#4: Heap and Parameters

September 6, 2017

Stack Memory – Solidifying Understanding

stack-array.cpp

```cpp
int first = 42;
int arr[6];

cout << &(first) << endl;
cout << &(arr[0]) << endl;
cout << &(arr[1]) << endl;
cout << &(arr[2]) << endl;
```

Location	Value	Type	Name
0xffff00f0 →			
0xffff00e8 →			
0xffff00e0 →			
0xffff00d8 →			
0xffff00d0 →			

Onto the Heap!

heap1.cpp

```cpp
int main() {
  int *p = new int;
  int *s = new Sphere(10);



  return 0;
}
```

Stack	Value
0xffff00f0 →	
0xffff00e8 →	
0xffff00e0 →	
0xffff00d8 →	
0xffff00d0 →	

Heap	Value
0x42020 →	
0x42018 →	
0x42010 →	
0x42008 →	
0x42000 →	

heap2.cpp

```cpp
int main() {
  Sphere *s1 = new Sphere();
  Sphere *s2 = s1;

  s2->setRadius( 10 );



  return 0;
}
```

Stack	Value
0xffff00f0 →	
0xffff00e8 →	
0xffff00e0 →	
0xffff00d8 →	
0xffff00d0 →	

Heap	Value
0x42020 →	
0x42018 →	
0x42010 →	
0x42008 →	
0x42000 →	

Heap Memory Lifecycle

Memory Address Operators

&s

***ptr**

heap-puzzle1.cpp

```cpp
#include <iostream>
using namespace std;

int main() {
  int *p, *q;
  p = new int;
  q = p;
  *q = 8;
  cout << *p << endl;

  q = new int;
  *q = 9;
  cout << *p << endl;
  cout << *q << endl;

  return 0;
}
```

heap-puzzle2.cpp

```cpp
#include <iostream>
using namespace std;

int main() {
  int *x;
  int size = 3;

  x = new int[size];

  for (int i = 0; i < size; i++) {
    x[i] = i + 3;
  }

  delete[] x;
}
```

heap-puzzle3.cpp

```cpp
int *x = new int;
int &y = *x;

y = 4;

cout << &x << endl;
cout << x << endl;
cout << *x << endl;

cout << &y << endl;
cout << y << endl;
cout << *y << endl;
```

Big Idea: Reference Variable

joinSpheres.cpp

```cpp
/*
 * Creates a new sphere that contains the exact volume
 * of the two input spheres.
 */
Sphere joinSpheres(Sphere   s1, Sphere   s2) {
  double totalVolume = s1.getVolume() + s2.getVolume();

  double newRadius = std::pow(
    (3.0 * totalVolume) / (4.0 * 3.141592654),
    1.0/3.0
  );

  Sphere result(newRadius);

  return  result;
}
```

Passing Parameters to Functions

1.

2.

3.

CS 225 – Things To Be Doing:

1. Register for Exam #1 – CBTF
2. Complete the POTDs
3. Finish up MP1 – Due Monday, Sept. 11 at 11:59pm
4. Complete lab_debug – Due Sunday, Sept. 10 at 11:59pm