0;

   for (i = 0; i < delta; i++) {
      b[i] += 1;
   }
   delta = 0;
   *b = 999;
   b = NULL;

   /* HERE */
}

int main() {
   int x = 50, *p = &x, eval = 2, a[MAX] = {7, 11, 3};
   float y = 30, *m = &y, *t = m;

   if (sizeof(p) == sizeof(m)) {
      x += 100;
   } else {
      x += 200;
   }
   *t += 4;
   *m += 5;

   work(a, eval);

   return 0;
}
```

Sample Memory Map

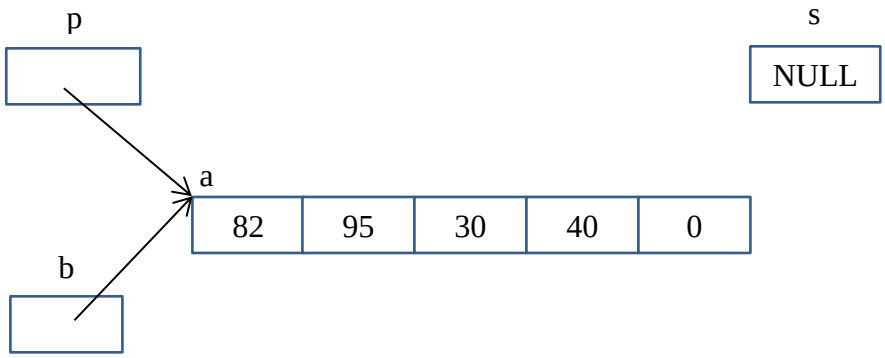
We are providing this example so you know what we are expecting for memory maps.

Example

Draw a memory map for the following program at the point in the program execution indicated by the comment **/*HERE */**.

```
#include <stdio.h>

#define MAX_LEN 5

void process(int *b, int *s) {
    b[0] = 82;
    s[1] = 95;
    s = NULL;
    /* HERE */
}

int main() {
   int a[MAX_LEN] = {10, 7, 30, 40};
   int *p = a;

   process(a, p);

   return 0;
}
```

Answer:



Note: You can also replace NULL with the ground symbol as done in lecture. For example, s above could be represented as: