

# The Basics

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# About me (Sakib)

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Office Hours in Boelter 2432

- Tuesday 1:30 – 3:30
- Friday 11:30 – 12:30

Email

- [sakibsha@ucla.edu](mailto:sakibsha@ucla.edu)
- Feel free to email me with questions, I am always available via email. (just put the title as CS31 pliss)

I will not be grading the correctness of your hw ☺

But will grade your reports, style, and comments ☺

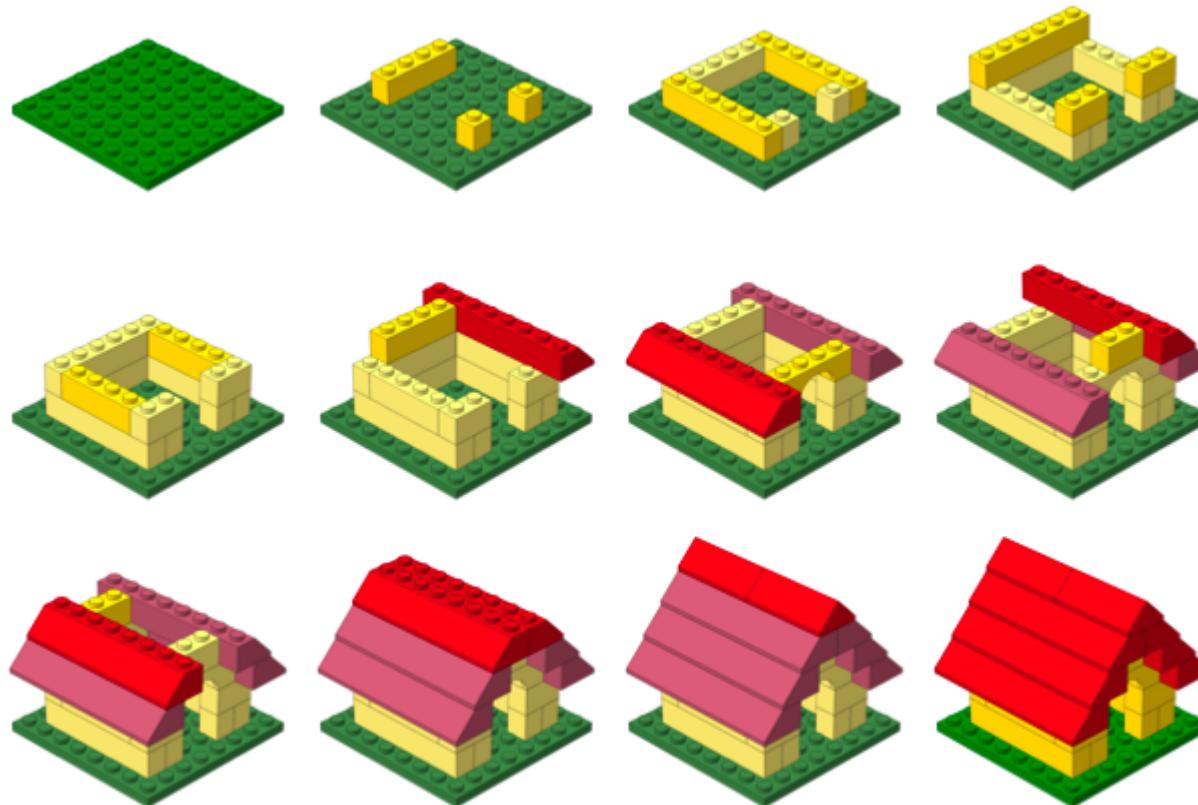
# Welcome to CS31!!!

---

Programming is a big part of computer science but what is it?

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Telling the computer step by step what you want it to compute

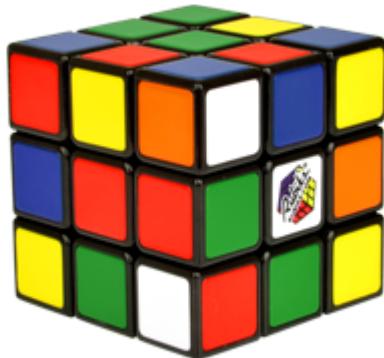


# Think if it like solving a puzzle

---

The tools include the language you are using, and your brain, and your fingers

Rules are set by how much you can do with the language



# What happens after you write the program?

You compile it into the language that your machine understands

- Binary

# Binary

---

A sequence of zeros and ones. “bits” that represent numbers & more

Extremely powerful

$$0000\ 0100 = 4$$

$$0001\ 0011 = 19$$

Each 0 or 1 represents a power of two

$$0100 = 0*2^3 + 1*2^2 + 0*2^1 + 0*2^0$$

How to represent 57 in binary?

# Binary

---

8 bits = 1 Byte

Hex representation. Group 4 bits together

- 0-9, A, B, C, D, E, F

0001 1011 = 0x1B

Computers are either 32 bit or 64 bit architectures

A word in a 32 bit architectures = 4 bytes

10000111110001000100111110101001

How many bytes in 64 bit computer?

# The IDE (Integrated Development Environment)

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Sounds scary but its your best friend



Visual Studio®

Set of tools to help you write, compile, & debug code

# IDE Setup

---

## Xcode

- Download from mac app store

## Visual Studio

- <https://www.visualstudio.com/downloads/download-visual-studio-vs#d-2013-express>
- Use Express 2013 for windows desktop

# Making a project

---

# Visual Studio

---

Live demo



Start Page

## Express 2013 for Windows Desktop

## Start

[New Project...](#)[Open Project...](#)[Open from Source Control...](#)

## Recent

disc1

## Discover what's new in Express 2013 for Windows Desktop

You can find information about new features and enhancements in Express 2013 for Windows Desktop by reviewing the following sections.

[Learn about new features in Express 2013 for Windows Desktop](#)[See what's new in .NET Framework 4.5.1](#)[Explore what's new in Team Foundation Service](#)[Connect to Azure](#)[Learn more about Azure](#)[Connect](#) [Relocate the What's New information](#)

## What's new in Windows Desktop

## Error List

0 Errors

0 Warnings

0 Messages

Search Error List

Description

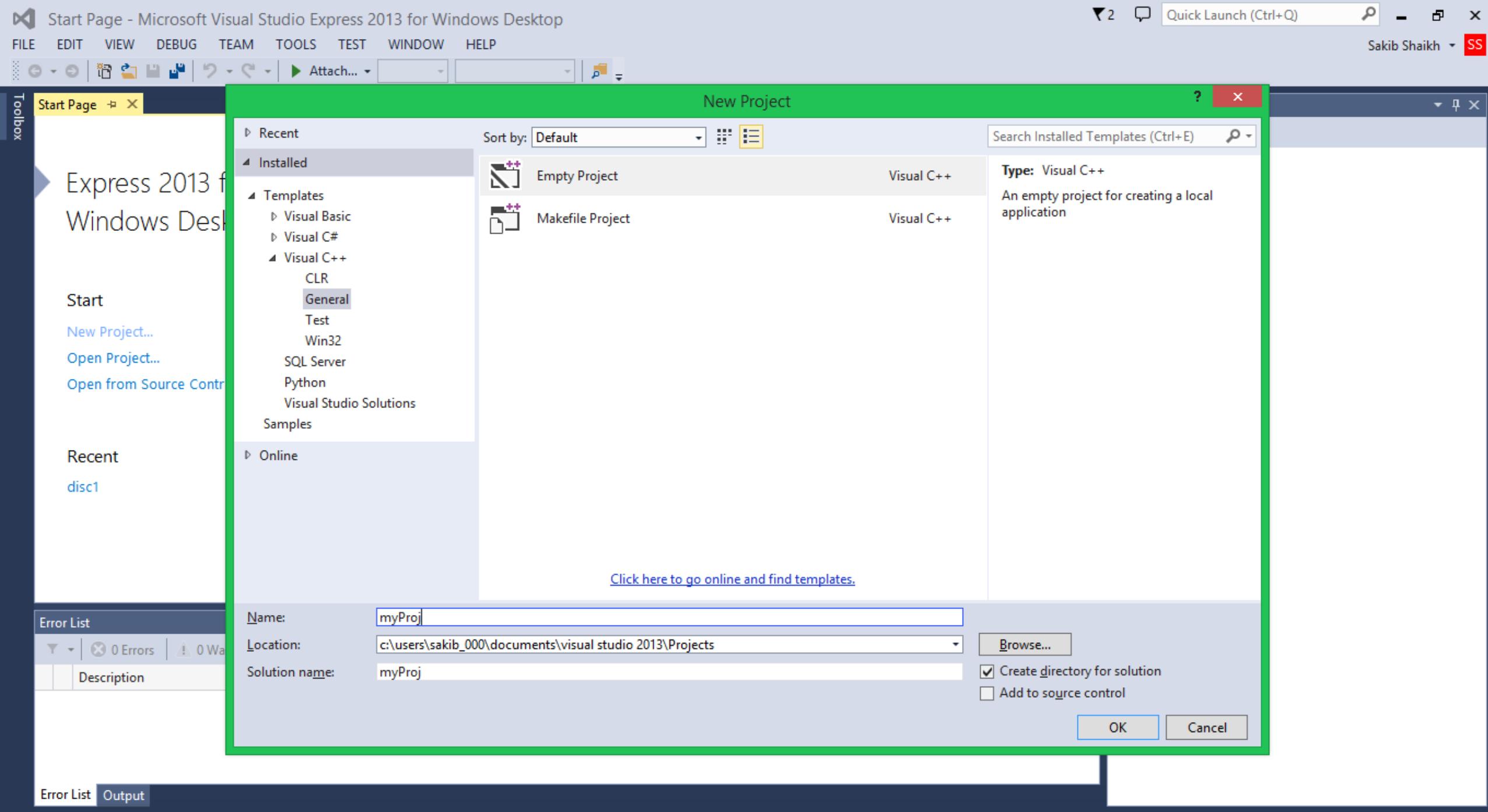
File

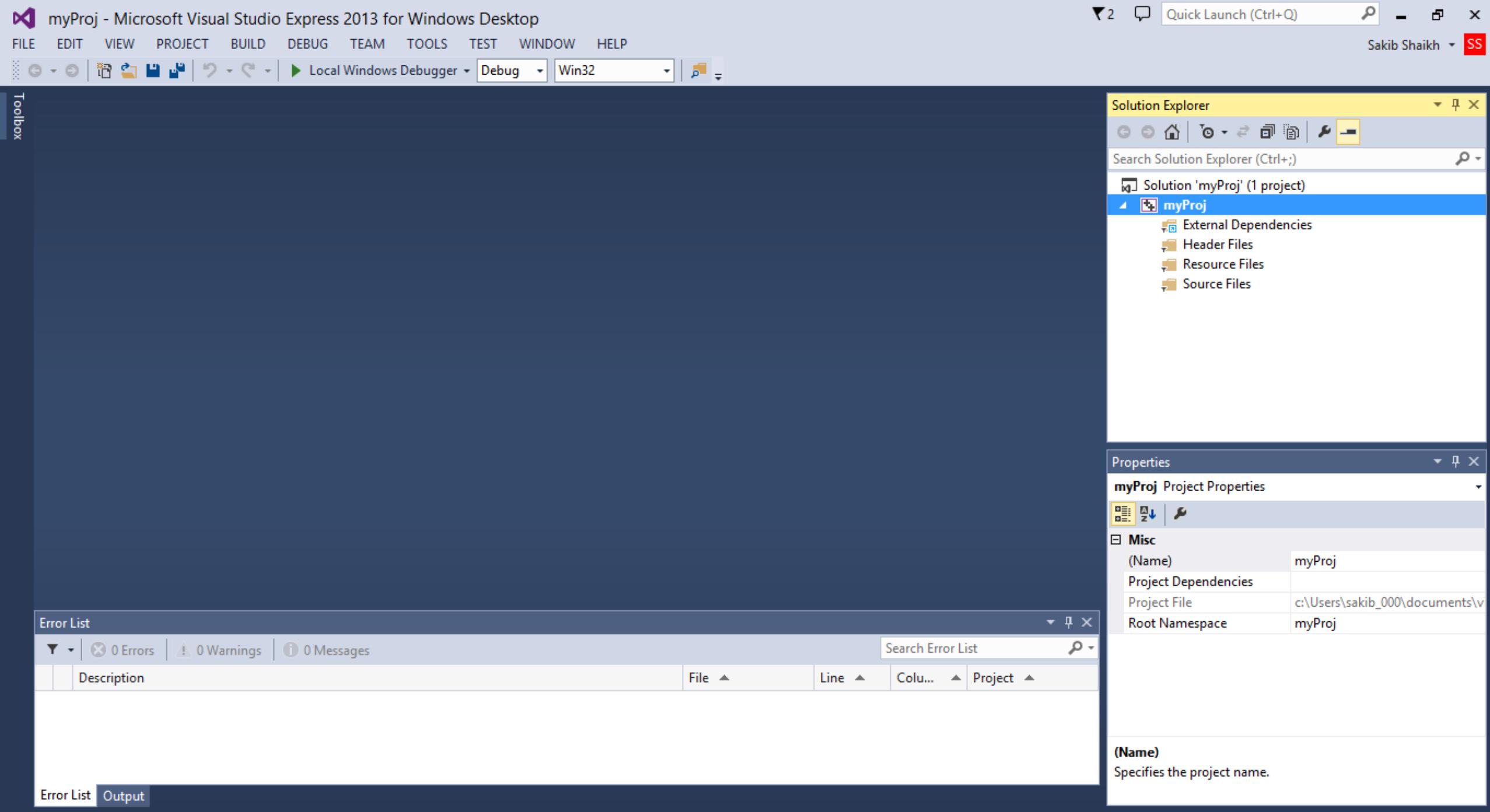
Line

Colu...

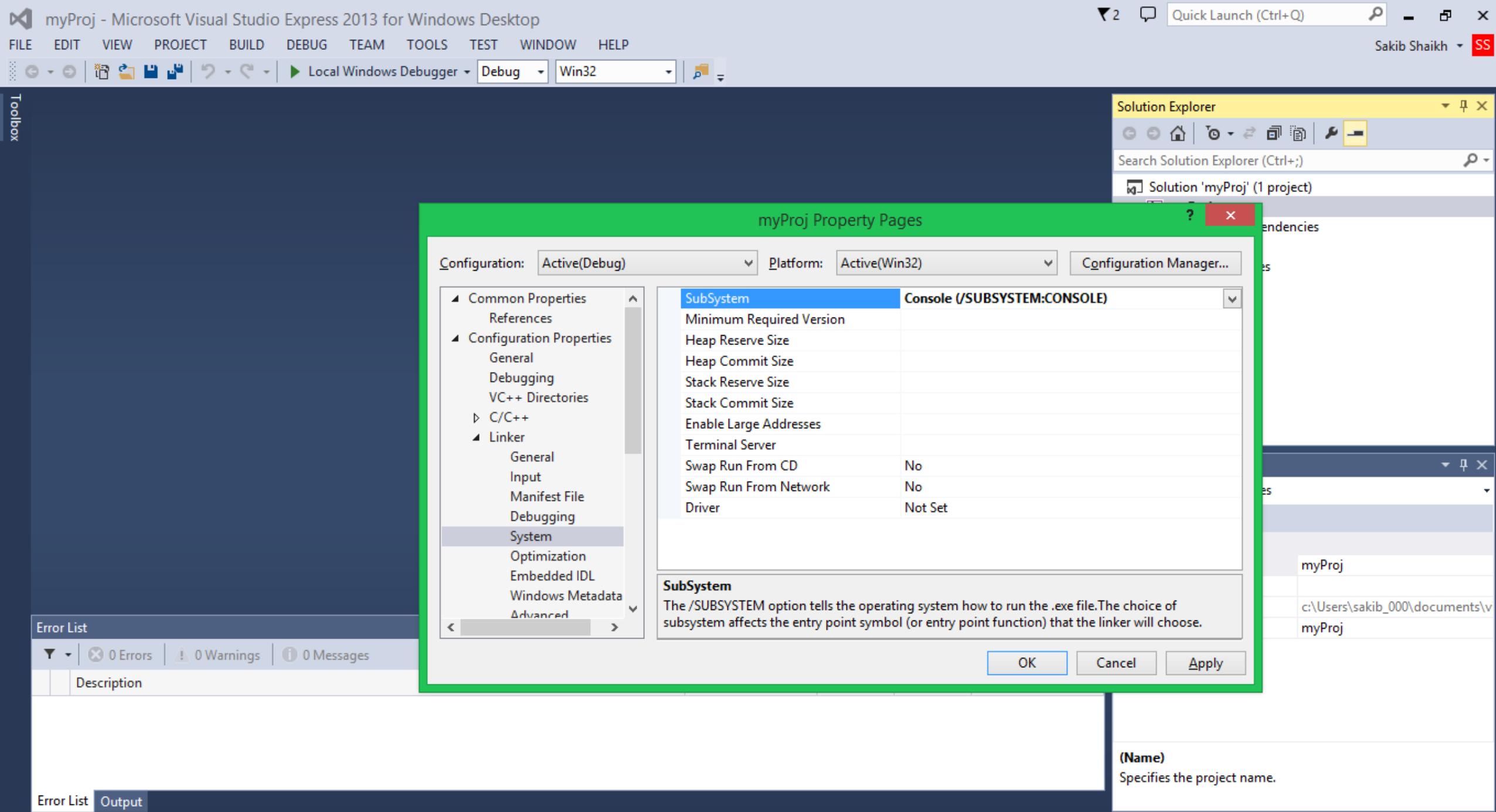
Project

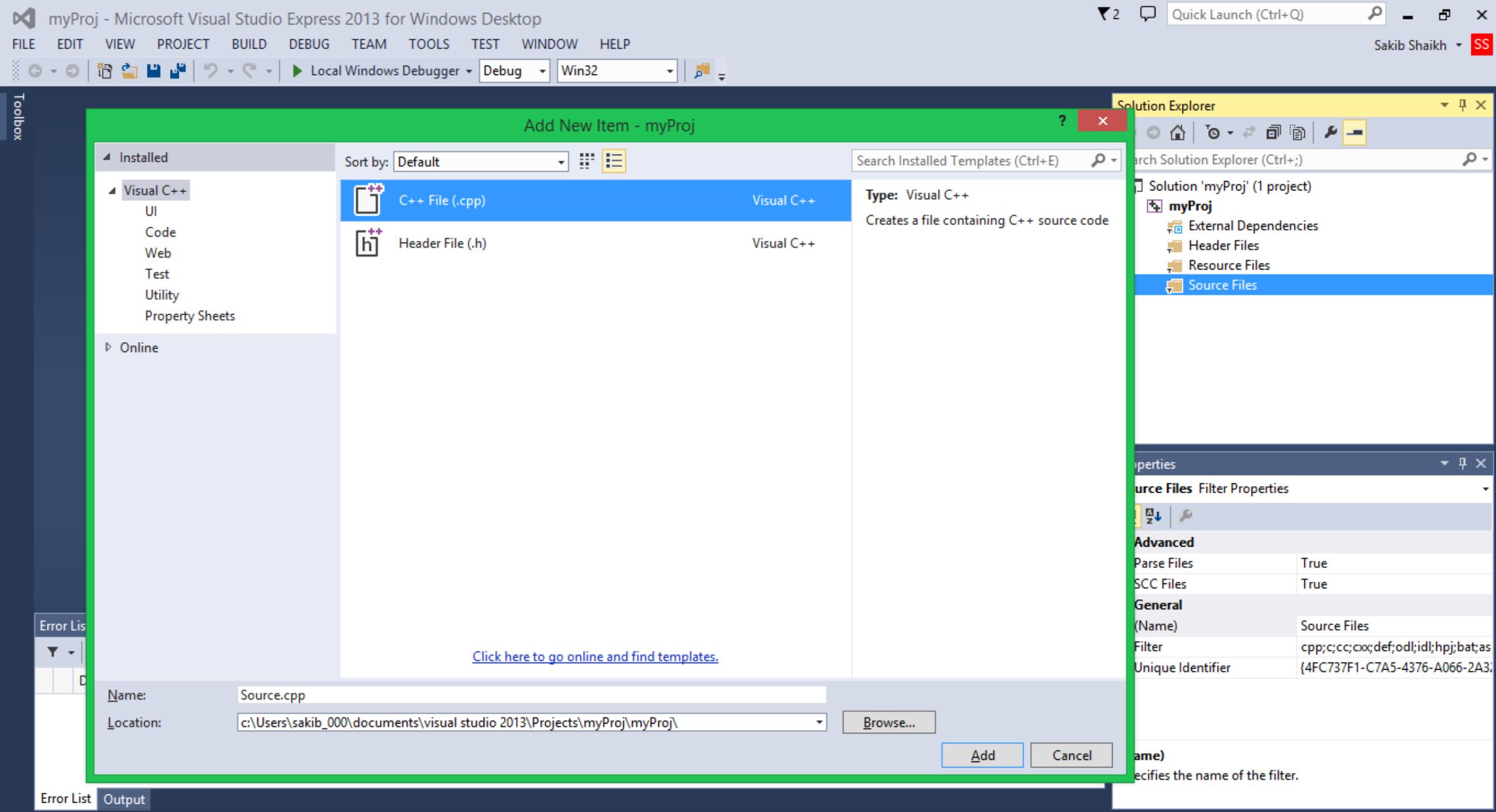
Error List Output





This item does not support previewing





myProj - Microsoft Visual Studio Express 2013 for Windows Desktop

FILE EDIT VIEW PROJECT BUILD DEBUG TEAM TOOLS TEST WINDOW HELP

Local Windows Debugger Debug Win32

Quick Launch (Ctrl+Q) Sakib Shaikh SS

Source.cpp X

myProj (Global Scope)

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

int main()
{
    cout << "Its alive!!!!!! MWAHAHAAA" << endl;
}
```

Solution Explorer

Search Solution Explorer (Ctrl+;)

Solution 'myProj' (1 project)

myProj

- External Dependencies
- Header Files
- Resource Files
- Source Files

Source.cpp

C:\Windows\system32\cmd.exe

```
Its alive!!!!!! MWAHAHAAA
Press any key to continue . . .
```

Properties

Output

Show output from: Build

```
1>----- Build started: Project: myProj, Configuration: Debug Win32 -----
1>  Source.cpp
1>  myProj.vcxproj -> c:\users\sakib_000\documents\visual studio 2013\Projects\myProj\Debug\myProj.exe
===== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped =====
```

Error List Output

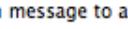
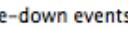
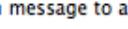
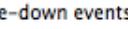
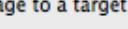
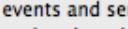
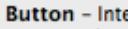
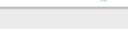
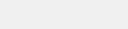
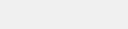
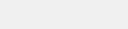
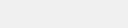
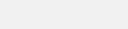
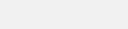
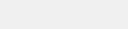
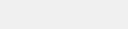
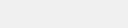
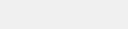
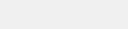
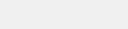
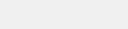
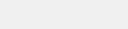
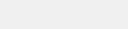
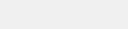
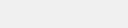
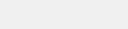
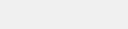
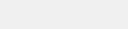
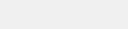
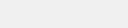
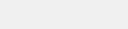
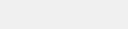
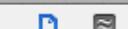
Build succeeded

# Xcode



Loading

No Issues



## Choose a template for your new project



Application  
Framework & Library  
Other



Application  
Framework & Library  
Application Plug-in  
System Plug-in  
Other  
SFML



Cocoa Application



SpriteKit Game

Cocoa-AppleScript  
Application

Command Line Tool



Command Line Tool

This template builds a command-line tool.

Cancel

Previous

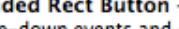
Next



**Push Button** – Intercepts mouse-down events and sends an action message to a target object when...



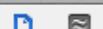
**Gradient Button** – Intercepts mouse-down events and sends an action message to a target object...



**Rounded Rect Button** – Intercepts mouse-down events and sends an action message to a target object...

Loading

No Issues



## Choose options for your new project:

Product Name Organization Name Company Identifier Bundle Identifier 

Type C++

Cancel

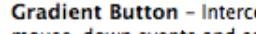
Previous

Next

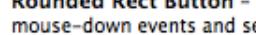
No Selection



**Push Button** – Intercepts mouse-down events and sends an action message to a target object when...



**Gradient Button** – Intercepts mouse-down events and sends an action message to a target object...



**Rounded Rect Button** – Intercepts mouse-down events and sends an action message to a target object...

Loading No Issues

Iphone Apps

FAVORITES

- skb\_shak
- Applications
- Desktop
- Documents
- Dropbox
- Downloads
- Pictures

DEVICES

- Sakib Shai...
- Macintosh...
- Remote Disc

Name	Date Modified	Size	Kind
ClassicPhotos	9/24/13	--	Folder
conflicts	11/9/12	--	Folder
cs31_hw3	1/30/15	--	Folder
customCells	11/13/13	--	Folder
disc3	1/23/15	--	Folder
examples	1/23/15	--	Folder
fun	11/8/12	--	Folder
hello	1/9/15	--	Folder
libraryCaller	2/3/14	--	Folder
masterDetailTest	4/25/13	--	Folder
Notes	11/7/12	--	Folder
page example	1/12/14	--	Folder
PureStorageInterview	1/24/14	--	Folder
searchPrototype	10/21/13	--	Folder
SingleViewApp	10/21/13	--	Folder
skgame	9/13/14	--	Folder
test	11/14/13	--	Folder
test1	2/2/15	--	Folder
testexec	2/20/15	--	Folder
testsk	2/2/15	--	Folder
TrafficJunkie	9/26/14	--	Folder

No Selection

Source Control:  Create git repository on My Mac

Xcode will place your project under version control

New Folder Cancel Create

Push Button – Intercepts mouse-down events and sends an action message to a target object when...

Gradient Button – Intercepts mouse-down events and sends an action message to a target object...

Rounded Rect Button – Intercepts mouse-down events and sends an action message to a target object...

myProj

myProj: Ready | Today at 11:25 PM No Issues

myProj > My Mac 64-bit

myProj

Build Settings Build Phases Build Rules

Basic All Combined Levels +

Architectures

Setting Resolved myProj myProj OS X Default

Base SDK Latest OS X (OS... <Multiple values> Latest OS X (OS... <Multiple values> No

Build Active Architecture Only

Debug Yes Yes No

Release No No No

Build Options

Setting Resolved myProj myProj OS X Default

Debug Information Format

<Multiple values> <Multiple values>

Deployment

Setting Resolved myProj myProj OS X Default

Installation Directory /usr/local/bin

OS X Deployment Target OS X 10.8 <Multiple values> OS X 10.8 OS X 10.9

Strip Debug Symbols During Copy

Debug No No Yes Yes

Release Yes Yes Yes Yes

Strip Linked Product Yes Yes Yes Yes

Packaging

Setting Resolved myProj myProj OS X Default

Info.plist File myProj myProj

Product Name myProj myProj

Search Paths

Setting Resolved myProj myProj OS X Default

Always Search User Paths No No Yes

Identity and Type

Name myProj

Location Absolute myProj.xcodeproj

Full Path /Users/skb\_shak/Desktop/Iphone Apps/myProj/myProj.xcodeproj

Project Document

Project Format Xcode 3.2-compatible

Organization Sakib Shaikh

Class Prefix

Text Settings

Indent Using Spaces

Widths 4 Tab 4 Indent

Wrap lines

Source Control

Repository --

Type --

Push Button - Intercepts mouse-down events and sends an action message to a target object when...

Gradient Button - Intercepts mouse-down events and sends an action message to a target object...

Rounded Rect Button - Intercepts mouse-down events and sends an action message to a target object...

myProj — 241E3F17-CEDD-439F-ABF6-F97FBFE66D73.cpp

myProj: Ready | Today at 11:25 PM No Issues

myProj > My Mac 64-bit

myProj myProj main.cpp main(int argc, const char \* argv[])

Identity and Type

Name main.cpp  
Type Default - C++ Source  
Location Relative to Group  
main.cpp  
Full Path /Users/skb\_shak/Desktop/Iphone Apps/myProj/myProj/main.cpp

Target Membership

myProj

Text Settings

Text Encoding Default - Unicode (UTF-8)  
Line Endings Default - OS X / Unix (LF)  
Indent Using Spaces  
Widths 4 Tab 4 Indent  
 Wrap lines

Push Button – Intercepts mouse-down events and sends an action message to a target object when...

Gradient Button – Intercepts mouse-down events and sends an action message to a target object...

Rounded Rect Button – Intercepts mouse-down events and sends an action message to a target object...

myProj

//  
// main.cpp  
// myProj  
//  
// Created by Sakib Shaikh on 4/1/15.  
// Copyright (c) 2015 Sakib Shaikh. All rights reserved.  
  
#include <iostream>  
using namespace std;  
int main(int argc, const char \* argv[]){  
 cout << "Hello, World!\n";  
 return 0;  
}

myProj — 241E3F17-CEDD-439F-ABF6-F97FBFE66D73.cpp

Finished running myProj : myProj

No Issues

myProj > My Mac 64-bit

myProj > myProj > main.cpp > main(int argc, const char \* argv[])

```
// main.cpp
// myProj
//
// Created by Sakib Shaikh on 4/1/15.
// Copyright (c) 2015 Sakib Shaikh. All rights reserved.

#include <iostream>
using namespace std;
int main(int argc, const char * argv[])
{
    cout << "Hello, World!\n";
    return 0;
}
```

Identity and Type

Name: main.cpp  
Type: Default - C++ Source  
Location: Relative to Group  
Full Path: /Users/skb\_shak/Desktop/Iphone Apps/myProj/myProj/main.cpp

Target Membership

myProj

Text Settings

Text Encoding: Default - Unicode (UTF-8)  
Line Endings: Default - OS X / Unix (LF)  
Indent Using: Spaces  
Widths: 4 Tab Indent  
 Wrap lines

Push Button - Intercepts mouse-down events and sends an action message to a target object when...

Gradient Button - Intercepts mouse-down events and sends an action message to a target object...

Rounded Rect Button - Intercepts mouse-down events and sends an action message to a target object...

No Selection

Hello, World!  
Program ended with exit code: 0

All Output

# Our first program & dissecting what it means

---

They grow up so fast :')

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

int main()
{
    cout << "Its alive!!!!!! MWAHAHAHA" << endl;
}
```

# #include <iostream>

---

This is a library of code that has the implementation of cout and cin.

- Without it they won't work

By including the library, it is as if your program has that code

When compiling, compiler compiles the library code too

There are many other libraries! You'll use more later.

# using namespace std;

---

Everyone has a name but if you are talking about John with a friend and you all know 10 Johns, its not clear who you are talking about.

Namespace provide a context for an identifier just like how adding a last name could make it more specific which John we are talking about.

By adding the using namespace std, we are using the std namespace and all calls to cout, cin, and endl are the ones defined in the std namespace

# The main function

---

This is the starting point of your program

We use `int main()` to specify it takes **no parameters** and **returns an integer**

In C++ the **main function** doesn't need to explicitly return a value.

Return value used by programs that call your program

- Want check if program ran successfully
- 0 means program ran successfully

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

int main()
{
    cout << "Its alive!!!!!! MWAHAHAHA" << endl;

    return 0;
}
```

# Sometimes our program won't compile

---

Or if it does, it does not do the right things...



# Syntax errors

---

You did not follow the language structure

Prevent compilation

Common errors

- Forgot semicolon
- Forgot brackets
- Missing namespace or include definitions
- Misspelled identifiers



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

int main() {
    int ThisIsCrazyYo = 4;
    ThIsIsCrazyYo = 10;

    cout << "The number is "
    cout << ThisIsCrazyTo < endl;
}
```

There are 3 syntax errors

# Runtime & logic errors

---

Program compiles but may break, crash, or do unexpected things when it is running

## Examples

- Division by 0
- Overflow (trying to assign a larger number than a variable is meant to hold)
- Using uninitialized values
- Faulty logic

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

int main() {
    int x = 10;
    int y = x / 0;
    cout << y << endl;
}
```

# A little bit about C++

---

# Declaring variables

---

Need to specify **type**, name, and value

**int** is integer type. Whole numbers only (-130, 1, 100, 1000)

**double** for decimal values.

If you do not provide initial value, the variable is undefined or holds a junk value

```
// Declaring a variable of type int  
// means that it is an integer with no decimal  
int x;
```

```
// We can also declare multiple variables at once  
int hereBeAnInt, // separate with commas!!  
andAnotherInt;
```

```
// Or assign them  
double testAssignment = 5.01,  
reallyDescriptiveVariableName = -10.0;
```

# Identifiers are names

---

In C++ identifier names MUST start with either a letter or underscore and all characters must be letters, digits, or underscore

Good

- x, x1, x\_1, \_abc, ABC123z7, sum, RATE, count, data2, bigBonus

Bad

- 12, 3X, %change, data-1, myfirst.c, PROG.CPP

C++ is case sensitive!!!

- MYVAR, myvar, myVar are all different names

# Comments

---

Keep track of what you are doing

Future reference

For others to see and understand

Single lines

Multiple lines

Not compiled

```
// Here is an example of a line-item comment
// Anything after the two slashes is ignored

/*
 * Here is an example of a block comment
 * Anything between the first slash-asterisk and
 * asterisk-slash is ignored. The asterisks on
 * the left are for aesthetic appeal only
 */
```

# Getting user inputs

---

Use **cin** to get input and store into variables

Program waits until you type something and press enter

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

int main()
{
    int favoriteNum;
    int myFavoriteNum;

    cout << "What is your favorite number?" << endl;
    cin >> favoriteNum;

    myFavoriteNum = favoriteNum + 2;
    cout << "My favorite number is " << myFavoriteNum << endl;
}
```

# If else statements

---

Introduce logic into your code

Do something if statement is true

3 components. Don't need to have all

- If
- Else if
- Else

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

int main()
{
    int x = 10;

    if (x < 10)
        cout << "less than 10" << endl;
    else if (x > 10)
        cout << "greater than 10" << endl;
    else
        cout << "equal to 10" << endl;
}
```

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

int main()
{
    int x = 10;

    if (x < 10) {
        cout << "x is ";
        cout << "less than 10" << endl;
    }
    else if (x > 10) {
        cout << "x is ";
        cout << "greater than 10" << endl;
    }
    else {
        cout << "x is ";
        cout << "equal to 10" << endl;
    }
}
```

# Are the following the same?

---

```
int x = 10;  
  
if (x > 1)  
    cout << "greater than 1" << endl;  
else if (x > 5)  
    cout << "greater than 5" << endl;  
else  
    cout << "x is " << x << endl;
```

```
int x = 10;  
  
if (x > 1)  
    cout << "greater than 1" << endl;  
if (x > 5)  
    cout << "greater than 5" << endl;  
else  
    cout << "x is " << x << endl;
```

# HW Tips

---

FOR FUTURE REFERENCE

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Read things well. Read the spec, understand the requirements

- Be precise in your coding and interpretation

Start early start early start early!!!!!!!!!!!!!!

- Gives you time to figure out what is going wrong
- Reach out for help from TAs

Develop incrementally. Test your code often!!

- cout is a good friend.

---

Remember to comment your code!!

Keep your code neat & organized for style pts

When you have to give testcases for future HWs, give actual values you used to test.

- Be thorough

---

Project 1 is up!!