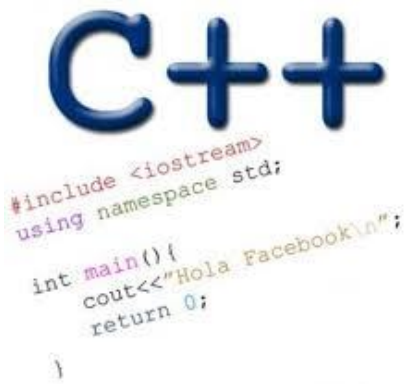
C++ PROGRAM DESIGN TEST DRIVEN DEVELOPMENT

Problem Solving with Computers-I

https://ucsb-cs16-wi17.github.io/



ASCII Art: Write a program to draw a house of stars!

- Inputs: Dimensions of the house (width, height)
- Output: Drawing of a house made of ascii ‘*’

Step 1: Top-down design

- Break down the problem into subtasks

- Design your functions

```
string getBody(int width, int height);
string getRoof(int rheight);
string getHouse(string roof, string body);
```

Step 2: Implement and test each part

- Test driven development- you are in control because you can….
  - measure your progress
  - write code systematically
  - debug systematically
  - automate testing

Step 2: Implement and test each part

How to do TDD?

```
string getRoof(int rheight);
```

- Test suite: Bunch of tests
  - **Case 1: Is** `getRoof(0) == '*'`
  - **Case 2: Is** `getRoof(1) == ?`
  - **Case 3: Is** `getRoof(2) == ?`

- Test harness: Functions to report PASS/FAIL

  If expected == actual, report TEST PASSED!

  else report TEST FAILED!

What is returned by getRoof(1)

```
string getRoof(int height){
    int numSpaces, numStars;
    string result=spaces=stars="";
    for(int row = 0 ; row <=height;row++){
        numSpaces=0;
        numStars=1;
        spaces=stars="";
        for(int i=0;i<numSpaces;i++)
            spaces+=" ";
        for(int i=0;i<numStars;i++)
            stars+="*";
        result= result+spaces+stars+spaces+"\n";
    }
    return result;
}
```

A

```
*
```

B

```
 *
***
```

C

```
*
*
```

D None of the above

Choose the replacement code to return the correct number of stars on each row for getRoof(1)

```
string getRoof(int height){
    int numSpaces, numStars;
    string result=spaces=stars="";
    for(int row = 0; row <=height; row++){
        numSpaces=0;
        numStars=1;
        spaces=stars="";
        for(int i=0; i<numSpaces; i++)
            spaces+=" ";
        for(int i=0; i<numStars; i++)
            stars+="*";
        result= result+spaces+stars+spaces+"\n";
    }
    return result;
}
```

```
  *
 ***
```

A
```
numStars=row;
```

B
```
numStars=height-row;
```

C
```
numStars=2*row+1;
```

D
```
numStars=2*height+1;
```

Choose replacement code to return the correct output for getRoof(0) and getRoof(1)

```
string getRoof(int height){
    int numSpaces, numStars;
    string result=spaces=stars="";
    for(int row = 0 ; row <=height;row++){
        numSpaces=0;
        numStars=2*row+1;
        spaces=stars="";
        for(int i=0;i<numSpaces;i++)
            spaces+=" ";
        for(int i=0;i<numStars;i++)
            stars+="*";
        result= result+spaces+stars+spaces+"\n";
    }
    return result;
}
```

```
  *          *
 ***
```

A `numSpaces=row;`

B `numSpaces=height-row;`

C `numSpaces=2*row+1;`

D `numSpaces=2*height+1;`

Step 3: Integrate all the parts and perform black box testing

- In our example we would integrate the code for the roof and body and test the entire program with different values for width and height. For example

./house -1 -1

./house 3 5

…..

Next time

- Separate compilation with makefiles
- Pointers