

1. What is the C preprocessor? Give 3 examples of its use in a .c file
When is `sizeof` evaluated?
What would be a good name for the following macro? What must be true for A?

```
#define NAME(A) ( sizeof(A) / sizeof(A[0]) )
```

2. Complete the following code to return 1 if the c string contains @ character, 0 otherwise.

Where will the code crash if called with NULL containsAt(NULL);

```
01 int containsAt(char* ptr) {
02
03
04
05
06
07
08
```

3. Explain how C uses memory from the process address space in each line of the following. (eg. stack, text segment, heap, global).
Where do you expect this code to fail?

```
01 int global;
02
03 void test() {
04     char* t1 = "hi"; // Initialize a pointer
05     char t2[] = "abcdefgh"; // copies bytes
06
07     *t2 = 'A';
08     *(t2 + 1) = 'B';
09     t2[1] = 'B';
10     *t1 = 'H';
11     t1 = malloc(123);
12 }
```

4. Why is this code broken?

```
01 #define max(a,b) a<b ? a : b
02 int result = max(10,5) + 1;
03 printf("Result:%d", result);
```

5. Spot the error(s)

```
01 double* f1(int n) {
02     int i;
03     double* r = malloc( n* sizeof (double) );
04     while( i < n) r[i++] = 12.3;
05     return r;
06 }
```

6. Is the following line valid?

```
printf("%p %p", main, malloc);
```

7. Pointer arithmetic

Write a function to return the number of items in an int array before a value of -1 is found. Tricky: Use pointer arithmetic (no counters allowed!)

```
01 count_before(int* array) {
02     int* ptr = array;
```

8. What would you call at line 2 such that p1 can be equal to p2?

```
01 void* p1 = malloc( 10 );
```

```
02 ??_____
```

```
03 void *p2 = malloc(8);
```

free()

9 What are asprintf sprintf and fprintf?

10. For the start of the program, `main(int argc, char** argv)`

What is special about `argv[0]`

What is special about `argv[argc]`

How do you print out all of the arguments of a program?

```
01 int main(int argc, char** argv) {
02
```

11. Which of the following would print out an address in the stack?

```
01 int abc = 5;
02
03 int main() { f1( 10, &abc); return 0;}
04
05 int f1(int v1, int* v2) {
06     printf("&v1 is %p \n", &v1);
07
08     printf("&v2 is %p \n", &v2);
09
10     printf(" v2 is %p \n", v2);
11 }
```

12 What are strcpy, strcat, strlen, strcmp ?

13 Which of the following is/are incorrect?

```
01 const char* f1() {
02     const char blah[] = "Hello";
03     return blah;
04 }
05
06 const char* f2() {
07     const char* foo = "Hi";
08     return foo;
09 }
10
11 char* f3() {
12     char* yo = malloc(2);
13     strcat(yo, "Hi");
14     return yo;
15 }
```

14. How do I change your variable? Complete the main function to print the message created by the `getMessage` function

```
01 void getMessage(char**magic) {
02     *magic = malloc(10);
03     strcpy(*magic, "Amazing C!");
04 }
05
06 int main() {
07     char* ptr = NULL;
08     ?
09     puts( _____);
10 }
```