C++ Week 10 Memory Management

Memory Management

Create a new C++ Console project and replace the code within the cpp file with that below.

```
#include <iostream>

using namespace std;

class NPC{
public:
	int id;
	NPC(){}
	NPC(int id):id(id){}
};


class AIManager{
private:
	NPC **npcs;
	int count;
	int size;
public:
	AIManager(int size):size(size){
		npcs = new NPC*[size];
		count = 0;
	}
	int Add(int id){
		NPC *temp = new NPC(id);
		for(int n=0;n<count;n++)
			if (npcs[n]->id == id) return 0;
		npcs[count++] = temp;
		return id;
	}
	void Display(){
		for(int n=0;n<count;n++)
			cout << "NPC ID: " << npcs[n]->id << endl;
	}
};

int main(){
	AIManager *ai = new AIManager(10);
	ai->Add(1);
	ai->Add(2);
	ai->Add(3);
	ai->Display();
	return 0;
}
```

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Exercise 1

Now modify the program to stop it from generating memory leaks.

Exercise 2

Add appropriate assert statements to

1. Ensure that an NPC with an id of zero can't be added to the array.
2. Count is less than size
3. The AIManager's constructor is passed a size that is greater than zero.

Exercise 3

Define an error handling function that will be invoked when a memory allocation fails. Now let's test it. Within main determine the approx size of the heap on your machine by creating a continuous loop that allocates memory.
Hint: char* MemoryString = new char[512000];
Define a variable whoes value is incremented by 512000 through each iteration of the loop and display its value on the console.

Exercise 4

Comment out the statements in main and define a static array of int that is large enough to generate a stack overflow. Run the program using the **Debug->Start Debugging** menu option. It should generate a Stack Overflow exception. If it does select **Debug->Stop Debugging** to quit the program.

Exercise 5

Comment out the previous statements in main. Define two standalone function that invoke each other. Invoke one of these from within main. Run the program using the **Debug->Start Debugging** menu option. It should generate a Stack Overflow exception. If it does select Debug->Stop Debugging to quit the program.