

# Introduction to OpenGL

# Outline

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- What is OpenGL
- OpenGL version
- What is GLUT
- Install OpenGL and GLUT

# What is OpenGL

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- Open Graphics Library ( OpenGL) is a cross language, cross platform API for rendering 2D and 3D vector graphics.
  - No window system
  - No input handling
- The API is typically used to interact with a graphics processing unit (GPU), to achieve hardware accelerated rendering.



# OpenGL version

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- ❑ Legacy OpenGL (1.0 ~ 2.1)
  - ❑ Fixed (function) (rendering) pipeline
  - ❑ Version 2.0 add the OpenGL Shading Language (GLSL)
- ❑ Modern OpenGL (3.0 ~ 4.5)
  - ❑ Programmable (rendering) pipeline
  - ❑ Fixed pipeline functions were declared deprecated
  - ❑ Core (no deprecated API) and compatibility (all)

# What is GLUT

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- OpenGL Utility Toolkit(GLUT) is a window system independent toolkit for writing OpenGL programs.
- It implements a simple windowing application programming interface (API) for OpenGL.

# Install OpenGL and GLUT - 0

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□ Install Visual Studio (version: 2019~) (**Must install C++ Desktop Tool**)

□ OpenGL 4.6

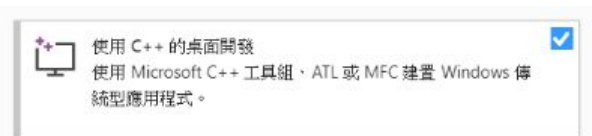
□ Make sure your driver is ready

□ [https://www.khronos.org/opengl/wiki/Getting\\_Started](https://www.khronos.org/opengl/wiki/Getting_Started)

□ GLUT 3.7

□ Download glut header file, .lib, . DLL

□ <https://www.opengl.org/resources/libraries/glut/glutdlls37beta.zip>



# Install OpenGL and GLUT - 1

1. Open a new visual studio project
2. Select empty project
3. Set any project name you want



# Install OpenGL and GLUT - 2

- Make “include”, “lib”, “dll” directory
- Put downloaded glut files into corresponding directory
- (Red word is additional file for this homework)

## ★ProjectName

- ProjectName
  - include
    - glut.h
    - Object.h
    - stb\_image.h
  - lib
    - glut.lib
    - glut32.lib
  - dll
    - glut.dll
    - glut32.dll
    - Pikachu.obj
    - Pikachu.png
    - clock.obj
- Object.cpp
- ProjectName.sln

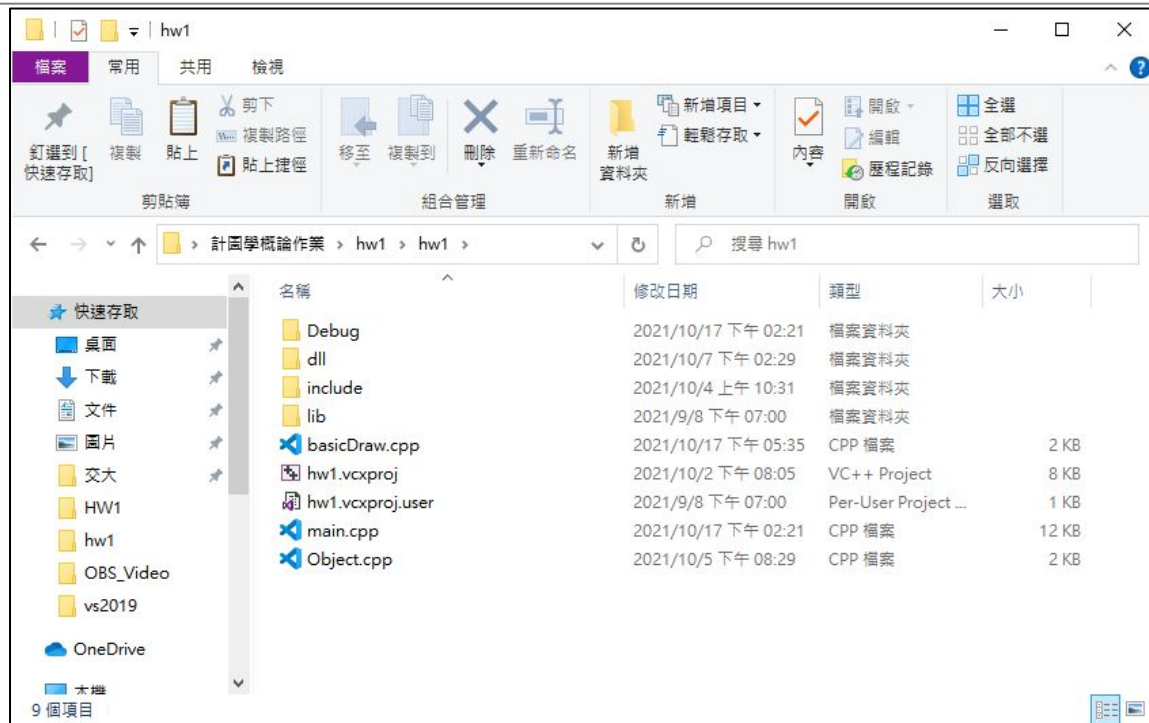


# Install OpenGL and GLUT - 2

The following table summarizes the files found in the 'dll' directory:

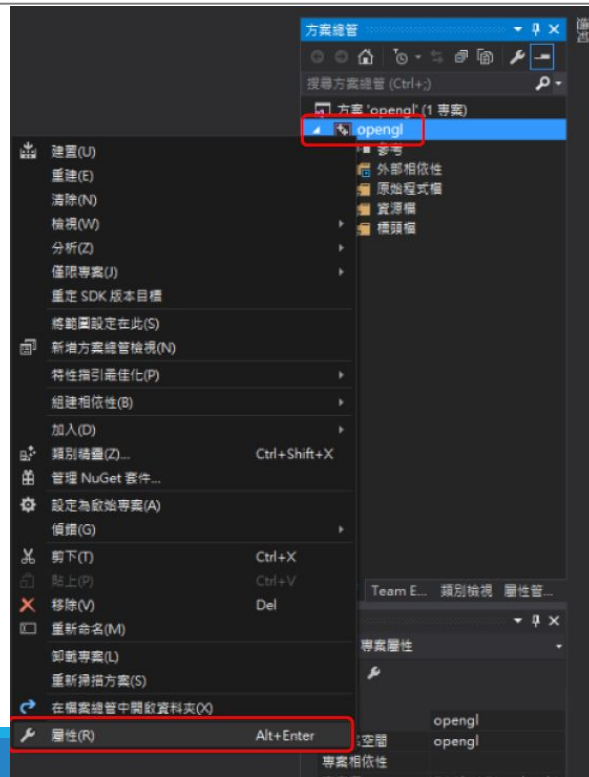
名稱	修改日期	類型	大小
clock.obj	2021/9/9 下午 02:23	3D Object	2,417 KB
glut.dll	2021/9/8 下午 07:00	應用程式式擴充	166 KB
glut32.dll	2021/9/8 下午 07:00	應用程式式擴充	166 KB
Pikachu.obj	2021/9/25 下午 03:43	3D Object	458 KB
Pikachu.png	2021/9/27 下午 05:28	PNG 檔案	69 KB

# Install OpenGL and GLUT - 2



# Install OpenGL and GLUT - 3

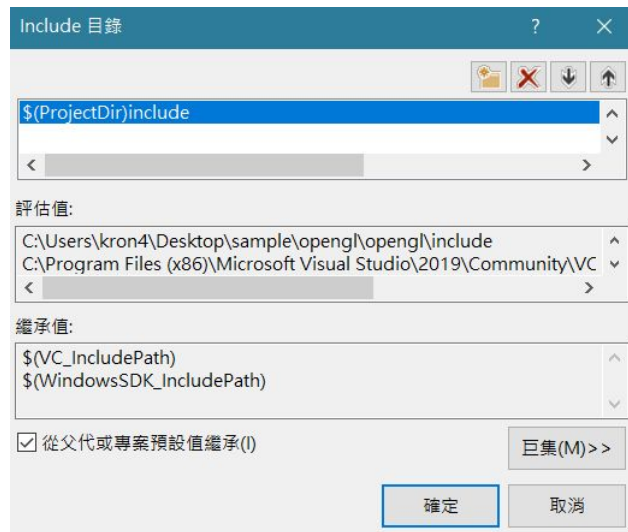
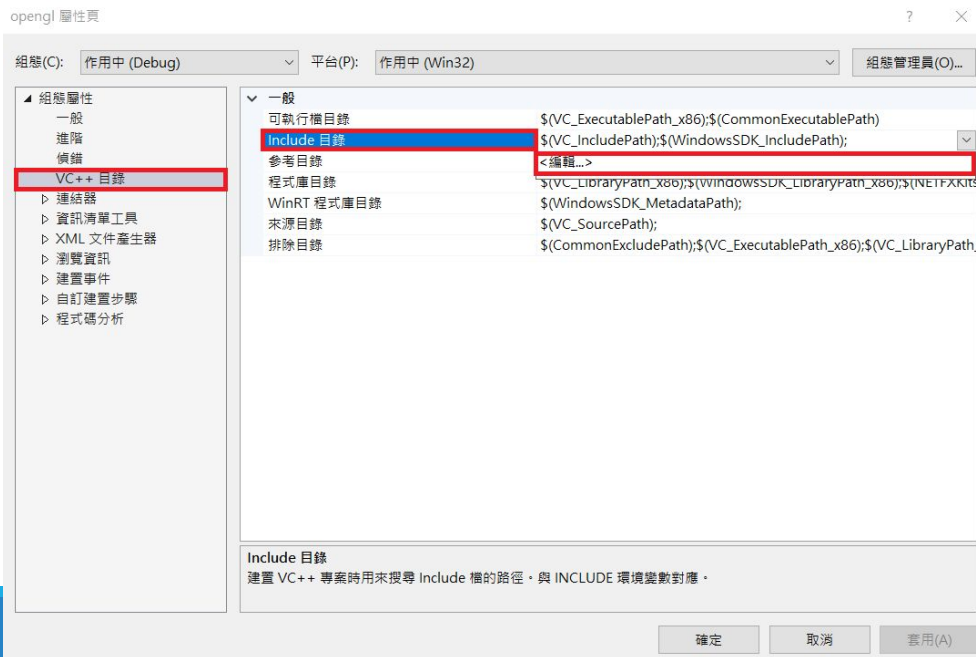
- Right click “ProjectName”
- Click “property”



# Install OpenGL and GLUT - 4

Click “VC++ directory”

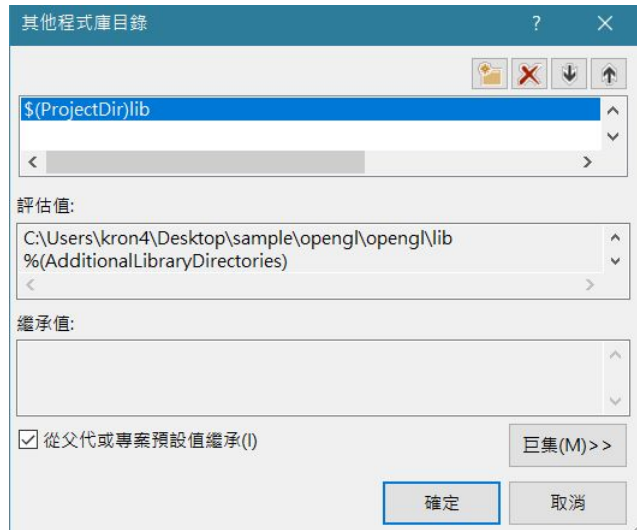
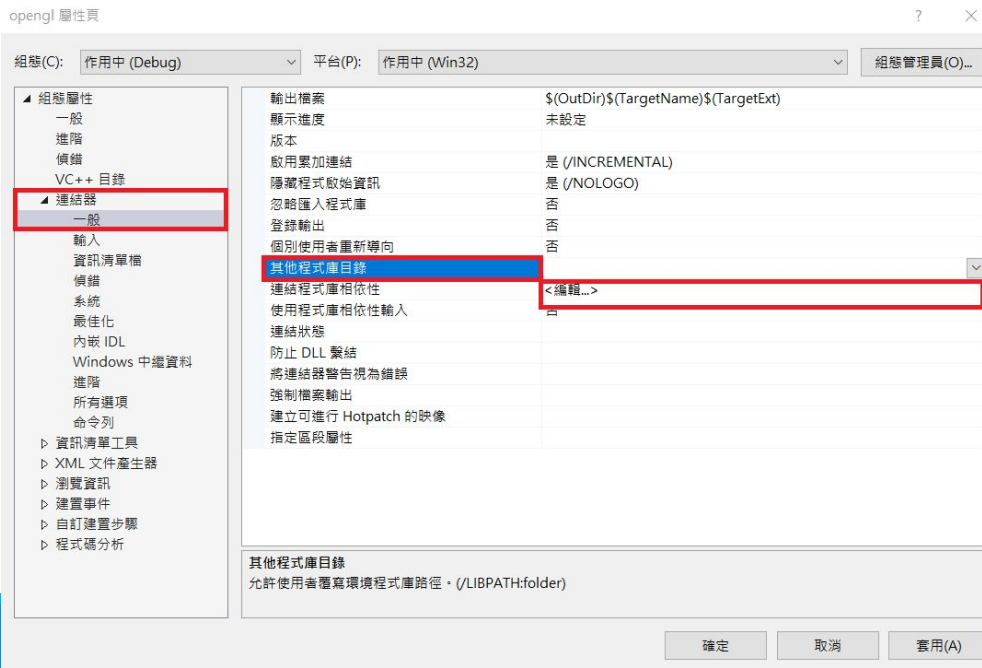
Set “include directory” into “\$(ProjectDir)include”



# Install OpenGL and GLUT - 5

□ Click “linker” -> Click “general”

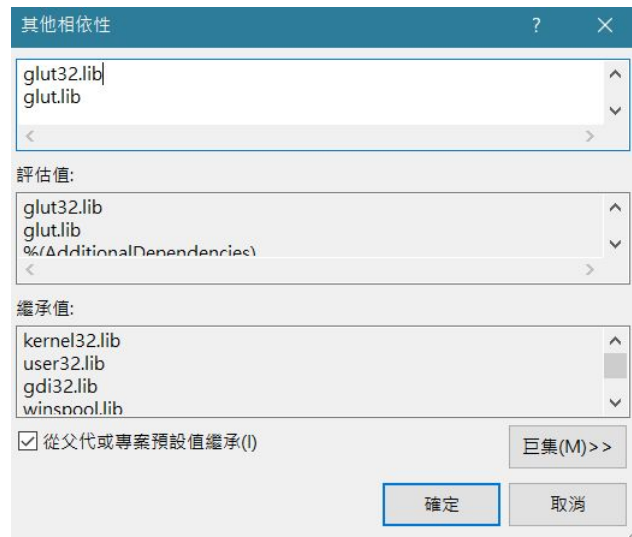
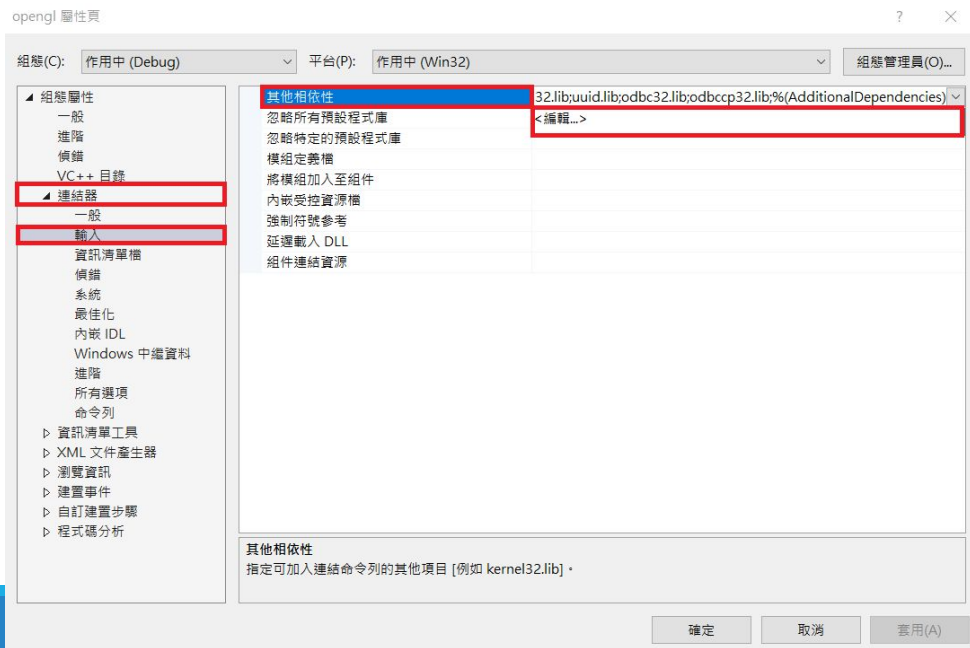
□ Set “additional library directories” into “\$(ProjectDir)lib”



# Install OpenGL and GLUT - 6

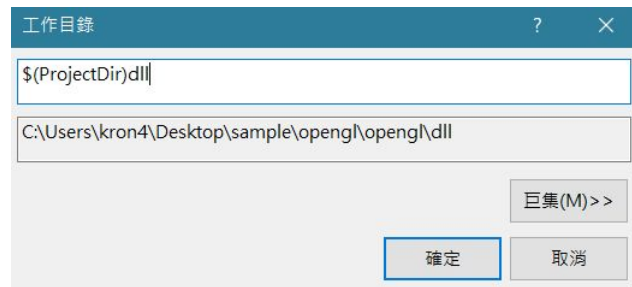
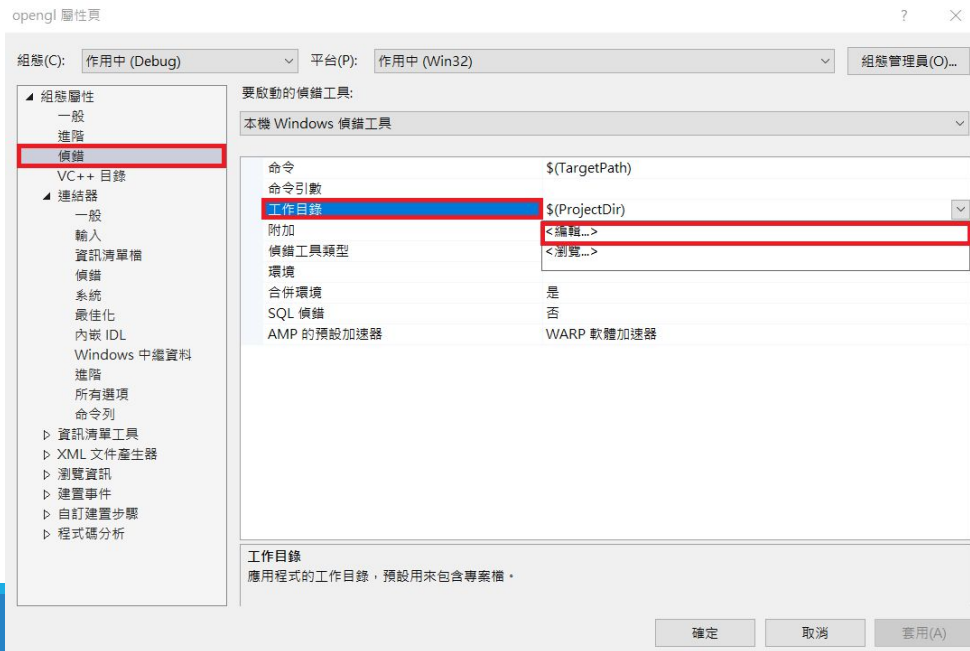
□ Click “linker” -> Click “input”

□ Set “additional dependencies” into “glut32.lib;glut.lib”



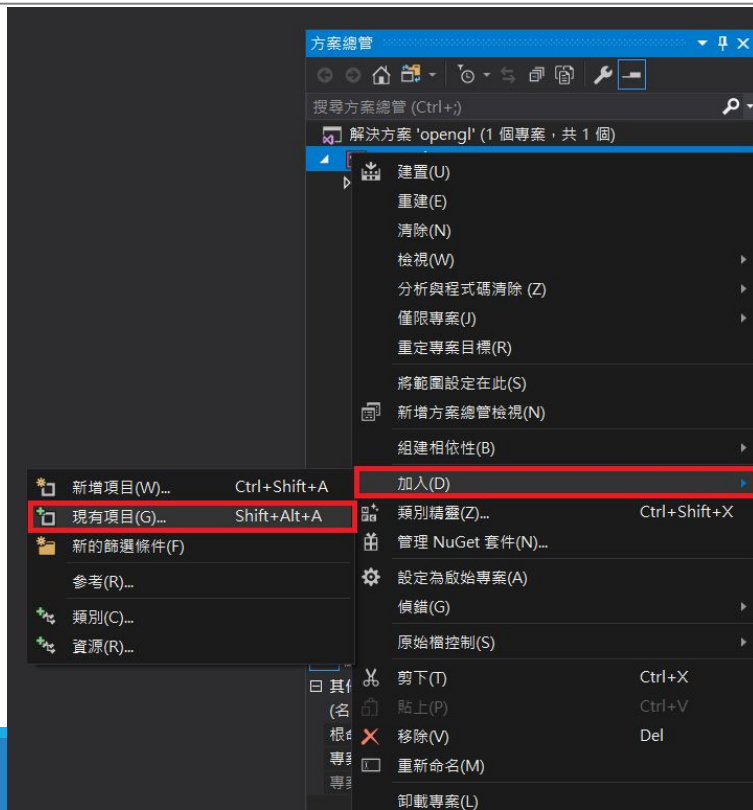
# Install OpenGL and GLUT - 7

- Click “debugging”
- Set “working directory” into “\$(ProjectDir)\dll”



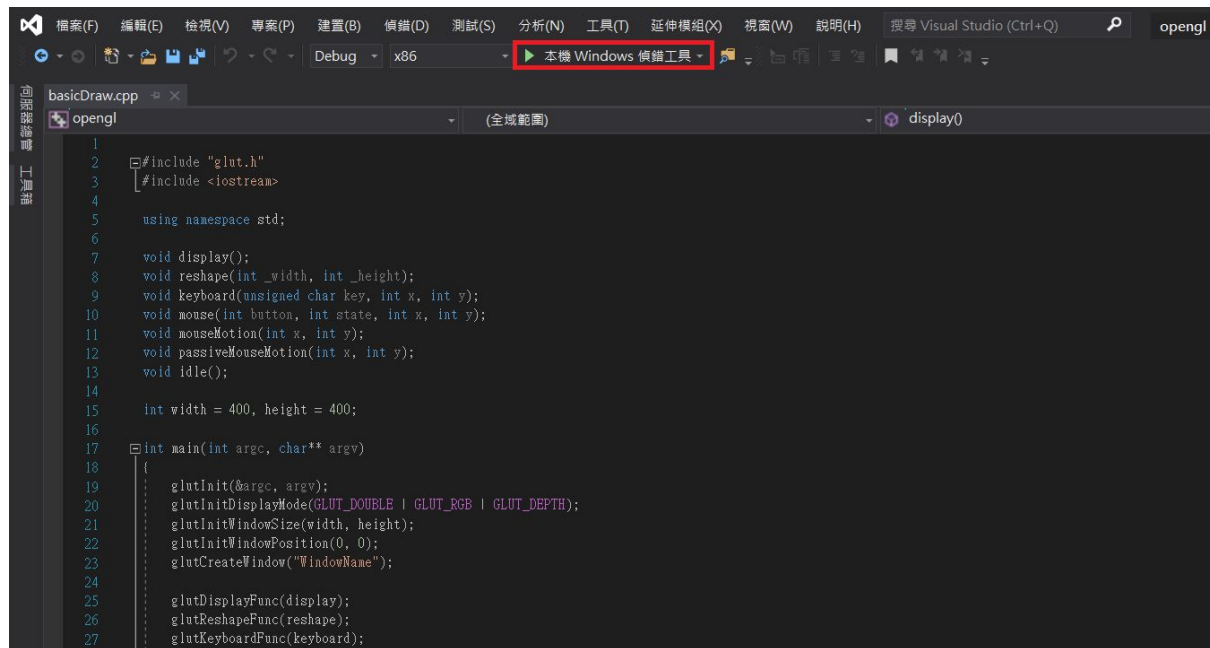
# Install OpenGL and GLUT - 8

- ❑ Right click “ProjectName”
- ❑ Click “add”
- ❑ Click “existing item”
- ❑ Choose “basicDraw.cpp”

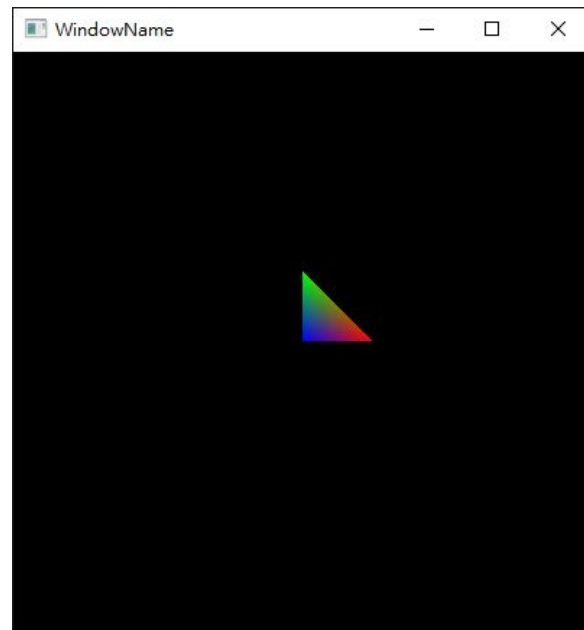




# Install OpenGL and GLUT - 9



```
1  #include "glut.h"
2  #include <iostream>
3
4  using namespace std;
5
6  void display();
7  void reshape(int _width, int _height);
8  void keyboard(unsigned char key, int x, int y);
9  void mouse(int button, int state, int x, int y);
10 void mouseMotion(int x, int y);
11 void passiveMouseMotion(int x, int y);
12 void idle();
13
14 int width = 400, height = 400;
15
16 int main(int argc, char** argv)
17 {
18     glutInit(&argc, argv);
19     glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB | GLUT_DEPTH);
20     glutInitWindowSize(width, height);
21     glutInitWindowPosition(0, 0);
22     glutCreateWindow("WindowName");
23
24     glutDisplayFunc(display);
25     glutReshapeFunc(reshape);
26     glutKeyboardFunc(keyboard);
27 }
```



# Exception

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- When you run the code and get error message like this,  
you can try “not to set additional dependencies” in “Install OpenGL and GLUT – 6” step.

