CS 2110 — Quiz 5 (30 minutes)
October 31st, 2018

Full name: ______________________

GT username: ______________________

This quiz is worth a total of **100 points**.

> In accordance with the Georgia Institute of Technology Honor Code, I have neither given nor received aid on this quiz.
>
> Signature: ______________________

Please make sure all of your answers are contained within the answer boxes or the fill-in lines. You have been provided with scratch paper for your work. You will **NOT** be given credit for showing work. Having anything except the answer inside the boxes or above the fill-in lines might cause incorrect results. **Write your name and answers legibly. You will not receive credit for illegible answers.**

Types

1. Consider the following C code segment:

```
char *v;
int **w, *ww, www;
char *x[15];        // x: an array of 15 pointer to char
float *(*y)[];      // y: a pointer to an array of pointer to float
float **z[10];      // z: an array of 10 pointer to pointer float
```

Please describe the evaluated type of the following expressions.

Note: Part (a) has been completed as an example.

(a) v pointer to char

(b) x[4] pointer to char 5

(c) www int 5

(d) z[0] pointer to pointer to float 5

(e) **y pointer to float 5

Code Tracing

2. For each line in the following table, show the updated value of the variable after the line is executed. You must have exactly one entry in each row. Use the & operator to denote the address of a variable. 28

Note: The first six lines have been filled for you!

Instructions	b	c	pb	pc	ppb	ppc
int b = 3;	3					
int c = 17;		17				
int *pb = &b;			&b			
int *pc = &c;				&c		
int **ppb = &pb;					&pb	
int **ppc = &pc;						&pc
*ppc = &b;				&b		
*pb = 13;	13					
**ppb = c + 3;	20					
*ppb = *ppc;			&b			
pb = &c;			&c			
(**ppc)++;	21					
**ppb = b;		21				

Macros

3. Write a macro called `PIE_AREA` with parameter `radius` which calculates the surface area of a pie. 10

   Recall that the area of a circle is πr^2 where r is the radius.

   Assume a macro `PI`, a symbolic name for `3.14159f`, has been written on a previous line in the file.

```
#define PIE_AREA(radius) ((PI) * (radius) * (radius))
```

Creating a Pumpkin Patch

4. *Note:* Assume `stdlib.h` and `assert.h` have been included.

   Note: If there is insufficient space in the heap, terminate the program with an error!

   (a) Define a `struct pumpkin` with an `int` (`seeds`), a `float` (`weight`) and an array of ten `char` (`name`). 8

```
struct pumpkin {
  int seeds;
  float weight;
  char name[10];
};
```

   (b) Make a new type name `pumpkin_t` which is an alias for `struct pumpkin`. 8

```
typedef struct pumpkin pumpkin_t;
```

   (c) Allocate space for an array of twenty `pumpkin_t` on the **heap**, and name a pointer to the first element of the array `pumpkin_patch`. 8

```
pumpkin_t *pumpkin_patch = (pumpkin_t*) malloc(sizeof(pumpkin_t) * 20);

if (pumpkin_patch == NULL) // One of several acceptable answers
  exit(0);
```

   (d) Initialize each `pumpkin_t`: Set `seeds` and `weight` to zero. 10

   Assign the first character in each `name` to be `'\0'` – you need not assign the other nine characters.

```
for (int i = 0; i < 20; i++) {
  pumpkin_patch[i].seeds   = 0;
  pumpkin_patch[i].weight  = 0.0;
  pumpkin_patch[i].name[0] = ‘\0’;
}
```

   (e) For the fifth `pumpkin_t` in the `pumpkin_patch`, using the allocated space from part (d), set the `name` to `"Jack"`. 8

```
pumpkin_patch[4].name[0] = ‘J’;
pumpkin_patch[4].name[1] = ‘a’;
pumpkin_patch[4].name[2] = ‘c’;
pumpkin_patch[4].name[3] = ‘k’;
pumpkin_patch[4].name[4] = ‘\0’;
```