16.216: ECE Application Programming

Fall 2012

Lecture 31: Key Questions
November 30, 2012

1. Explain why dynamic memory allocation is useful.

2. Explain the `malloc()` function.

3. Explain the use of type casting, and why it is necessary with the allocation functions.

4. Explain the `calloc()` function.

5. Explain the `realloc()` function.

6. Explain the use of the `free()` function and why it is necessary.

7. Explain the following common pitfalls of dynamic memory allocation, as well as their solutions:

a. Memory leaks

b. Dangling pointers

8. Explain how dynamic memory allocation can be used with arrays.

9. What does the following program print? What is the state of the array after each allocation function call?

```
void main() {
     int *arr;
     int n, i;

     n = 7;
     arr = (int *)calloc(n, sizeof(int));
     for (i = 0; i < n; i++)
          printf("%d ", arr[i]);
     printf("\n");

     n = 3;
     arr = (int *)realloc(arr, n * sizeof(int));
     for (i = 0; i < n; i++) {
          arr[i] = i * i;
          printf("%d ", arr[i]);
     }

     n = 6;
     arr = (int *)realloc(arr, n * sizeof(int));
     for (i = 0; i < n; i++) {
          arr[i] = 10 - i;
          printf("%d ", arr[i]);
     }
}
```