

Name _____ Login name _____

Section: _____ TA _____

General Instructions

- DO NOT PUT YOUR SSN ON ANYTHING!
- DO NOT WRITE YOUR NAME ON ANY PAGE EXCEPT THIS ONE!
- Turn off any noise making device, especially **CELL PHONES**. You may lose up to one letter grade if your device disturbs the peace of the exam.
- You have 50 minutes. **Pace yourself**, and pay attention to the point values.
- The exam is % multiple choice, and % programming and short answer.
- Do not add features that are not required by the problem. For example, if the instructions don't say anything about user input, then your program should not take user input. If you aren't sure, ask.
- Do problems you are confident about first. If you finish the problems you know, write what you do know about other problems to gain partial credit; but erroneous information may detract from that credit or irritate the grader, so don't make stuff up.
- Read *all* the directions *carefully* on each problem.
- Often writing a fast, rough version of a program in English or pseudocode will make your C coding faster and more accurate. It also enables me to give partial credit in some circumstances.
- You may assume that input will not produce errors for the code described, unless the questions say otherwise.
- Do not do unnecessary testing. For example, testing for both $x < 0$ and $x \geq 0$ instead of using one test and then `else` would be considered unnecessary testing.
- Have fun!

Error definition

Errors do not always create problems in output, but should be considered errors anyway, as we do in class. This means errors include, but are not limited to:

- incorrect format specifiers
- incorrect number of parameters
- reading/writing invalid memory
- reading uninitialized ("garbage") memory
- other compilation errors
- other runtime errors

Errors do not include type coercion in arithmetic (for example, assigning a double to an int) unless that impairs the correctness of a program.

1. (3 pts) What is the output?

```
#include <stdio.h>
int main(void)
{
    char a[40];
    printf("%c", a[9]);
    return 0;
}
```

- (a) `\0` (b) `0` (c) `^@` (d) `!#[` (e) error

2. (3 pts) What is the last index of `w` that is initialized after the declaration shown?

```
char w[10] = "marking";
```

- (a) 7
(b) 8
(c) 9
(d) none of the above
(e) error

3. (3 pts) Which of the following assigns a random value to `x`?

- (a) `srand(x);` (b) `x = srand(x)` (c) `rand(x);`
(d) `x = x % rand();` (e) none of these

4. (3 pts) Assume `x` contains a random number. Which of the following puts `x` in the range 0-9, inclusive?

- (a) `x %= 9;`
(b) `x %= 10;`
(c) `x = x % 9;`
(d) `x = x / 9;`
(e) `srand(time(NULL));`
(f) none of these

5. (3 pts) According to our discussion in class, 2^{20} is approximately how much?
- (a) approximately 1000000
 - (b) approximately 100000
 - (c) approximately 10000
 - (d) approximately 1000
 - (e) none of the above
6. (3 pts) According to our discussion in class, 2^{14} is approximately how much?
- (a) approximately 1600
 - (b) approximately 3200
 - (c) approximately 6400
 - (d) approximately 9600
 - (e) none of the above
7. (3 pts) Which of the following function prototypes represents a function that can modify the contents of an integer array declared in main() as `int data[5];` ?
- (a) `double f(int array[]);`
 - (b) `int f(int data);`
 - (c) `void f(char * argv[]);`
 - (d) `int f(int *data[]);`
 - (e) none of the above
8. (3 pts) Which of the following function prototypes represents a function that can modify the contents of an integer declared in main() as `int input;` ?
- (a) `double f(int input);`
 - (b) `int f(int data);`
 - (c) `void f(const int data);`
 - (d) `int f(int data, int size);`
 - (e) none of the above
9. (3 pts) Consider the following program. Your task is to decide which set of three answers below goes in place of 111, 222, and 333 to make this program print the alphabet.
- ```
#include <stdio.h>
int main() {
 int i;

 for (i = 111; i <= 222; i++) /* replace 111, 222, and 333 */
 printf("%c", 333);
 return 0;
}
```
- (a) 'A', 'Z', and `getchar(i)`
  - (b) 'A', 'Z', and `i`
  - (c) 0, 25, and `i`
  - (d) 1, 26, and `i`
  - (e) none of the above

For the next **three** questions, choose the letter that shows the value that would be in x. Assume x and y are declared as integers. Choose “error” if you think a fragment will not compile and run. The fragments are unrelated (each question is separate from the others).

10. (2 pts)

```
x = 19/5;
```

- (a) 4    (b) 3    (c) 2    (d) error    (e) none of the above

11. (2 pts)

```
x = 11 % 3;
```

- (a) 2    (b) 1    (c) 3    (d) error    (e) none of the above

12. (2 pts)

```
x = 5 % 9;
```

- (a) 0    (b) 1    (c) 4    (d) 2    (e) none of the above

### File input and output: 4 questions

Suppose you have an input file called `data.dat`. Each line in is supposed to contain an integer value. Your task is to read in all of these lines of input and find the sum. The questions must be read in sequence (but you may answer in any order you wish).

13. (2 pts) Read this question carefully: Which of the following *declares a variable* that could be used to access data currently stored in the file `data.dat`?

- (a) `input = fopen("data.dat", "r");`
- (b) `input = fopen("data.dat", "w");`
- (c) `FILE *input;`
- (d) `FILE *data.dat;`
- (e) none of the above

14. (2 pts) Which of the following opens the file `data.dat` so that the program can do operations such as `fscanf`?

- (a) `FILE *input;`
- (b) `FILE *data.dat;`
- (c) `input = fopen("data.dat", "r");`
- (d) `fgets("data.dat", 80, input);`
- (e) none of the above

15. (2 pts) Which of the following evaluates to true when there was a problem opening the file (e.g. `data.dat` doesn't exist)?

- (a) `(input!=NULL)`
- (b) `(input==NULL)`
- (c) `(input==EOF)`
- (d) `(input!=EOF)`
- (e) none of the above

16. (2 pts) Suppose a variable has been declared as `int x;` Which of the following could read an integer from a file into the integer variable `x`?

- (a) `fscanf(input, "%d", x);`
- (b) `scanf("%d", x);`
- (c) `scanf("%d", &x);`
- (d) `fgets(x, 40, input);`
- (e) none of the above

## Short Answers

Consider the **partial** program below. Imagine that you are going to add some functions and their prototypes to it. Make up function names, and use parameters from the existing code. Do **not** write function definitions.

```
#include <stdio.h>

/* Terry Harvey CISC105-20 TA: Tina Weymouth*/

int main(){

 char word1[] = "fertilizer";
 char word2[20];
 int heights[10] = {4,5,6,7,8,9};
 int argc = 5;
 ...
}
```

17. (4 pts) Write a prototype for a function that can take an integer array and an index for the array as parameters.
18. (4 pts) Show how you could call the function from question 17 in main() to print the “6” from the heights array.
19. (4 pts) Write a prototype for a function that can take a character array parameter.
20. (4 pts) Show how you could call the function from question 19 in main() to print the word1 array.
21. (4 pts) Write a prototype for a function that can take a character array and an index for the array as parameters.
22. (4 pts) Show how you could call the function from question 21 in main() to print only the 'z' from the word1 array.

Consider the **partial** program below. Imagine that you are going to add some functions to it. Make up function names, and use parameters from the existing code.

```
#include <stdio.h>

/* Terry Harvey CISC105-20 TA: Liric Waterchard*/

int main(){

 int someData[100] = {1,2,3,4,5,6,7};
 int one = 5;
 ...
}
```

23. (4 pts) Write a prototype for a function that can change any element in someData. Do not write the definition.
24. (4 pts) Show how you could call the function from question 23 in main().
25. (4 pts) The function printInteger takes a single integer as argument. Show a call to printInteger that will print the 4 from someData.
26. (4 pts) A program is running and has 200Kb of memory available for an array. What is the maximum number of integers an array could hold and still fit? Show your work.
27. (6 pts) The file **data.txt** is in your home directory. Show the complete shell commands, in order, that would get you to your home directory, move the file to the 105 directory of your webpage and then make it readable.

28. (10 pts) Two sections of code are missing from the code below. Fill them in after carefully reading the comments.

```
#include <stdio.h>

/*
 * Do not use any predefined string functions. Do not change any of
 * the code provided.
 *
 * Terry Harvey CISC 105 section 98 TA Marcus Miller
 */

int main(){

 char input[80];
 int i = 0;
 int length = 0;

 printf("Enter a word: ");

 /* Read a single word of user input */

 <<<PUT CODE HERE

 /* Write a loop to find the length of the word. */

 <<<PUT CODE HERE

 /* prints the length of the word (prints 3 for ``cat'') */
 printf("%d\n", length);

 return 0;
}
```

29. (5 pts) Write a prototype for a function `printArray` that prints an integer array of arbitrary size (Hint: how will it know when to stop?).
30. (10 pts) Write a program that declares an integer array, opens an input file called “data”, and reads three numbers into the array. After the numbers are read, the function `printArray` from 29 is called on the array to print it out. Do not write the function `printArray`.
31. (8 pts) Write a function “`printTriangle`” that takes a size parameter and prints a triangle (shown here for size 4). You may solve this with loops alone; if you choose to use a helper function, you must also write that function.

```
 *
 * *
* * *
* * * *
```

MC answers: EAEBA EAEBB AECCB E (?)