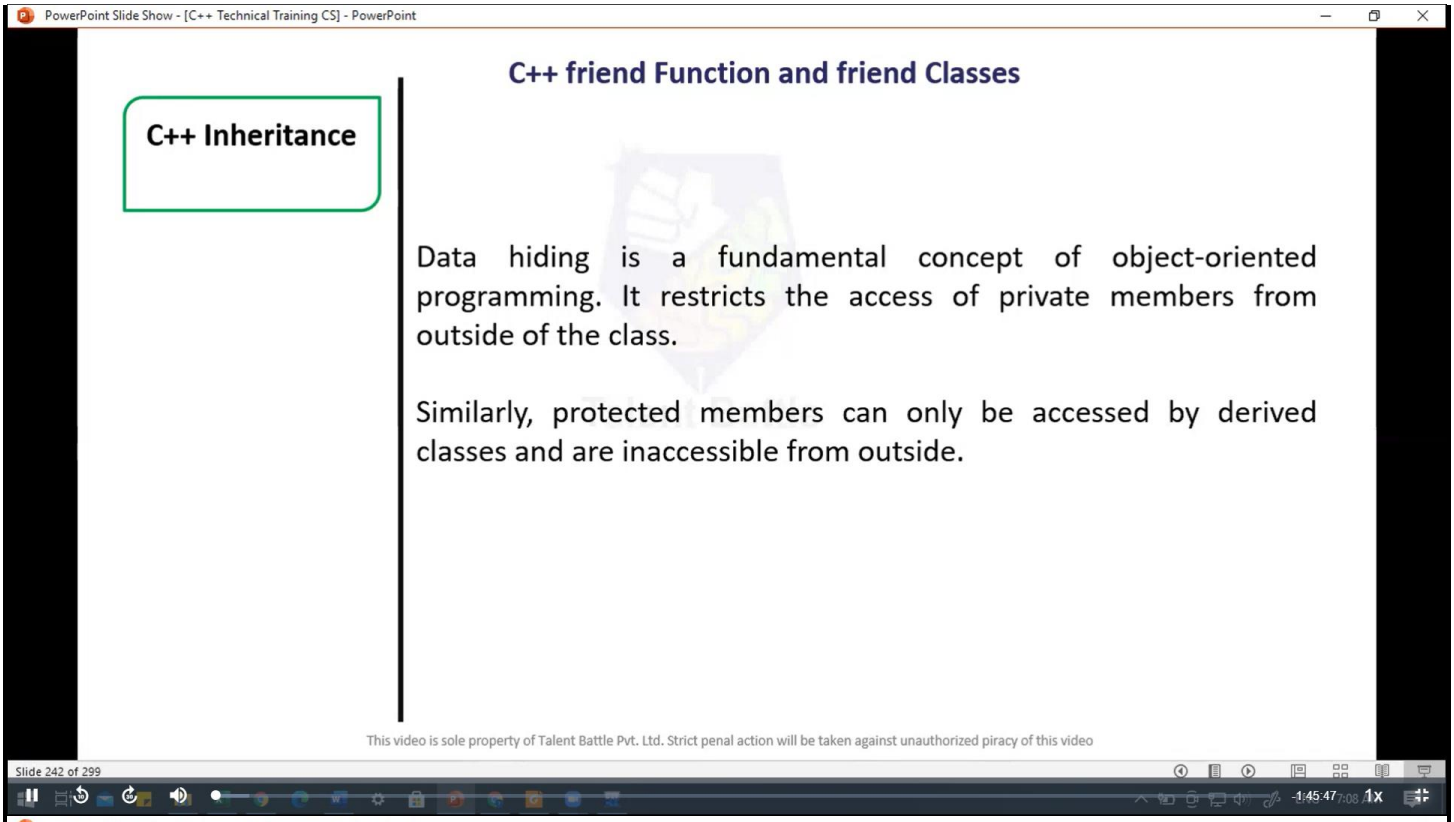
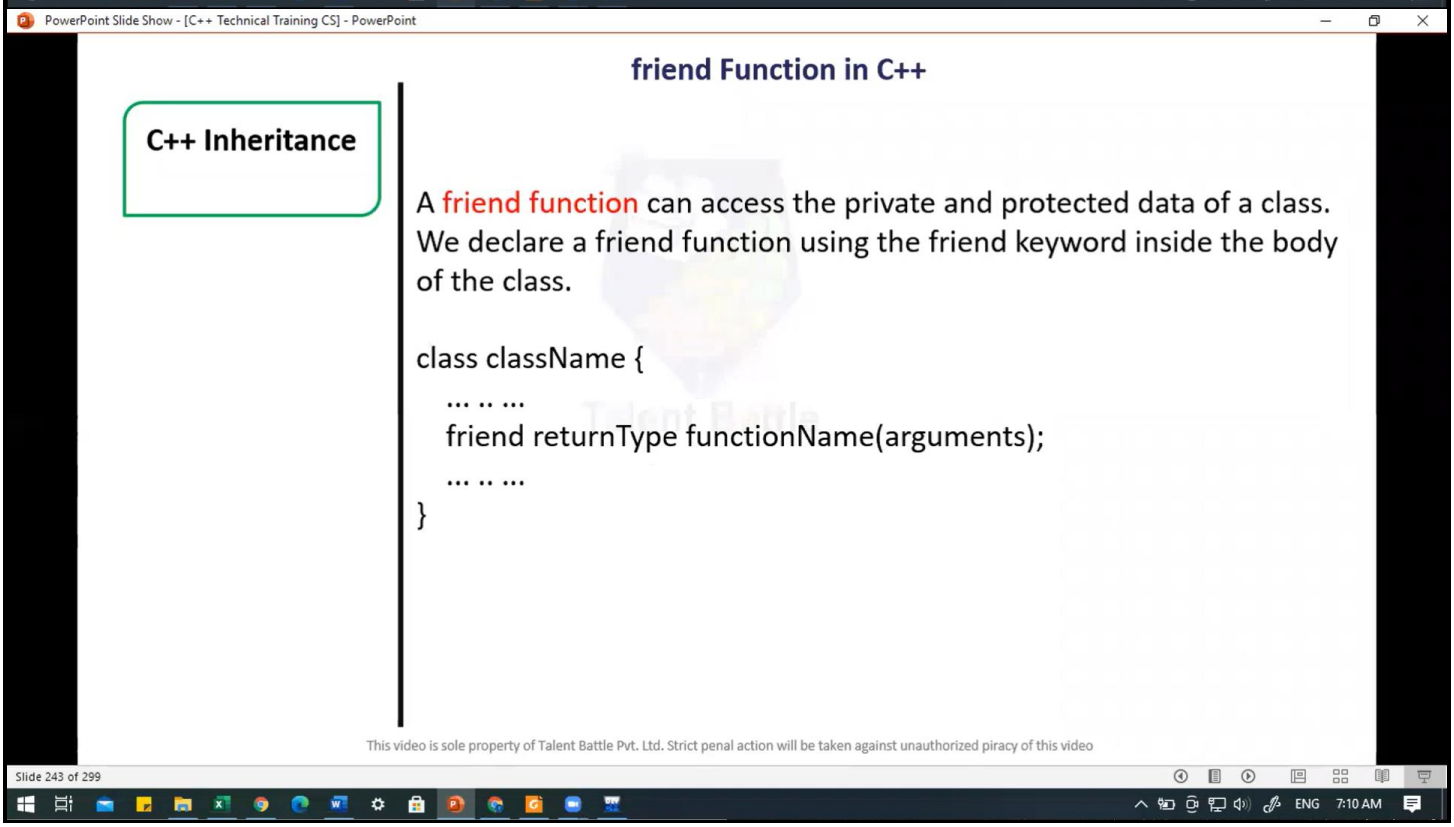
Day 8

Friend Function, Pure Virtual, FileHandling, Templates

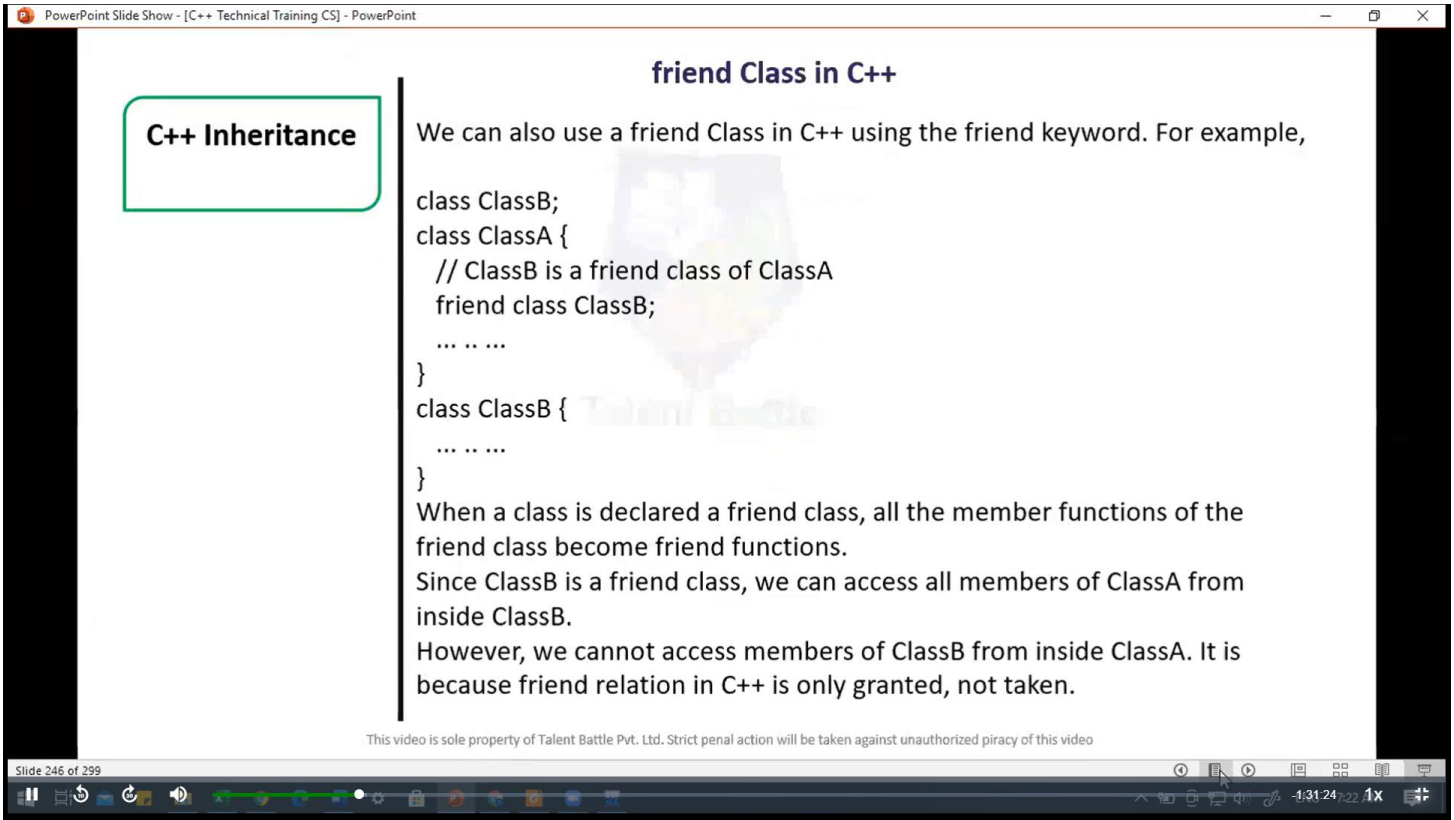




```cpp
// C++ program to demonstrate the working of friend function

#include<iostream>
using namespace std;

class Distance {
  private:
    int meter;

    // friend function
    friend int addFive(Distance);

  public:
    Distance(): meter(0){}
};

// freind function definition
int addFive(Distance d){
  // Accessing private members from the friend function
  d.meter += 5;
  return d.meter;
}

int main(){
  Distance D;
  cout << "Distance: " << addFive(D);
  return 0;
}



/*
Distance: 5
--------------------------------
Process exited after 0.1592 seconds with return value 0
Press any key to continue . . .
*/
```

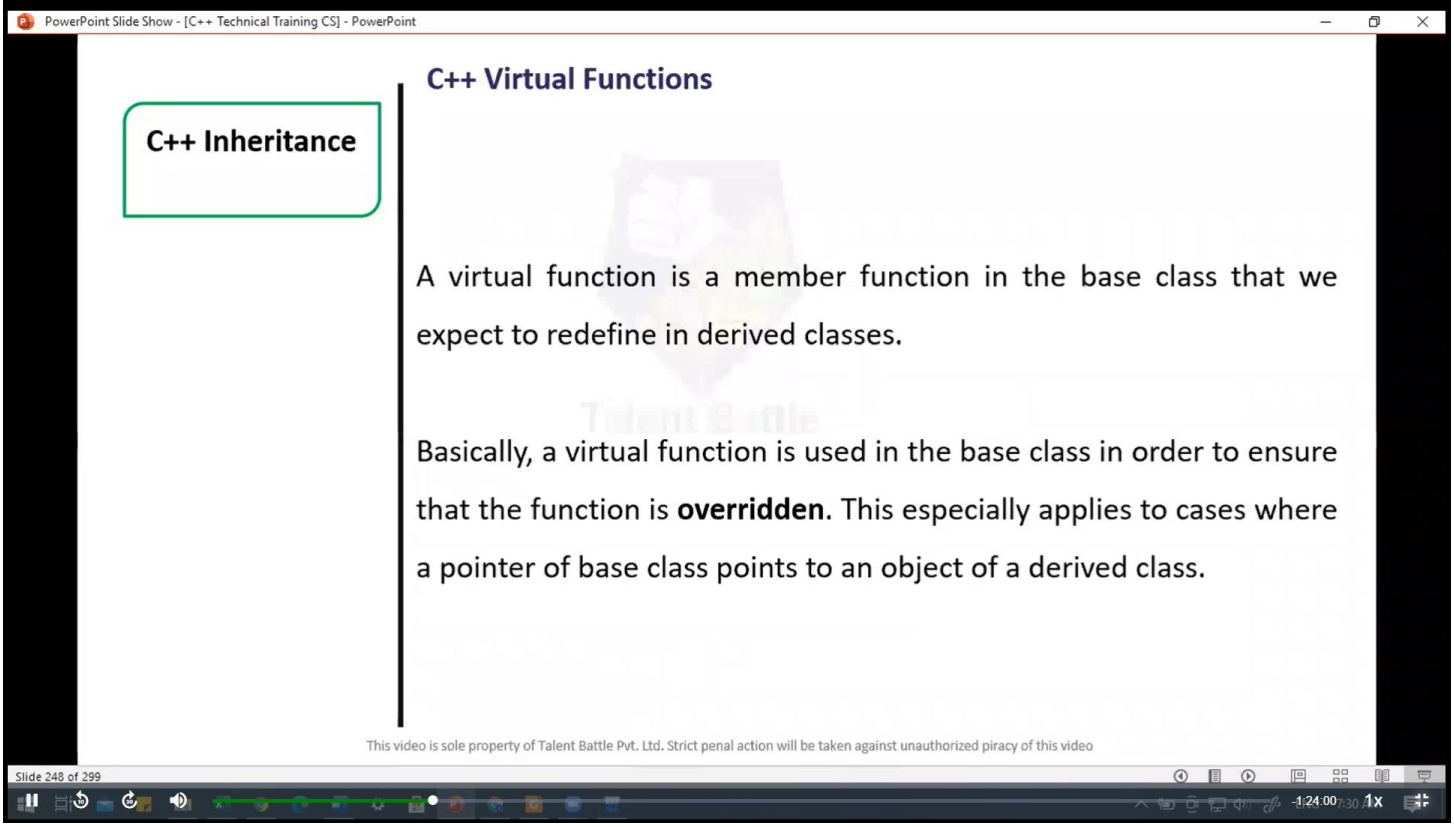
```cpp

//================================================
// Add members of two different classes using friend functions


#include<iostream>
using namespace std;

// forward declaration
class ClassB;
```

```cpp
class ClassA{
  public:
    // constructor to initialize numA to 12
    ClassA(): numA(12){}

  private:
    int numA;
    // friend funciton declaration
    friend int add(ClassA, ClassB);
};

class ClassB{
  public:
    // constructor to initialize  numB to 1
    ClassB(): numB(1){}

  private:
    int numB;
    // friend funciton declaration
    friend int add(ClassA, ClassB);
};

// access members of both classes
int add(ClassA objectA, ClassB objectB){
  return (objectA.numA + objectB.numB);
}

int main(){
  ClassA objectA;
  ClassB objectB;
  cout << "Sum: " << add(objectA, objectB);
  return 0;
}


/*
Sum: 13
--------------------------------
Process exited after 0.1271 seconds with return value 0
Press any key to continue . . .
*/
```




```cpp
//=====================================================
// C++ program to demonstrate the working of friend class

#include <iostream>
using namespace std;

// forward declaration
class ClassB;

class ClassA{
  private:
    int numA;

    // friend class declaration
    friend class ClassB;

  public:
    // constructor to initialize numA to 12
    ClassA(): numA(12){}
};

class ClassB{
  private:
    int numB;

  public:
    // constructor to initialize numB to 1
    ClassB(): numB(1){}
```

```
    // memer friend to add numA
    // from ClassA and numB from ClassB
    int add(){
      ClassA objectA;
      return objectA.numA + numB;
    }
};

int main(){
  ClassB objectB;
  cout << "Sum: " << objectB.add();
  return 0;
}


/*
Sum: 13
--------------------------------
Process exited after 0.1059 seconds with return value 0
Press any key to continue . . .

*/
```



```cpp
//=====================================================

// C++ program to demonstrate the use of virtural functions

#include<iostream>
using namespace std;

class Base{
  public:
    virtual void print(){
      cout << "Base Function" << endl;
    }
};

class Derived : public Base {
  public:
    void print(){
      cout << "Derived function" << endl;
    }
};

int main(){
  Derived derived1;

  // pointer of Base type that points to derived1
  Base*base1 = &derived1;

  // class member funciton of Derived class
  base1 -> print();
  return 0;
}

// Virtul funcitons are runtime polymorphism.


/*
Derived function

--------------------------------
Process exited after 0.1403 seconds with return value 0
Press any key to continue . . .
*/
```

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C++ Inheritance

```
class Base {
    public:
      virtual void print() {
          // code
      }
};

class Derived : public Base {
    public:
      void print() {
          // code
      }
};

int main() {
    Derived derived1;
    Base* base1 = &derived1;

    base1->print();

    return 0;
}
```

print() of Derived class is called because print() of Base class is virtual

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C++ Inheritance

Abstract Class and Pure Virtual Function in C++

Abstract Class is a class which contains at least one Pure Virtual function in it.

Abstract classes are used to provide an Interface for its sub classes.

Classes inheriting an Abstract Class must provide definition to the pure virtual function, otherwise they will also become abstract class.

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C++ Inheritance

Pure Virtual Functions in C++

Pure virtual Functions are virtual functions with no definition.

They start with virtual keyword and ends with = 0.

Here is the syntax for a pure virtual function,

virtual void f() = 0;

C++ Inheritance

Pure Virtual Functions in C++

virtual void print()=0;

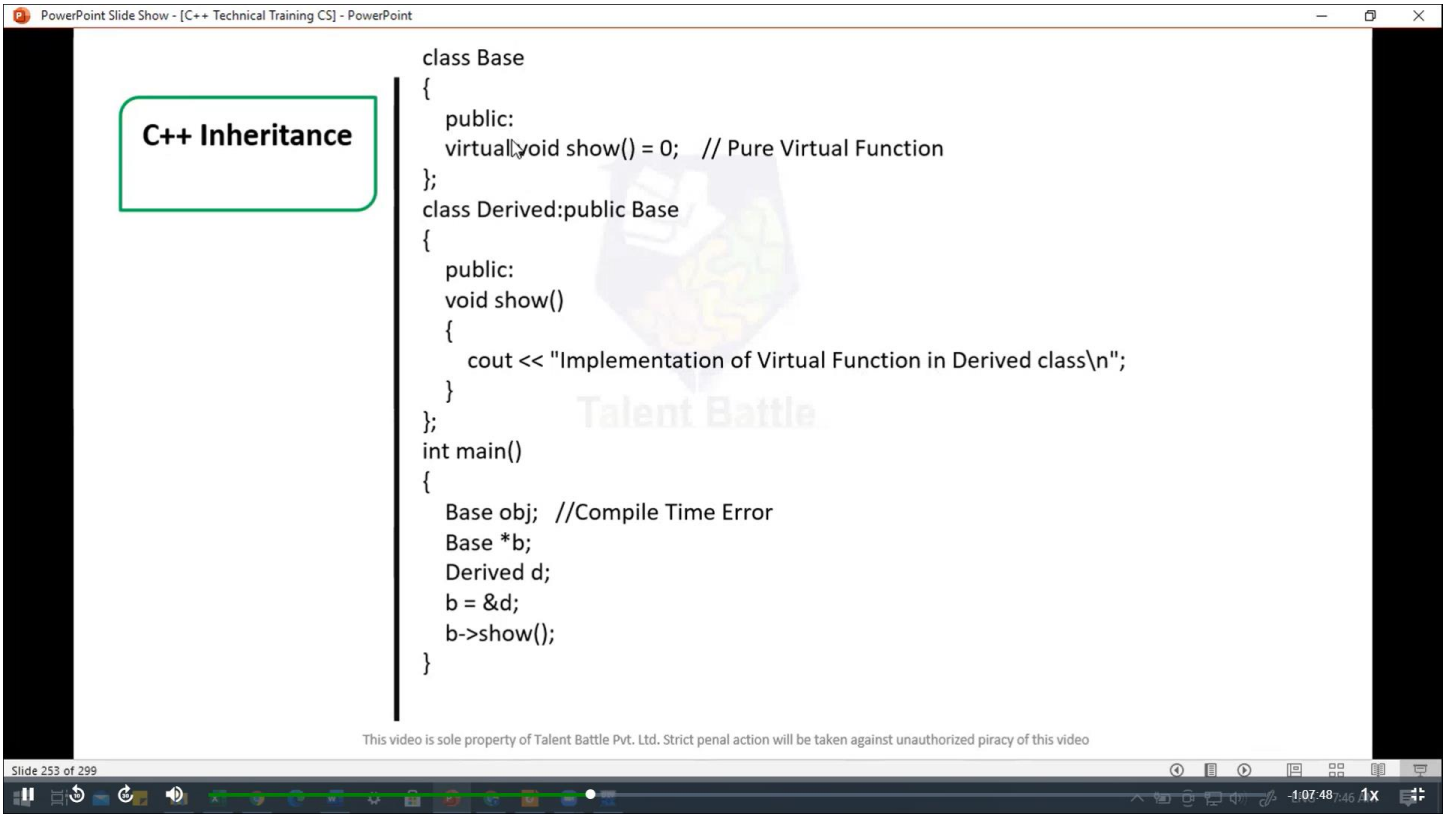
Pure virtual Functions are virtual functions with no definition.

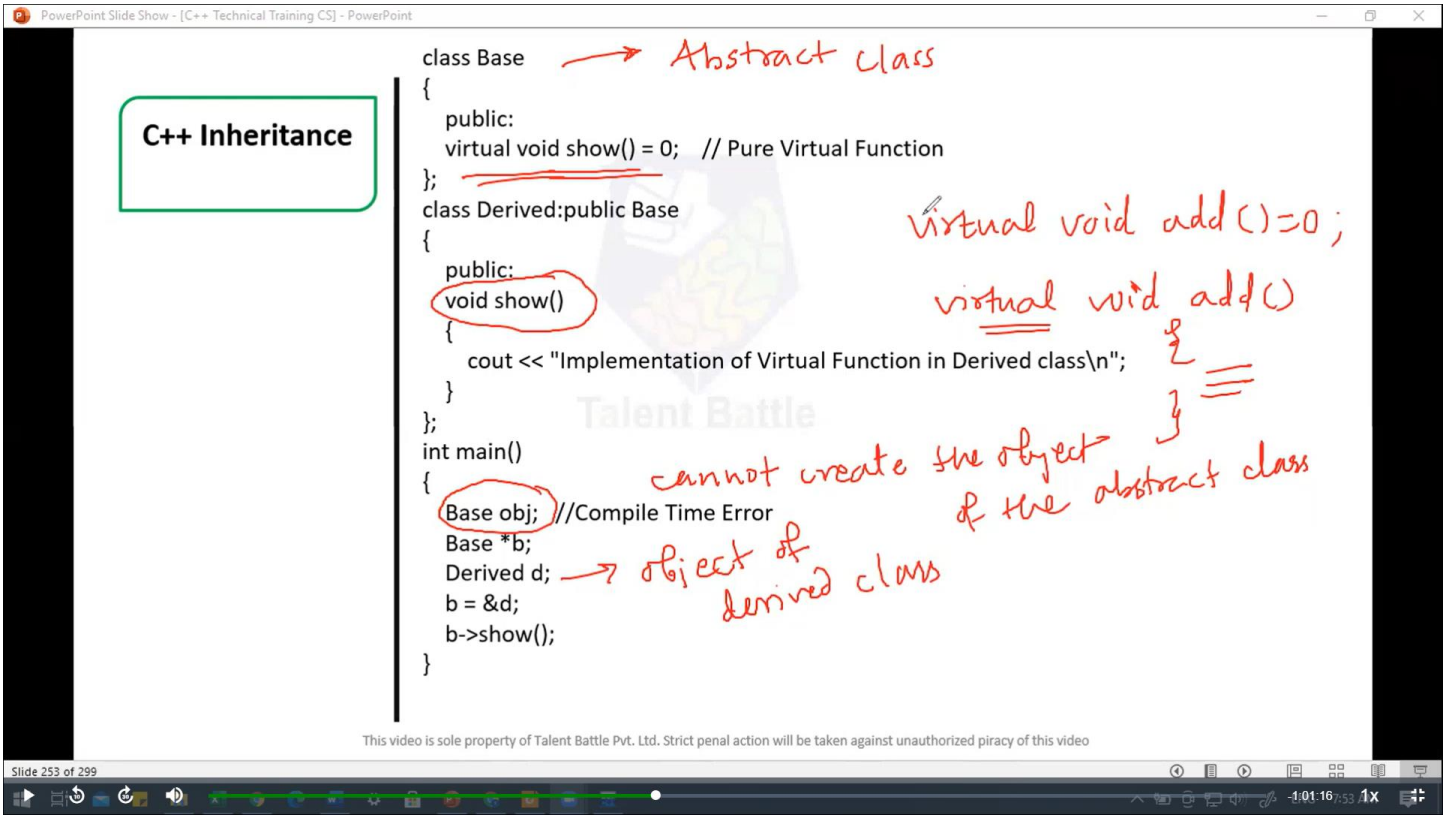
They start with virtual keyword and ends with = 0.

Here is the syntax for a pure virtual function,

virtual void f() = 0;

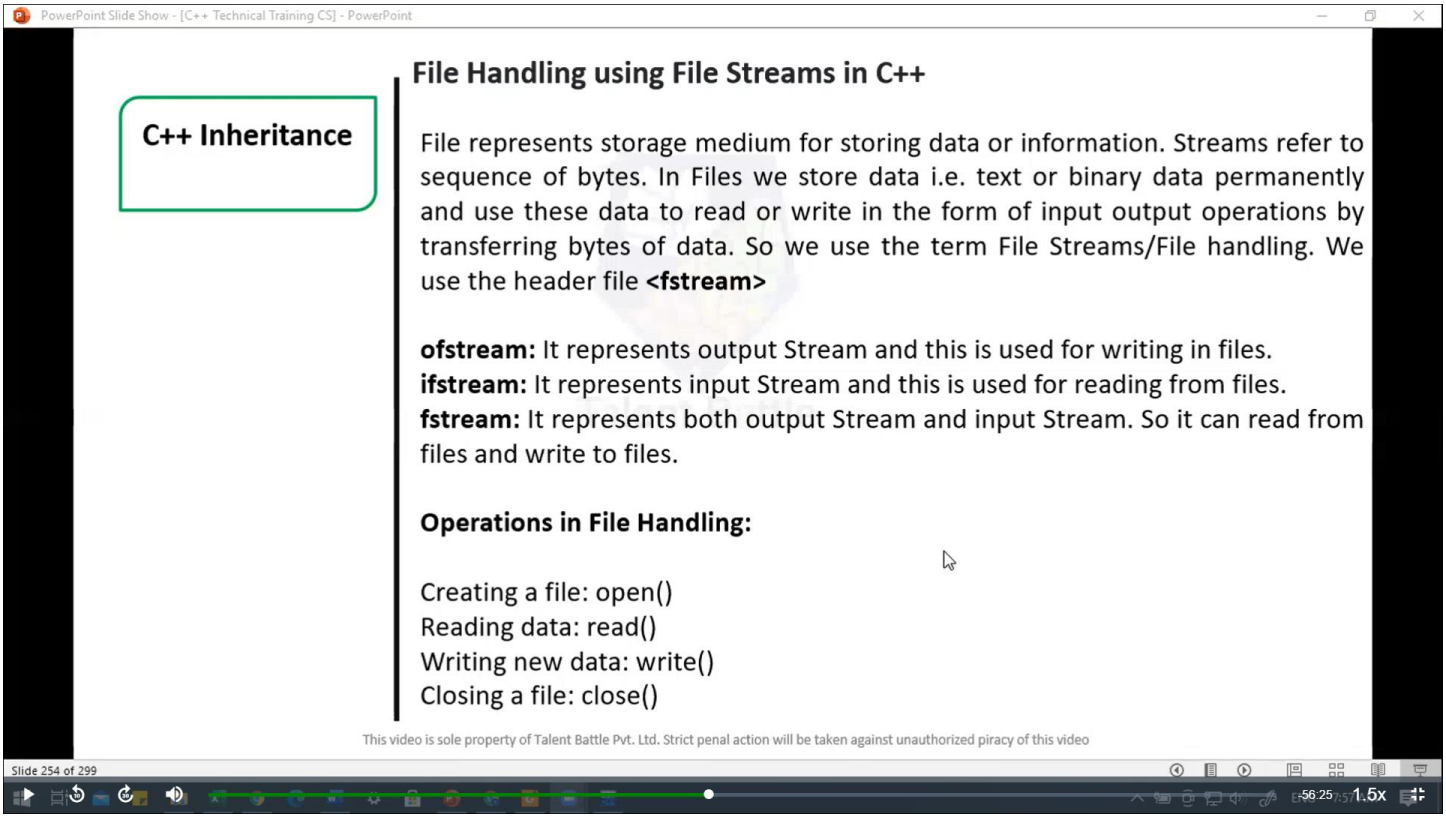
```
virtual void print()
{
cout<<" Hello";
}
```

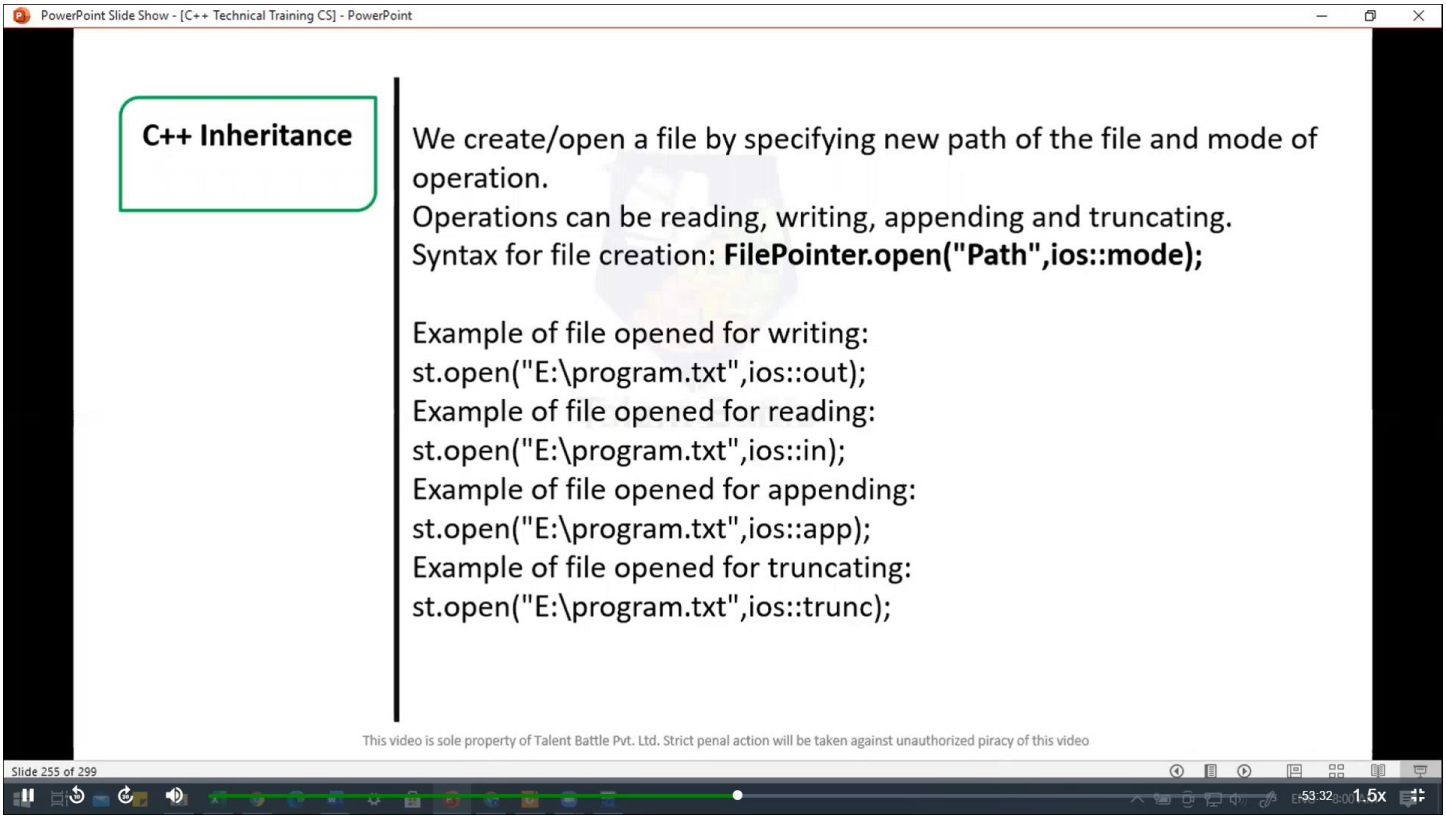





```
//============================================
// pure virtual function

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

```cpp
class Base{
  public:
    virtual void show()=0; // pure virtual function
};

class Derived: public Base{
  public:
    void show(){
      cout << "Implementation of Virtual funciton in Derived class\n";
    }
};

int main(){
  //Base obj; // Compile Time Error
  Base *b;
  Derived d;
  b = &d;
  b ->show();
  return 0;
}


/*
Implementation of Virtual funciton in Derived class

--------------------------------
Process exited after 0.12 seconds with return value 0
Press any key to continue . . .

*/
```

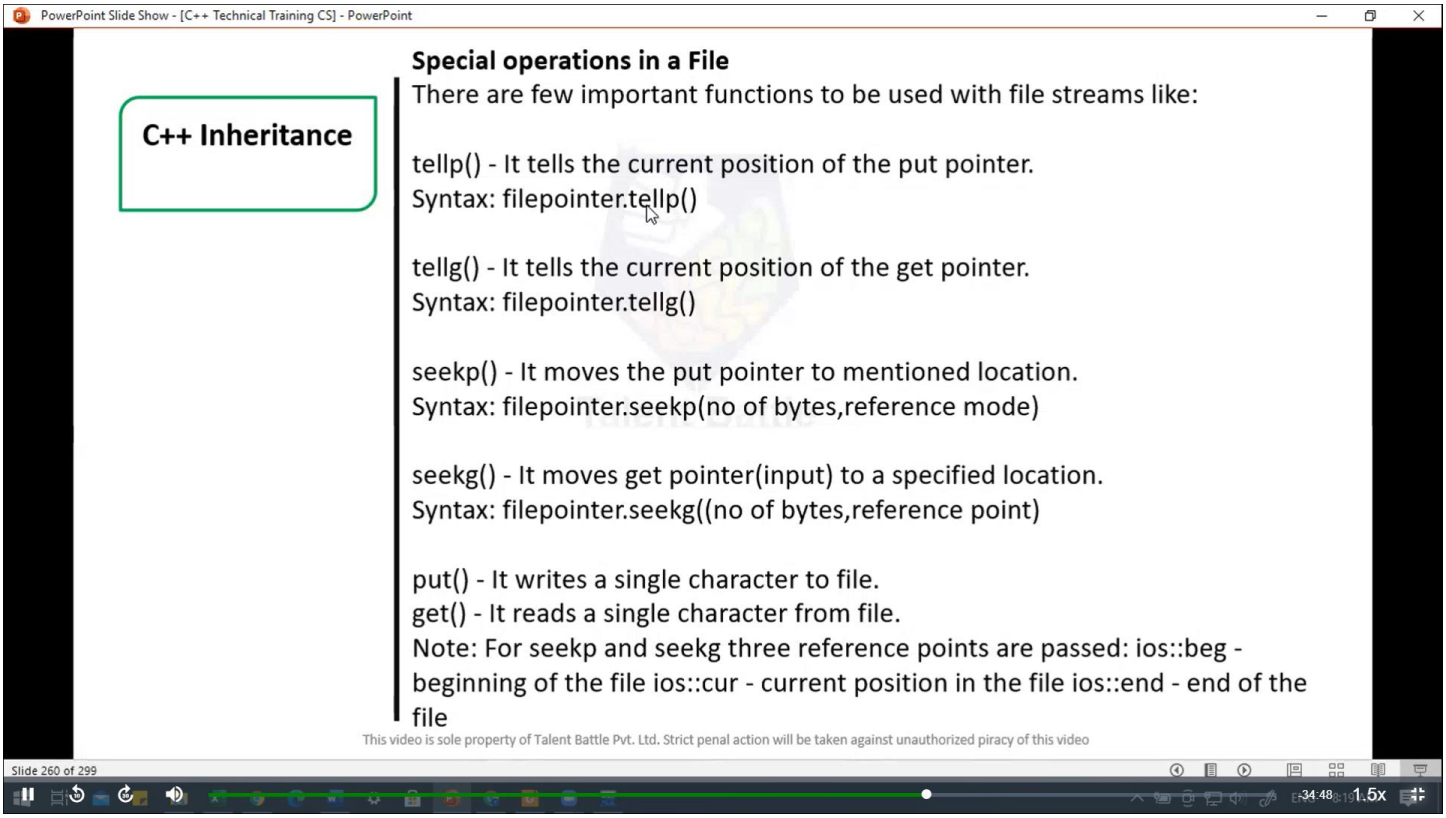





```cpp
//=======================================
// file handling

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

```cpp
int main(){
  fstream st; // step 1: creating object of fstream class
  st.open("C:/Users/hp/Desktop/TCS IT/C++ language/Day8/program.txt", ios::out); // Step 2: create new file
  if(!st) // step 3: checking whether file exist
  {
    cout << "File creation failed";
  } else {
    cout << "New file created";
    st.close(); // step 4: Closing file
  }

  return 0;
}


/*
New file created
--------------------------------
Process exited after 0.1531 seconds with return value 0
Press any key to continue . . .
*/



//===============================================
// file handling --> writing too a file


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

int main(){
  fstream st; // Step 1: create object of fstream class
  st.open("C:/Users/hp/Desktop/TCS IT/C++ language/Day8/program.txt", ios::out); // Step 2: creating new file
  if(!st) // step 3: checking whether file exist
  {
    cout << "File creation failed";
  } else {
    cout << "New file created";
    st << "Hello"; // step 4: writing to file
    st.close(); // step 5: closing file
  }
  return 0;
}

/*
New file created
```

```
--------------------------------
Process exited after 0.01468 seconds with return value 0
Press any key to continue . . .
*/
```



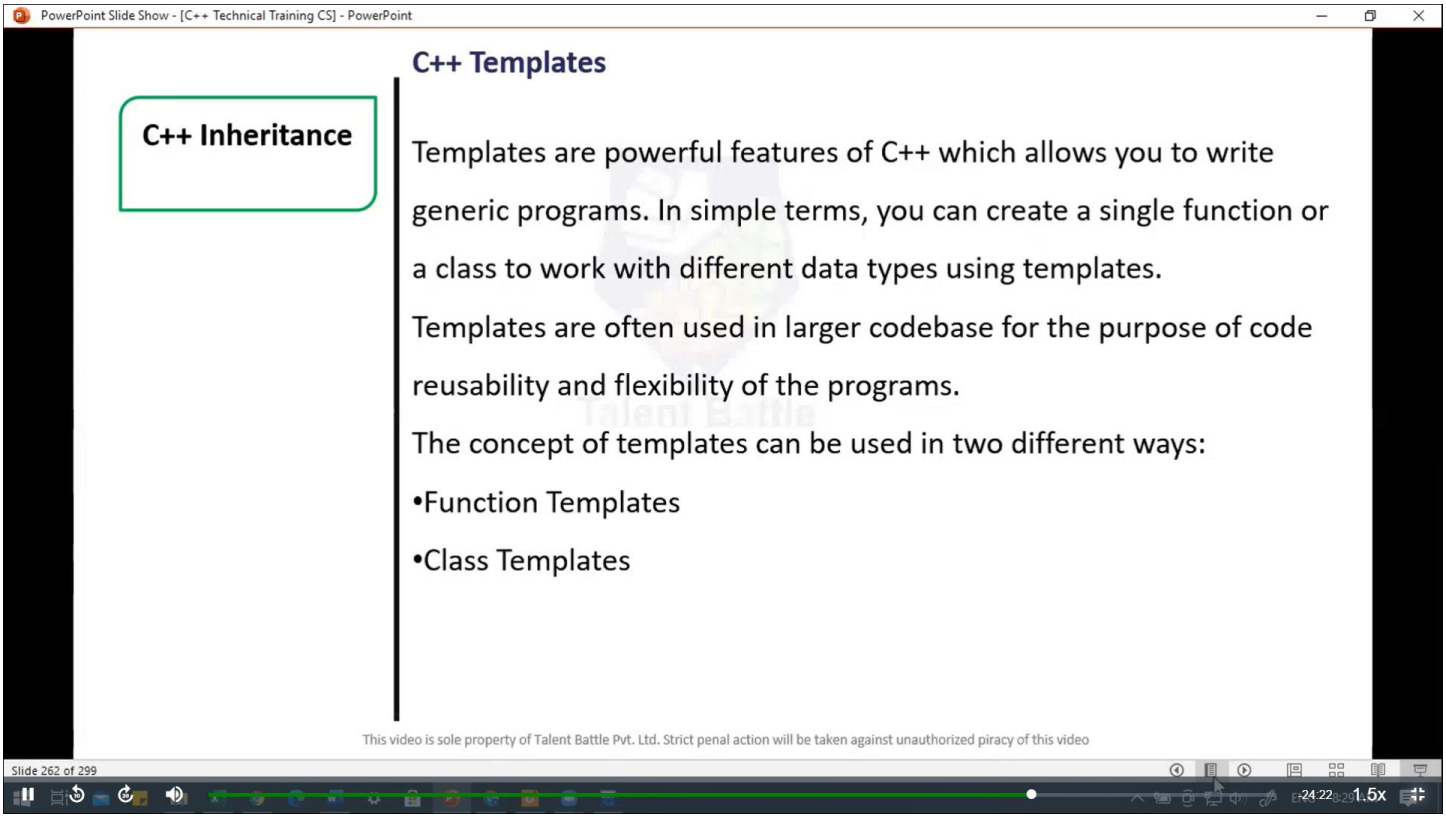

```
//=============================================
// file handling --> Reading from a file

/*
#include<iostream>
#include<fstream>
using namespace std;

int main(){
  fstream st; // Step 1: create object of fstream class
  st.open("C:/Users/hp/Desktop/TCS IT/C++ language/Day8/program.txt", ios::in); // Step 2:
creating new file
  if(!st) // step 3: checking whether file exist
  {
    cout << "No such file";
  } else{
    char ch;
    while(!st.eof()){
      st >> ch; // step 4: Reading from file
      cout << ch; // Message Read from file
    }
```

```
    st.close(); // step 5 : closing file
  }
  return 0;
}
*/



/*
ThisisC++filee
--------------------------------
Process exited after 0.01591 seconds with return value 0
Press any key to continue . . .
*/




//================================================
// close a file
// It is done by FilePointer.close()

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

int main(){
  fstream st; // step 1: creating object of fstream class
  st.open("C:/Users/hp/Desktop/TCS IT/C++ language/Day8/program.txt", ios::out); // step 2:
creating new file
  st.close(); // step 3 : closing file

  return 0;
}


/*

--------------------------------
Process exited after 0.01027 seconds with return value 0
Press any key to continue . . .

*/
```

```
//===================================
```

```cpp
#include<iostream>
#include<fstream>
using namespace std;
int main(){
  fstream st; // creating object of fstream class
st.open("C:/Users/hp/Desktop/TCS IT/C++ language/Day8/program.txt", ios::out); // create new file
  if(!st) // checking whether file exist
  {
    cout << "File creation failed";
  } else {
    cout << "New file created" << endl;
    st << "Hello Friends"; // writing to file

    // checking the file pointer position
    cout << "File pointer position is " << st.tellp() << endl;

    st.seekp(-1, ios::cur); // Go one position back from current position

    // checking the file pointer position
    cout << "As per tellp file pointer position is " << st.tellp() << endl;

    st.close(); // closing file
  }

  st.open("C:/Users/hp/Desktop/TCS IT/C++ language/Day8/program.txt", ios::in); // opening file in read mode
  if(!st) // checking whether file exist
  {
    cout << "No such file";
  } else {
    char ch;
    st.seekg(5, ios::beg); // go to position 5 from beging.
    cout << "As per tellg File pointer position is " << st.tellg() << endl; // checking file pointer position
    cout << endl;
    st.seekg(1, ios::cur); // Go to position 1 from beginning
    st.close(); // closing file
  }
  return 0;
}

/*
New file created
File pointer position is 13
As per tellp file pointer position is 12
As per tellg File pointer position is 5


--------------------------------
```

```
Process exited after 0.1185 seconds with return value 0
Press any key to continue . . .
*/
```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C++ Templates
C++ Inheritance
Templates are powerful features of C++ which allows you to write generic programs. In simple terms, you can create a single function or a class to work with different data types using templates.
Templates are often used in larger codebase for the purpose of code reusability and flexibility of the programs.
The concept of templates can be used in two different ways:
•Function Templates
•Class Templates
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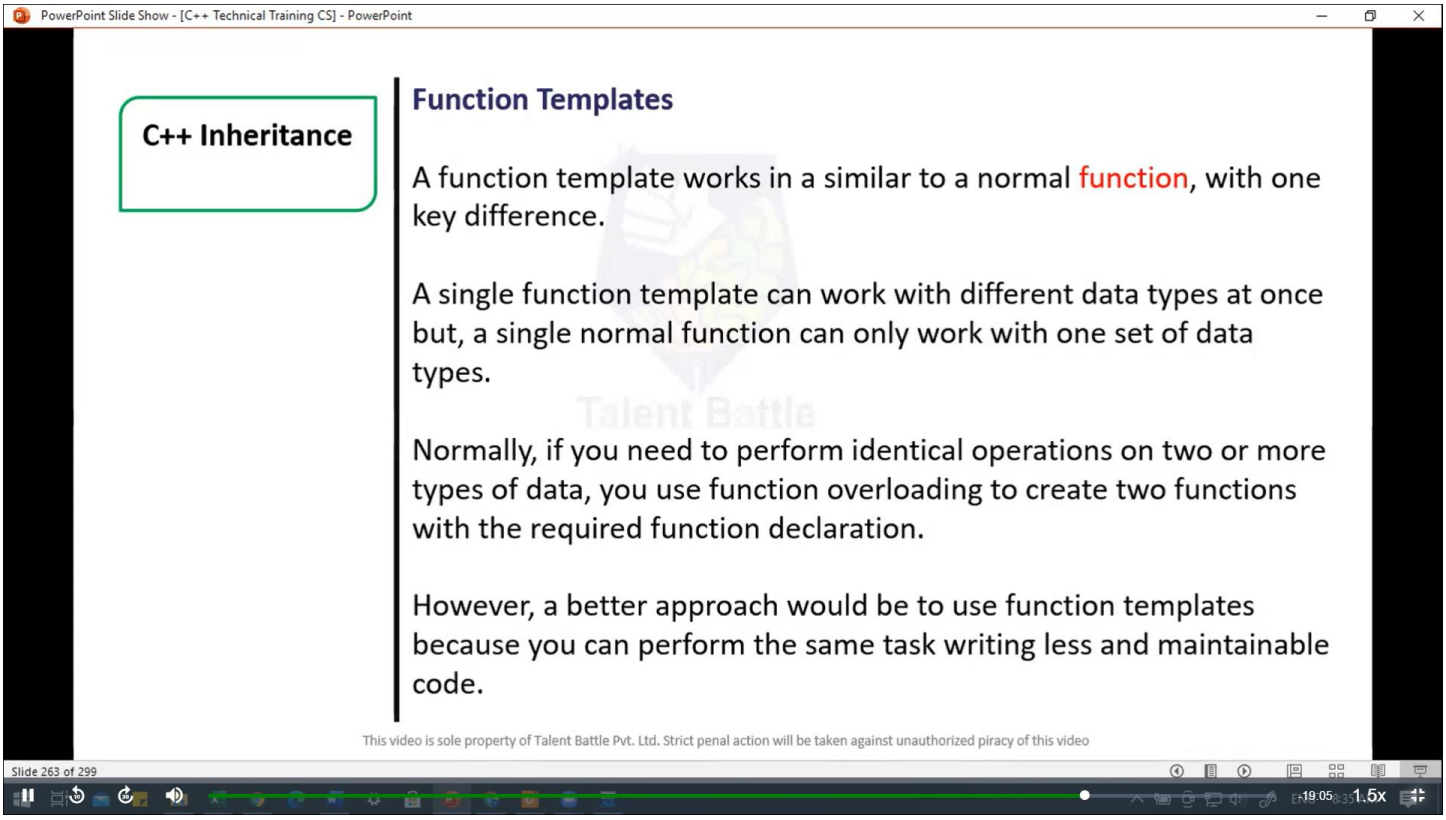
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C++ Inheritance
Function Templates
A function template works in a similar to a normal function, with one key difference.
A single function template can work with different data types at once but, a single normal function can only work with one set of data types.
Normally, if you need to perform identical operations on two or more types of data, you use function overloading to create two functions with the required function declaration.
However, a better approach would be to use function templates because you can perform the same task writing less and maintainable code.
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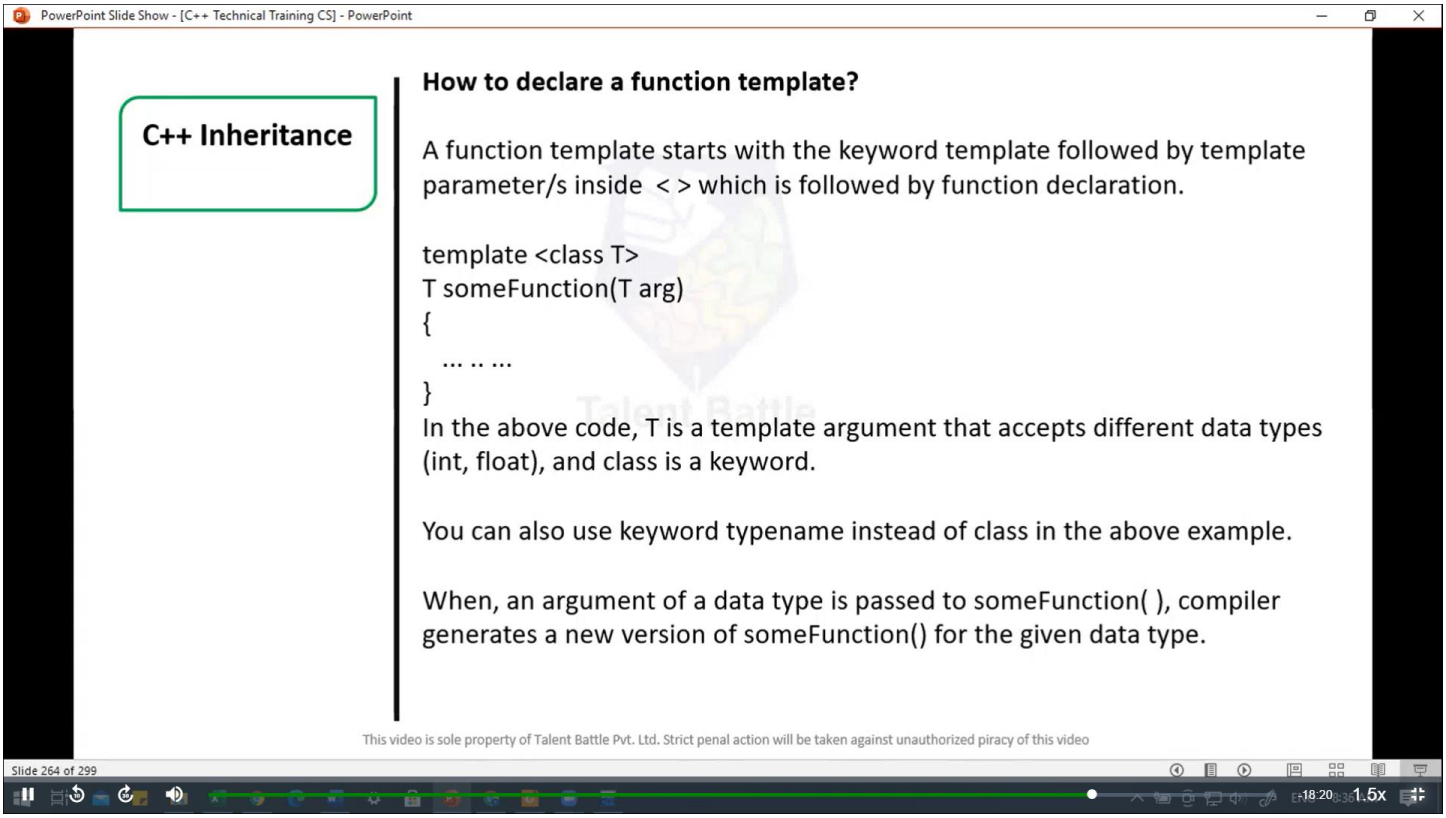


```cpp
//=======================================================
// Program to display largest among two numbers using function templates.
// If two characters are passed to functon template, character with larger ASCII value is displayed

#include <iostream>
using namespace std;

// template funciton
template <class T>
T Large(T n1, T n2){
  return (n1 > n2) ? n1 : n2;
}

int main(){
  int i1, i2;
  float f1, f2;
  char c1, c2;

  cout  << "Enter two integers:\n";
  cin >> i1 >> i2;
  cout << Large(i1, i2) << " is larger. " << endl;

  cout << "\n Enter two floating-point numbers:\n";
  cin >> f1 >> f2;
  cout << Large(f1, f2) << "is larger." << endl;
```

```
  cout << "\nEnter two characters:\n";
  cin >> c1 >> c2;
  cout << Large(c1, c2) << " has larger ASCII value.";

  return 0;
}


/*
Enter two integers:
55
66
66 is larger.

 Enter two floating-point numbers:
33
22
33is larger.

Enter two characters:
h
l
l has larger ASCII value.
--------------------------------
Process exited after 18.82 seconds with return value 0
Press any key to continue . . .
*/
```