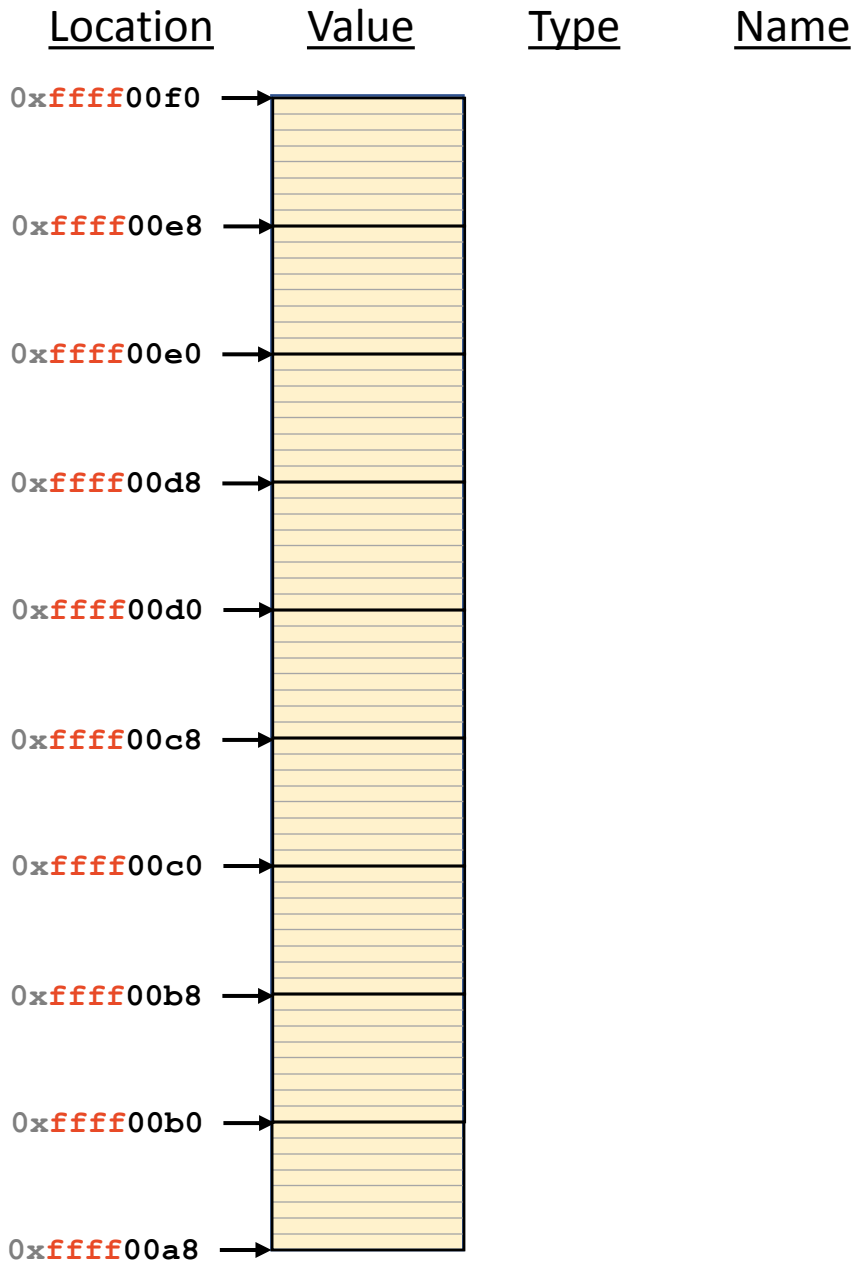
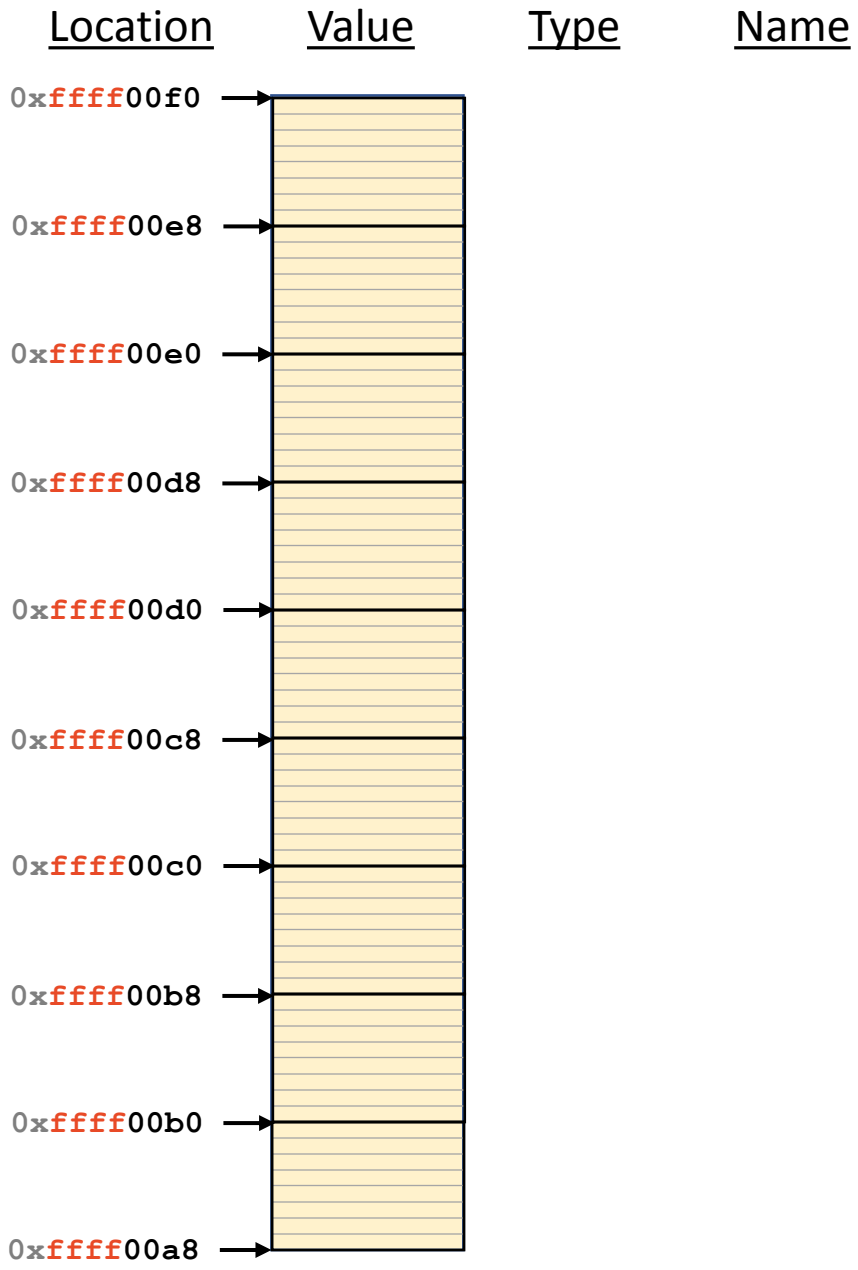
CS 225

Data Structures



stack-array.cpp

```
 1 #include <iostream>
 2 using namespace std;
 3
 4 int main() {
 5   int first = 42;
 6   int arr[6];
 7
 8   cout << &first << endl;
 9   cout << &(arr[0]) << endl;
10   cout << &(arr[1]) << endl;
11   cout << &(arr[2]) << endl;
12
13   return 0;
14 }
```



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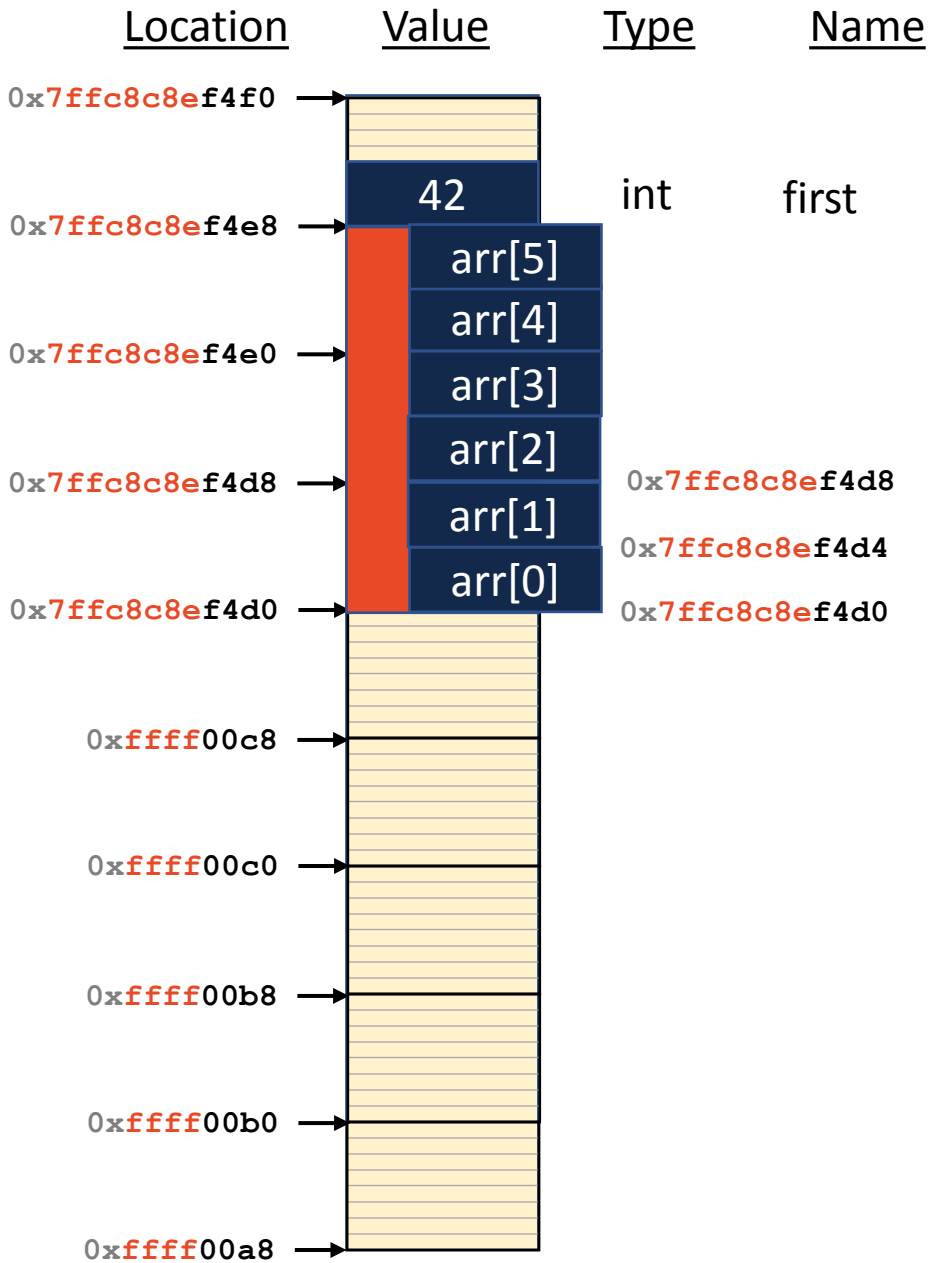
```
waf@linux-a2:~
[waf@linux-a2 ~]$ clang++ -std=c++11 -stdlib=libc++ stack-array.cpp
[waf@linux-a2 ~]$ ./a.out
0x7ffc8c8ef4e8
0x7ffc8c8ef4d0
0x7ffc8c8ef4d4
0x7ffc8c8ef4d8
[waf@linux-a2 ~]$ nano stack-array.cpp
[waf@linux-a2 ~]$
```



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[waf@linux-a2 ~]$ nano stack-array.cpp
[waf@linux-a2 ~]$
```

Exam 1

In the Computer Based Testing Center (CBTF)

https://cbtf.engr.illinois.edu/

Covers material through last week.

No coding!

Practice exam will be available.

POTD

These have started!

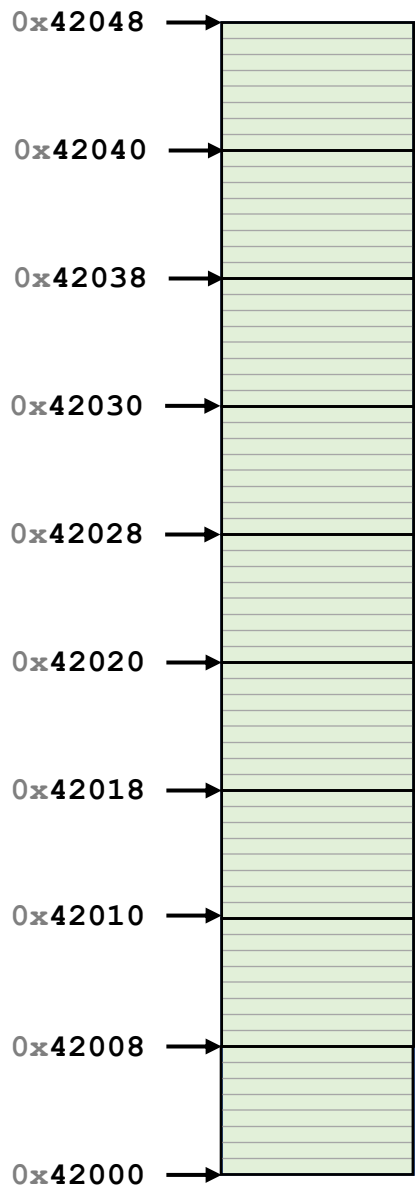
https://prairielearn.engr.illinois.edu/

You will have 24 hours from when they are released.

Usually 8am each day.

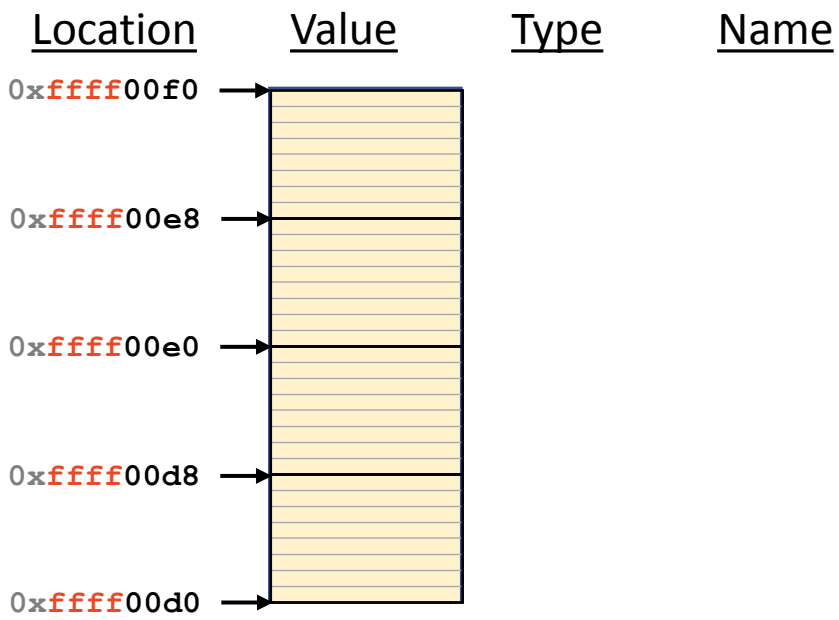
Have fun!

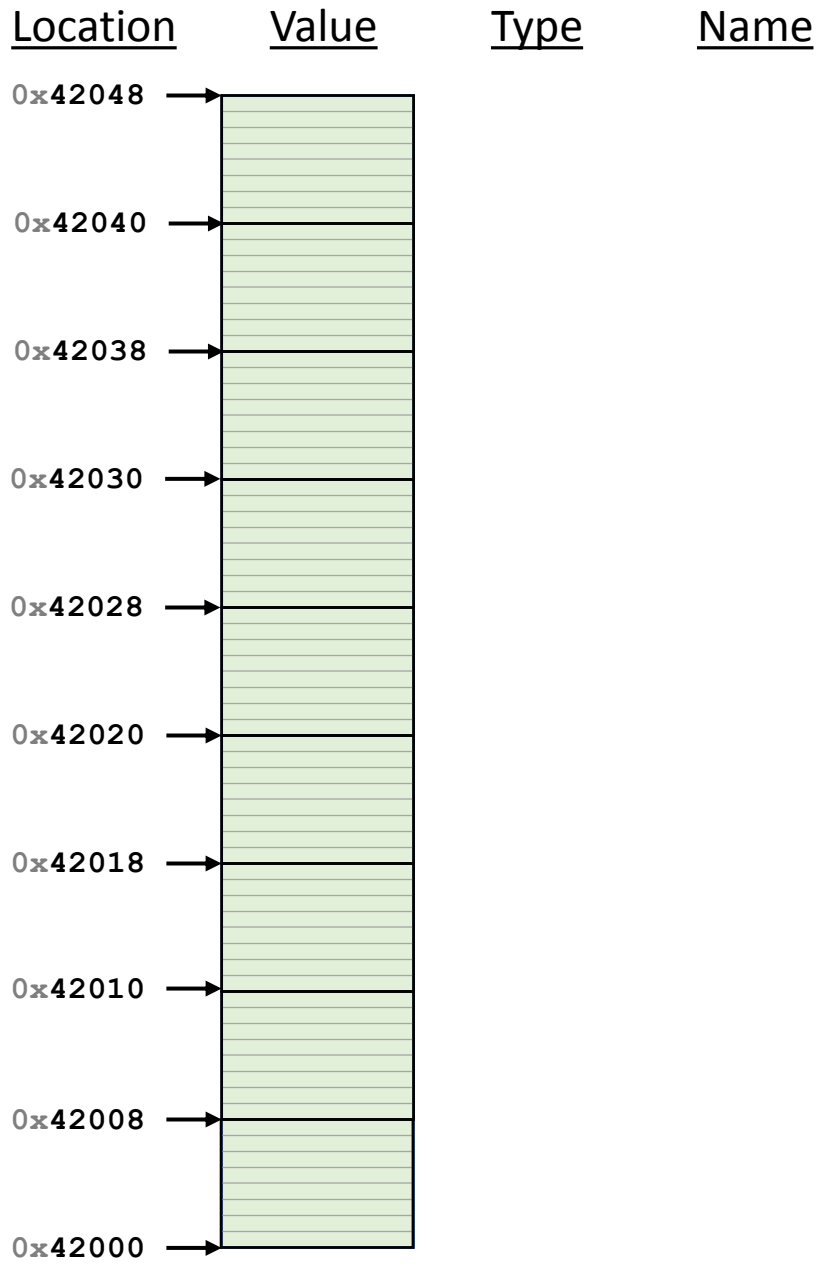
Heap Memory


0x42048
0x42040
0x42038
0x42030
0x42028
0x42020
0x42018
0x42010
0x42008
0x42000

heap1.cpp

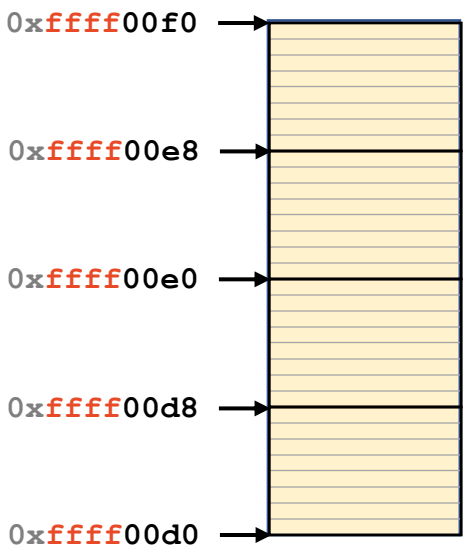
```
1  #include "sphere.h"
2  using namespace cs225;
3
4  int main() {
5    int *p = new int;
6    int *s = new Sphere(10);
7
8
9
10   return 0;
11 }
```



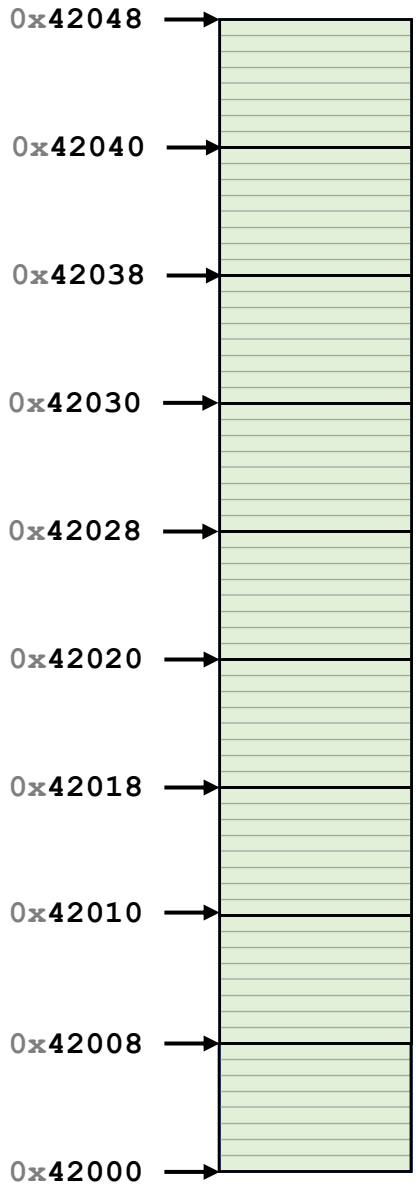


heap2.cpp

```
1  #include "sphere.h"
2  using namespace cs225;
3
4  int main() {
5    Sphere *s1 = new Sphere();
6    Sphere *s2 = s1;
7
8    s2->setRadius( 10 );
9
10
11
12   return 0;
13 }
```



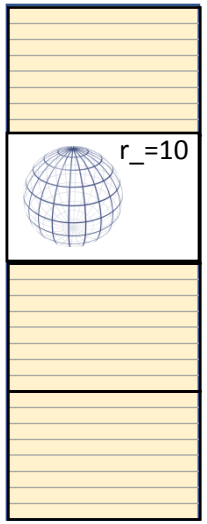
Location	Value	Type	Name



Heap Memory Lifecycle

Accessing Memory and Data

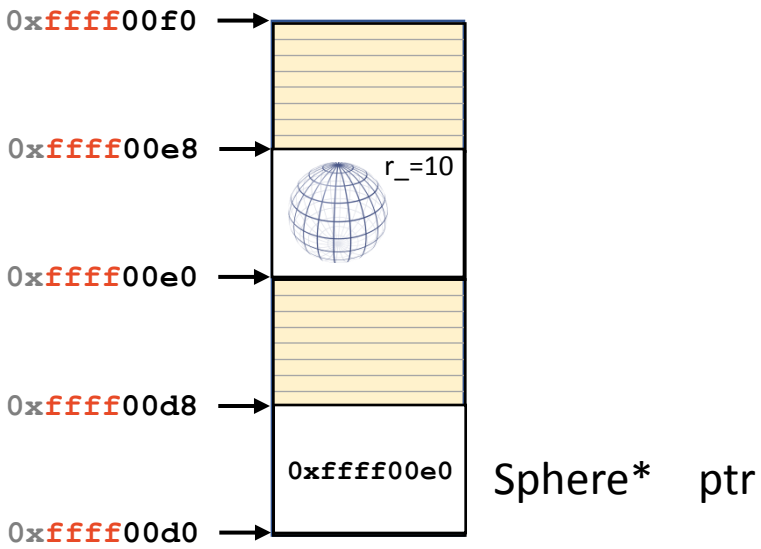
```
&s
```



Sphere s

Accessing Memory and Data

```
*ptr
```



heap-puzzle1.cpp

```
 1 #include <iostream>
 2 using namespace std;
 3
 4 int main() {
 5   int *p, *q;
 6   p = new int;
 7   q = p;
 8   *q = 8;
 9   cout << *p << endl;
10
11   q = new int;
12   *q = 9;
13   cout << *p << endl;
14   cout << *q << endl;
15
16   return 0;
17 }
```

heap-puzzle2.cpp

```
 1 #include <iostream>
 2 using namespace std;
 3
 4 int main() {
 5   int *x;
 6   int size = 3;
 7
 8   x = new int[size];
 9
10   for (int i = 0; i < size; i++) {
11     x[i] = i + 3;
12   }
13
14   delete[] x;
15 }
16
17
```

heap-puzzle3.cpp

```
 1 #include <iostream>
 2 using namespace std;
 3
 4 int main() {
 5   int *x = new int;
 6   int &y = *x;
 7
 8   y = 4;
 9
10   cout << &x << endl;
11   cout << x << endl;
12   cout << *x << endl;
13
14   cout << &y << endl;
15   cout << y << endl;
16   cout << *y << endl;
17 }
```

Reference Variable

joinSpheres.cpp

```
11 /*
12  * Creates a new sphere that contains the exact volume
13  * of the two input spheres.
14  */
15 Sphere joinSpheres(Sphere   s1, Sphere   s2) {
16   double totalVolume = s1.getVolume() + s2.getVolume();
17
18   double newRadius = std::pow(
19     (3.0 * totalVolume) / (4.0 * 3.141592654),
20     1.0/3.0
21   );
22
23   Sphere result(newRadius);
24
25   return  result;
26 }
```

CS 225 – Things To Be Doing

Register for Exam 1 (CBTF)

Details on the course website!

Every day, work on the POTDs

Available on PrairieLearn, every weekday!

Finish MP1

Due: Monday, Sept. 11th (11:59pm)

Attend lab and complete lab_debug

Due: Sunday, Sept. 10th (11:59pm)