Minor programming

Programming 2 (C)

March 26th, 2014

You can earn up to 57 points for this exam.
To pass the exam, you need to earn at least 29 points.

The time allowed is 120 minutes. Once started, you are not allowed to leave the room. Please turn off your cell phone. Besides a pen or pencil, nothing else is allowed to be on your table during the exam.

Good luck!

Name:

Student ID:

Autograph:

Multiple-choice questions (20 points)
The first 10 questions are multiple-choice. For each of these questions, there is exactly one correct answer. Circle the answer you think is correct. Each correct answer rewards you with 2 points; each wrong answer deducts 1 point. Questions left unanswered do not give or take points. (In other words, it might not be a good idea to guess answers.)

1. Which of the following is not a programming language?

   A C
   B PHP
   C HTML
   D JavaScript

2. Recall the `chmod` command, which can be used on Unix operating systems to modify the permissions of a given file. How would I provide full permissions for a file called `somefile.c` to each and every user?

   A `chmod 999 somefile.c`
   B `chmod 777 somefile.c`
   C `chmod 640 somefile.c`
   D `chmod 111 somefile.c`

3. Consider the following HTML code.

```
<form action="http://cs50.net/register.php" method="get"
name="reg">
      Name: <input id="name" name="name" type="text">
      <input type="submit" value="Register!">
</form>
```

   Suppose that Jan fills in this form (with his own name). At what URL will he find himself when he hits the submit button?

   A `http://cs50.net/register.php?name=Jan`
   B `http://cs50.net/register.php?text=Jan`
   C `http://cs50.net/reg.php?name=Jan`
   D `http://cs50.net/register.php`

4. Consider a `bool` in C, which is stored using a byte because that is generally the smallest unit that most CPU's can address. Although a `bool` can only represent two values, `true` and `false`, you could actually store a lot more values in a single byte. How many of these possibilities do we waste by storing a `bool` in a byte?

   A 7
   B 126
   C 254
   D 255

5 Suppose you've just written a program and would like to check if it leaks memory. Which program should you use to check just that?

A `gdb`
B `clang`
C `valgrind`
D `leak-check`

6. Which of the following lines of C code allocates memory on the heap?

A `int a[4] = { 0, 1, 2, 3 };`
B `char *words = "hello world\n";`
C `char *words = malloc(4 * (sizeof char));`
D `sprintf(words, "hello, %d", 14);`

7. What is the decimal representation of the hexadecimal value 39?

A 27
B 29
C 57
D 61

8. Consider the following snippet of C code, and assume that the surrounding code will cause this snippet to compile and run.

```
int i = 7;

for (int i = 0; i <= 10; i++)
{
      i++;
      printf("%d ", i);
}
```

What would be printed?

A `1 3 5 7 9`
B `1 3 5 7 9 11`
C `2 4 6 8 10`
D `7 7 7 7 7`

9. Is the value of `a` in the following snippet of C code passed to `function` by value or by reference?

```
int a = 42;
function(true, &a);
```

A by value
B by reference

10. Recall the `.bmp` format, which is used to store pictures. Each pixel has three values associated with it: a red intensity, green intensity, and blue intensity. If we want each color to have 128 possible different values, how many bits would we need to store one pixel of such a picture?

    A 3
    B 21
    C 24
    D 384

Open questions (37 points)
The remaining questions are open questions. Their point values are printed alongside them. Answering these incorrectly does not deduct any points, so try to answer every one of them, even if (in part) unsure!

11. (3 points.) Why is it important to "escape" any user's input before querying your database using that user's input?

12. (2 points.) In C, how can I check if two `string`s contain the same content (e.g. are the same)?

13. (2 points.) Describe in one sentence what `gdb` can do for you.

For questions 19 and 20, consider the following pseudo-code, where `data` represents either a stack or a queue. Assume that `push(value)` adds a `value` to `data` and that `pop()` removes one and prints the value being removed.

```
data.push(1);
data.push(2);
data.pop();
data.push(3);
data.pop();
data.pop();
data.push(4);
data.push(5);
data.push(6);
data.push(7);
data.pop();
data.pop();
```

14. (3 points.) If `data` is a stack, what will be printed?

15. (3 points.) If `data` is a queue, what will be printed?

16. (2 points.) Why would we want to define the style of our website in a separate `.css` file when we could also just add a style attribute to our HTML elements?

17. (3 points.) What does the 'V' stand for in 'MVC'? Describe in one sentence what this layer does.

18. (3 points.) Why would we use 'MVC' anyway? Name at least two advantages.

19. (6 points.) Recall the modulo operator in C, PHP, and JavaScript, which calculates the remainder of a division, usually between two integers.

    Implement in JavaScript a function that takes two floating point values and returns the remainder of the division between those two values. You're not allowed to use the built-in `%` operator! If the divisor (second variable) is zero, your function should return the first variable. You may assume that `a` and `b` will both never be negative.

    Some example executions:

```
document.write(modulo(7.0, 4.0));   // would print 3.0
document.write(modulo(6.0, 2.3));   // would print 1.4
document.write(modulo(4.5, 0.0));   // would print 4.5
```

    Write your function on next page.

20. (1 point.) Suppose I've just allocated memory using the following statement.

```
int *a = malloc(sizeof int);
```

How do I de-allocate the allocated memory when I'm done with it?

21. (3 points.) Why would I store the contents of a dictionary (e.g. the words) in a hash table rather than, say, in a lexicographically ordered array?

22. (4 points.) Suppose you have a database called `d` that contains a table of users called `u`. Said table contains, amongst other data, a unique user ID for each user in field `id` and their first name in field `fn`.

Write a PHP function that prints exactly one number; the amount of people in the database named John.

23. (2 points.) Suppose that you want to remove the user with `id` 27 from `u`. Which SQL query should you execute?