

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);
```

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 }
```