Minor programming

Programming 2 (C)

April 23rd, 2014

You can earn up to ~~64~~ 62 points for this exam.
To pass the exam, you need to earn at least ~~33~~ 32 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:

Note: The correct answer to question 14 was not included as a choice. Therefor, question 14 question was excluded from the quiz' results.

Multiple-choice questions (~~28~~ 26 points)
The first 14 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. 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`

3. What is the decimal representation of the hexadecimal value 1F?

   A 17
   B 31
   C 32
   D 39

4. Consider the following snippet of C code. Are the variables `a` and `b` allocated on the heap or on the stack?

```
int a = 18;
char *b = "Hello world!\n";
```

   A `a` is allocated on the heap and `b` is allocated on the stack
   B `b` is allocated on the heap and `a` is allocated on the stack
   C both are allocated on the heap
   D both are allocated on the stack

5. Suppose I have a stack structure on which I can push and pop values. Suppose I now execute the following sequence of push and pop commands:

```
push(1); pop(); push(2); push(3); push(4); pop(); push(5);
```

If I call `pop()` one more time after this sequence, which value will I pop?

A 1
B 3
C 4
D 5

6. Suppose I have a queue structure on which I can push and pop values. Suppose I now execute the following sequence of push and pop commands:

```
push(1); pop(); push(2); push(3); push(4); pop(); push(5);
```

If I call `pop()` one more time after this sequence, which value will I pop?

A 1
B 3
C 4
D 5

7. How are `.jpg` files generally recognized as actually being JPG files?

A by the image data contained within them
B because their file name contains the `.jpg` extension
C because they have some specific bytes - magic numbers - in their headers
D the file manager simply makes a guess based on the file's contents

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. Consider that I have an integer that can have a value between -10 and 42, inclusive. How many bits would I, at a minimum, require to store this integer?

A 4
B 6
C 8
D 16

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 512 possible different values, how many bits would we need to store one pixel of such a picture?

A 3
B 9
C 27
D 384

11. What happens when I attempt to compile and run the following C program?

```
#include <stdlib.h>

int main(void)
{
      char *a = NULL;
      free(a);
}
```

A this program won't compile due to one or more error(s)
B this program will run without problems
C this program will run into a `segmentation fault`
D this program will run without problems, but it does leak memory

12. Which of the following is not a SQL statement?

A `INSERT`
B `UPDATE`
C `SEARCH`
D `SELECT`

13. What will the resulting value of `c` be after the following line of C code?

```
int c = sizeof(bool);
```

A 1
B 2
C 8
D 32

14. What will the resulting value of `d` be after the following line of C code?

```
int d = sizeof(int);
```

A 1
B 2
C 8
D 32

Open questions (36 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!

15. (6 points.) Describe the 'MVC' software pattern. Your description should include what the abbreviation stands for, and what this software pattern is used for. Be precise in your answer, but do not use more than 70 words.

16. (2 points.) Consider the following two bytes and assume that they both represent `unsigned int`s. If I multiply (e.g. `*`) these numbers, what would the result be in binary?

```
0001 1011
0000 0011
```

17. (2 points.) Again consider question 16, but assume that both bytes now represent signed `int`s instead. Does that change the answer of the multiplication? If so, calculate the new answer. If not, explain why not.

For question 18, consider the following snippet of C code.

```
int a = 42;
```

18. (2 points.) Pass the value of integer `a` to function `func()` two times; once by reference and once by value.

    by reference: `func(_____);`
    by value: `func(_____);`

19. (2 points.) In PHP, what is the difference between == and ===?

20. (1 point.) Why should databases not store passwords as clear text?

21. (2 points.) How should databases store passwords instead? Propose an idea or method and briefly explain the advantage(s) of that method.

22. (2 points.) Consider the HTML status code below.

    ```
    403 Forbidden
    ```

    When might this status code pop up, and how can you fix it?

23. (2 points.) What does it mean to "escape" a user's input and when would you want to do so?

24. (9 points.) Suppose that there are `d` days in a month. You are given `p` pennies on the first day, 2`p` pennies on the second day, 4`p` pennies on the third day, et cetera, with the daily number of pennies doubling on each subsequent day. Now consider the HTML form below.

```
<form action="pennies.php" method="get">
      Days in month: <input name="d" type="text">
      <br>
      Pennies on first day: <input name="p" type="text"> <br>
      <input type="submit" value="Calculate Total">
</form>
```

Write the code for a page `pennies.php` that calculates the total amount of pennies received after a month. The page should display the amount of pennies, in dollar notation, at the end of a month. You may assume that `d` will always be valid (e.g. between 28 and 31 inclusive) and that `p` will always be positive and nonzero. Be sure your `php` page is syntactically valid and includes all opening and closing tags it needs.

Your output should be formatted as, for example, `$21474836.47`

25. (2 points.) Name an advantage and a disadvantage of storing a dictionary in a hash table.

26. (2 points.) Are HTTP POSTs more secure than HTTP GETs? Briefly explain your answer in no more than once sentence.

27. (2 points.) What can the tool `valgrind` do for you?