

# Princeton University

## COS 217: Introduction to Programming Systems

### C Dynamic Memory Management Fundamentals

#### Dynamic Memory Management for Elementary Types

```
int *pi;
...
/* pi = (int*)malloc(4); */
pi = (int*)malloc(sizeof(int));
/* pi = (int*)malloc(sizeof(*pi)); */
...
*pi = 5;
...
free(pi);
...
```

#### Dynamic Memory Management for Arrays

```
int *pi;
...
/* pi = (int*)malloc(20); */
/* pi = (int*)malloc(5 * sizeof(int)); */
/* pi = (int*)malloc(5 * sizeof(*pi)); */
/* pi = (int*)calloc(5, 4); */
pi = (int*)calloc(5, sizeof(int));
/* pi = (int*)calloc(5, sizeof(*pi)); */
...
*(pi + 2) = 5;
pi[3] = 6;
...
free(pi);
...
```

#### Dynamic Memory Management for Structures

```
struct Location {int iLat; int iLon;};
...
struct Location *psLoc;
...
psLoc = (struct Location*)malloc(sizeof(struct Location));
/* psLoc = (struct Location*)malloc(sizeof(*psLoc)); */
...
(*psLoc).iLat = 41;
psLoc->iLon = 74;
...
free(psLoc);
...
```

#### Changing the Size of a Dynamically Allocated Array

```
int *pi1, *pi2;
...
pi1 = (int*)calloc(5, sizeof(int));
...
pi2 = (int*)realloc(pi1, 3 * sizeof(int));
...
pi2 = (int*)realloc(pi1, 10 * sizeof(int));
...
free(pi2);
...
```