# IMPLEMENTING C++ CLASSES

Problem Solving with Computers-II

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

int main(){
    cout<<"Hola Facebook\n";
    return 0;
}
```

Read the syllabus.  Know what's required.  Know how to get help.

CLICKERS OUT – FREQUENCY AB

# How is h01 (specifically the CS16 final) going?

A. Done - I think I have done well

B. Attempted - found it a bit difficult

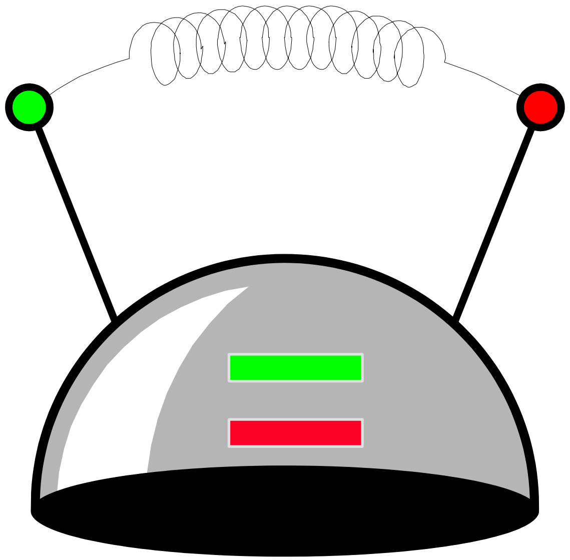
C. Attempted - found some concepts alien

D. Attempted - extremely difficult

E. Haven’t attempted

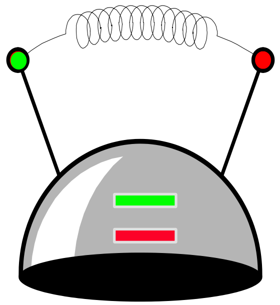
Clickers out – frequency AB

# Description of the thinking cap



- You may put a piece of paper in each of the two slots (green and red), with a sentence written on each.
- You may push the green button and the thinking cap will speak the sentence from the green slot's paper.
- And same for the red button.

# Thinking Cap Implementation

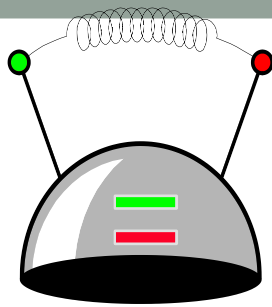


- Usually we implement the class in a separate .cpp file.

```
class thinking_cap
{
public:
    void slots(char new_green[ ], char new_red[ ]);
    void push_green( );
    void push_red( );
private:
    char green_string[50];
    char red_string[50];
};
```

Function bodies will be in .cpp file.

# Thinking Cap Implementation

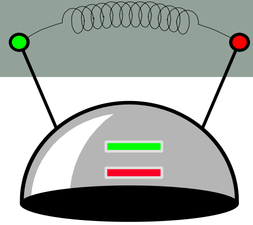


There are two special features about a member function’s implementation . . .

```
void thinking_cap::slots(char new_green[ ], char new_red[ ])
{



}
```



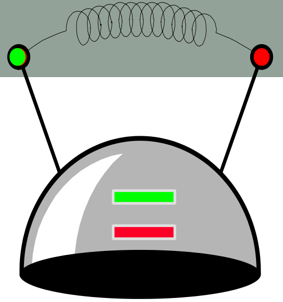
# Thinking Cap Implementation

There are two special features about a member function's implementation . . .

1. The class name is included in the function's heading using the :: operator
2. The function can refer to any of the member variables

```
void thinking_cap::slots(char new_green[ ], char new_red[ ])
{
    assert(strlen(new_green) < 50);
    assert(strlen(new_red) < 50);
    strcpy(green_string,  new_green);
    strcpy(red_string, new_red);
}
```

# Thinking Cap Implementation



Within the body of the function, the class’s member variables and other methods may all be accessed.

```
void thinking_cap::slots(char new_
{
    assert(strlen(new_green) < 50).
    assert(strlen(new_red) < 50);
    strcpy(green_string,  new_gree
    strcpy(red_string, new_red);
}
```

***But, whose member variables are these? Are they***

***c1.green_string***

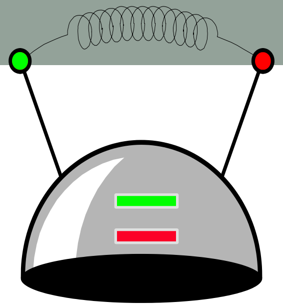
***c1.red_string***

***c2.green_string***

***c2.red_string***

**?**

# Thinking Cap Implementation



Within the body of the function, the class’s member variables and other member functions may all be accessed.

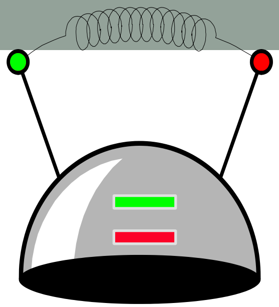
```
void thinking_cap::slots(char new_
{
    assert(strlen(new_green) < 50).
    assert(strlen(new_red) < 50);
    strcpy(green_string,  new_gree
    strcpy(red_string, new_red);
}
```

***If we activate c1.slots():***

***c1.green_string***

***c1.red_string***

# Thinking Cap Implementation



Within the body of the function, the class’s member variables and other member functions may all be accessed.

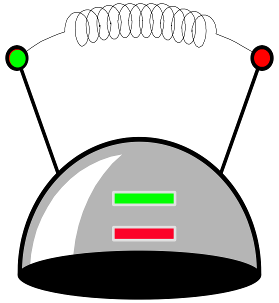
```
void thinking_cap::slots(char new_
{
    assert(strlen(new_green) < 50).
    assert(strlen(new_red) < 50);
    strcpy(green_string,  new_gree
    strcpy(red_string, new_red);
}
```

***If we activate  c2.slots():***

***c2.green_string***

***c2.red_string***

# Thinking Cap Implementation



Here is the implementation of the push_green() member function, which prints the green message:

```
void thinking_cap::push_green( )
{

    cout << green_string << endl;

}
```

# A Common Pattern

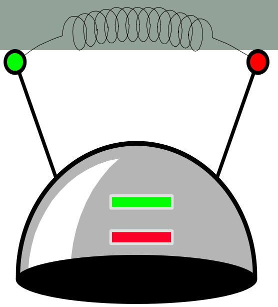
- Often, one or more member functions will place data in the member variables...

```
class thinking_cap {
public:
    void slots(char new_green[ ], char new_red[ ]);
    void push_green( ) const;
    void push_red( ) const;
private:
    char green_string[50];
    char red_string[50];
};
```

slots

push_green & push_red

# Thinking Cap Definition



```
class thinking_cap
{
public:
    void slots(char new_green[ ], char new_red[ ]);
    void push_green( );
    void push_red( );
private:
    char green_string[50];
    char red_string[50];
};
```

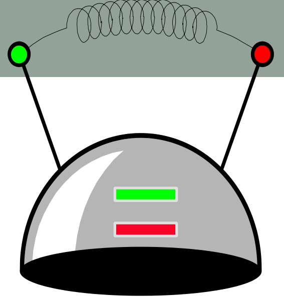
When are the data members (green_string and red_string) created in memory

A. When the compiler compiles the class definition (above)

B. When an object of type thinking_cap is created in the program (at run-time)

C. When the slots() member function is activated

# Constructor



An “initialization” function that is guaranteed to be called when an object of the class is created

```
class thinking_cap
{
public:
    thinking_cap(char green[], char red[]);
    void slots(char new_green[ ], char new_red[ ]);
    void push_green( ) const;
    void push_red( ) const;
private:
    char green_string[50];
    char red_string[50];
};
```

***Which distinction(s) do you see between the constructor and other methods of the class?***

***A. The constructor has the same name as the class***

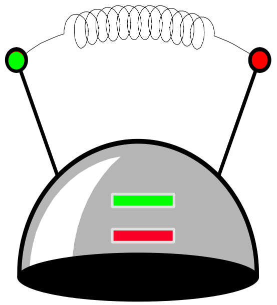
***B. It doesn’t have a return type***

***C. It has formal parameters***

***D. A and B***

***E. None of the above***

# Implementation of the constructor



Do you expect the body of the constructor to be different from the slots() method in this example? Discuss with your group why or why not.

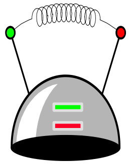
A. Yes
B. No

```
thinking_cap::thinking_cap(char green[], char red[] )
{
    //Code for initializing the member variables of



}
```

# Using the constructor

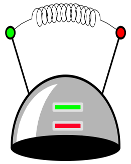


```
class thinking_cap
{
public:
    thinking_cap(char green[], char red[]);
    void slots(char new_green[ ], char new_red[ ]);
    void push_green( ) const;
    void push_red( ) const;
private:
    char green_string[50];
    char red_string[50];
};
```

*What is the output of this code?*

```
int main( )
{
    thinking_cap c(“Hi”,”there”);
    c.push_green( );
}
```

# Using the constructor

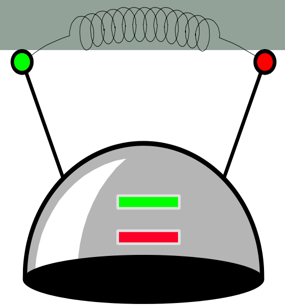


```
class thinking_cap
{
public:
    thinking_cap(char green[], char red[]);
   void slots(char new_green[ ], char new_red[ ]);
    void push_green( ) const;
    void push_red( ) const;
private:
    char green_string[50];
    char red_string[50];
};
```

***What is the output of this code?***

```
int main( )
{
    thinking_cap c;
    c.slots(“Hi”, “There”);
    c.push_green( );
}
```

```
class thinking_cap
{
public:
    thinking_cap(); //Default constructor
    thinking_cap(char ng[], char nr[]); //Parameterized
    void slots(char new_green[ ], char new_red[ ]);
    void push_green( ) const;
    void push_red( ) const;
private:
        char green_string[50];
        char red_string[50];
}
```



When are the data members (green_string and red_string) created in memory

A. When the compiler compiles the class definition (above)

B. When an object of type thinking_cap is created in the program (at run-time)

C. When the constructor explicitly creates these variables.

# Summary

- Classes have member variables and member functions (method). An object is a variable where the data type is a class.
- You should know how to declare a new class type, how to implement its member functions, how to use the class type.
- Frequently, the member functions of an class type place information in the member variables, or use information that's already in the member variables.
- In the future we will see more features of OOP.

# Next time

- Operator overloading
- The Big four: constructor, de-constructor, copy-constructor, copy-assignment