Const keyword in C++

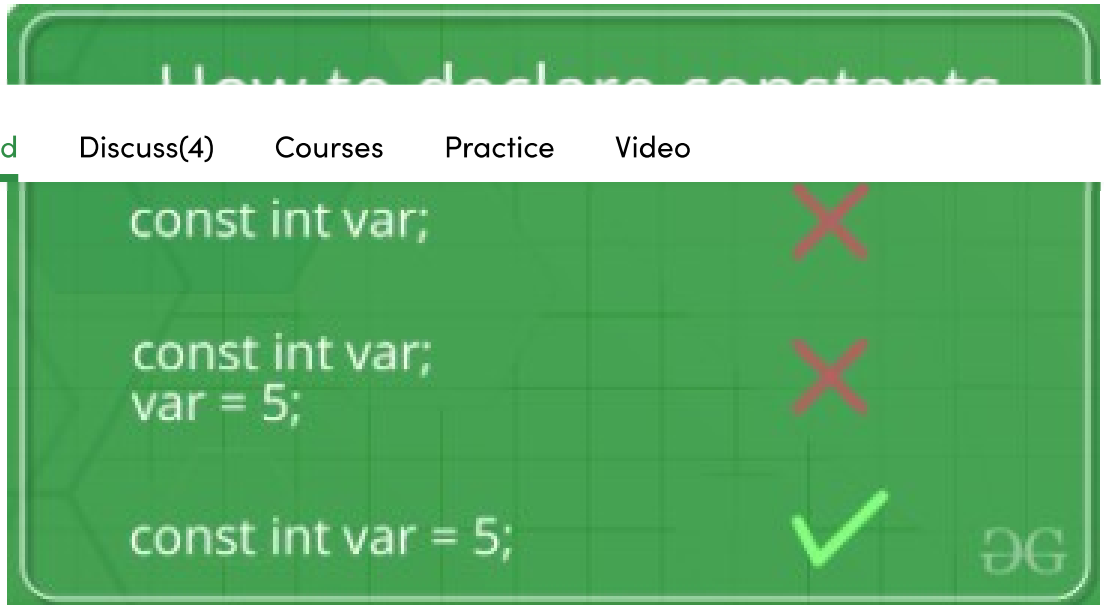
Difficulty Level : Medium • Last Updated : 10 Oct, 2022

In this article, the various functions of the const keyword which is found in **C++** are discussed. Whenever **const keyword** is attached with any method(), variable, pointer variable, and with the object of a class it prevents that specific **object/method()/variable** to modify its data items value.

Constant Variables:

There are a certain set of rules for the declaration and initialization of the constant variables:

- The const variable cannot be left un-initialized at the time of the assignment.
- It cannot be assigned value anywhere in the program.
- Explicit value needed to be provided to the constant variable at the time of declaration of the constant variable.



Below is the C++ program to demonstrate the above concept:

C++

```
// C++ program to demonstrate the
// the above concept
#include <iostream>
using namespace std;

// Driver Code
int main()
{
```

```
    cout << y;
```


Output:

```
10
```

The error faced for faulty declaration: If you try to initialize the const variable without assigning an explicit value then a compile-time error (CTE) is generated.

```
Binary.C++: In function 'int main()':
Binary.C++:6:15: error: uninitialized const 'x' [-fpermissive]
     const int x;
               ^
Binary.C++:7:7: error: assignment of read-only variable 'x'
     x=9;
       ^
PS E:\C++_prog>
```

Const Keyword With Pointer Variables:

Pointers can be declared with a const keyword. So, there are three possible ways to use a const keyword with a pointer, which are as follows:

When the pointer variable point to a const value:

Svntax:

Below is the C++ program to implement the above concept:


```
// C++ program to demonstrate the
// above concept
#include <iostream>
using namespace std;

// Driver Code
int main()
{
    int x{ 10 };
    char y{ 'M' };

    const int* i = &x;
    const char* j = &y;

    // Value of x and y can be altered,
    // they are not constant variables
    x = 9;
    y = 'A';

    // Change of constant values because,
    // i and j are pointing to const-int
    // & const-char type value
    // *i = 6;
    // *j = 7;

    cout << *i << " " << *j;
}
```

Output:

```
9 A
```

Explanation: Here in the above case, i and j are two pointer variables that are pointing to a memory location const int-type and char-type,

Otherwise, the following error will appear: If we try to modify the


```
Binary.C++: In function 'int main()':
Binary.C++:62:8: error: assignment of read-only location '* i'
     *i=6;   //  We aren't allowed to change constant values,because pointer variable pointing to
        ^
Binary.C++:63:8: error: assignment of read-only location '* j'
     *j=7;   // the Const type values i,j. Cte(Error)
```

When the const pointer variable point to the value:

Syntax:

```
data_type* const var_name;
```

Below is the example to demonstrate the above concept:

C++

```
// C++ program to demonstrate the
// above concept
#include <iostream>
using namespace std;

// Driver Code
int main()
{
    // x and z non-const var
    int x = 5;
    int z = 6;

    // y and p non-const var
```

```
    // to the var x's location
    int* const i = &x;
```



```
    // to the var y's location
    char* const j = &y;


    // The values that is stored at the memory location can modified
    // even if we modify it through the pointer itself
    // No CTE error
    *i = 10;
    *j = 'D';

    // CTE because pointer variable
    // is const type so the address
    // pointed by the pointer variables
    // can't be changed
    // i = &z;
    // j = &p;

    cout << *i << " and " << *j
         << endl;
    cout << i << " and " << j;

    return 0;
}
```

```
Output:
10 and D
0x7ffe7b2392a0 and DC
```

Explanation: The values that are stored in the corresponding pointer variable i and j are modifiable, but the locations that are pointed out by const-pointer variables where the corresponding values of x and y are stored aren't modifiable.

Otherwise, the following error will appear: The pointer variables are const and pointing to the locations where the x and y are stored if we

```
PS C:\Users\LENOVO Z50\Desktop\edureka\Contribute\infer> cd "e:\C++_prog\" ; if ($?) { g++ Binary.C++ -o Binary } ; if ($?) { .\Binary }
Binary.C++: In function 'int main()':
Binary.C++:66:9: error: invalid conversion from 'int*' to 'int' [-fpermissive]
     *i=&z;  //Cte(error), because pointer variable is const type
        ^~
Binary.C++:67:9: error: invalid conversion from 'char*' to 'char' [-fpermissive]
     *j=&p;  //Cte(error), because pointer variable is const type
        ^~
```

When const pointer pointing to a const variable:

Syntax:

```
const data_type* const var_name;
```

Below is the C++ program to demonstrate the above concept:

C++

```
// C++ program to demonstrate
// the above concept
#include <iostream>
using namespace std;

// Driver code
int main()
{
    int x{ 9 };

    const int* const i = &x;

    // *i=10;
    // The above statement will give CTE
    // Once Ptr(*i) value is
    // assigned, later it can't
```

```
    const char* const j = &y;
```



```
    // Once Ptr(*j) value is
    // assigned, later it can't
    // be modified(Error)

    cout << *i << " and " << *j;

    return 0;
}
```

Output:

```
9 and A
```

Explanation: Here, the const pointer variable points to the const variable. So, you are neither allowed to change the const **pointer variable(*P)** nor the value stored at the location pointed by that **pointer variable(*P).**

Otherwise, the following error will appear: Here both pointer variable and the locations pointed by the pointer variable are const so if any of them is modified, the following error will appear:

```
Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\LENOVO Z50\Desktop\edureka\Contribute\infer> cd "e:\C++_prog\" ; if ($?) { g++ Binary.C++ -o Binary } ; if ($?) { .\Binary }
Binary.C++: In function 'int main()':
Binary.C++:58:8: error: assignment of read-only location '*(const int*)i'
     *i=10;   //Cte(error)
        ^~
Binary.C++:60:8: error: assignment of read-only location '*(const char*)j'
     *j='B';   //Once Ptr(*j) value is assigned later it can't be modified
        ^~~
```

cause error: Passing const argument value to a non-const parameter

Below is the C++ program to demonstrate the above concept:

C++

```
// C++ program to demonstrate
// the above concept
#include <iostream>
using namespace std;

int foo(int* y)
{
    return *y;
}

// Driver code
int main()
{
    int z = 8;
    const int* x = &z;
    cout << foo(x);
    return 0;
}
```

Output: The compile-time error that will appear as if const value is passed to any non-const argument of the function then the following compile-time error will appear:

```
PS C:\Users\LENOVO Z50\Desktop\edureka\Contribute\infer> cd "e:\C++_prog\" ; if ($?) { g++ Binary.C++ -o Binary } ; if ($?) { .\Binary }
Binary.C++: In function 'int main()':
Binary.C++:63:16: error: invalid conversion from 'const int*' to 'int*' [-fpermissive]
     cout<<foo(x);
                ^
Binary.C++:54:5: note:   initializing argument 1 of 'int foo(int*)'
 int foo(int* y)
     ^~~
PS E:\C++_prog>
```

In nutshell, the above discussion can be concluded as follows:

1. int value = 5; // non-const value

*2. const int *ptr_1 = &value; // ptr_1 points to a "const int" value, so this is a pointer to a const value.*

*3. int *const ptr_2 = &value; // ptr_2 points to an "int", so this is a const pointer to a non-const value.*

*4. const int *const ptr_3 = &value; // ptr_3 points to a "const int" value, so this is a const pointer to a const value.*

Constant Methods:

Like member functions and member function arguments, the objects of a class can also be declared as **const**. An object declared as const cannot be modified and hence, can invoke only const member functions as these functions ensure not to modify the object.

Syntax:

of object, const object as well as non-const objects.

declaring is possible only with the help of constructors.

There are two ways of a constant function declaration:

Ordinary const-function Declaration:

```
const void foo()
{
   //void foo() const Not valid
}
int main()
{
   foo();
}
```

A const member function of the class:

```
class
{
   void foo() const
   {
       //.....
   }
}
```

Below is the example of a constant function:

C++

```
// C++ program to demonstrate the
// constant function
#include <iostream>
using namespace std;
```

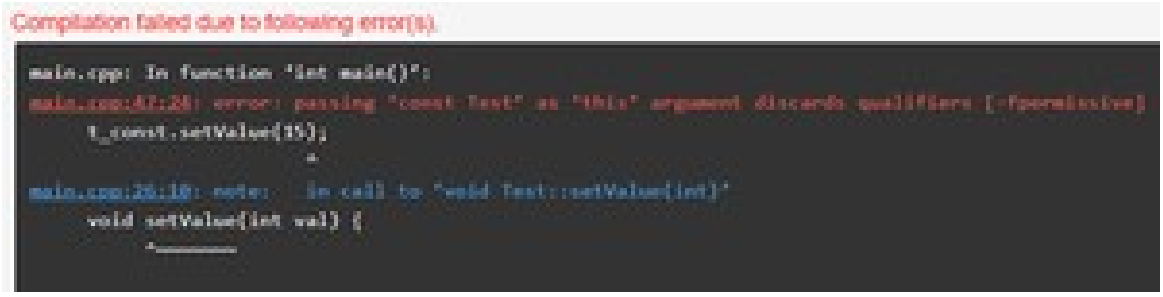
```
public:
```



```
    {
        value = v;
    }

    // We get compiler error if we
    // add a line like "value = 100;"
    // in this function.
    int getValue() const
    {
        return value;
    }

    // a nonconst function trying to modify value
    void setValue(int val) {
        value = val;
    }
};

// Driver Code
int main()
{
    // Object of the class T
    Test t(20);

    // non-const object invoking const function, no error
    cout << t.getValue() << endl;

    // const object
      const Test t_const(10);

    // const object invoking const function, no error
    cout << t_const.getValue() << endl;

    // const object invoking non-const function, CTE
    // t_const.setValue(15);

    // non-const object invoking non-const function, no error
    t.setValue(12);

    cout << t.getValue() << endl;
```

Output:

The Following error will if you try call the non-const function from a const object



Constant Function Parameters And Return Type:

A function() parameters and return type of function() can be declared as constant. Constant values cannot be changed as any such attempt will generate a compile-time error.

Below is the C++ program to implement the above approach:

C++

```
// C++ program to demonstrate the
// above approach
#include <iostream>
using namespace std;
```

```
    // y = 6; const value
    // can't be change
```



```
// Function foo() with variable int
void foo1(int y)
{
    // Non-const value can be change
    y = 5;
    cout << '\n'
         << y;
}

// Driver Code
int main()
{
    int x = 9;
    const int z = 10;

    foo(z);
    foo1(x);

    return 0;
}
```

Output:

```
10
5
```

Explanation: The following error will be displayed:

- // y = 6; a const value can't be changed or modified.

```
Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\LENOVO Z50\Desktop\edureka\Contribute\infer> cd "e:\C++_prog\" ; if ($?) { g++ Binary.C++ -o Binary } ; if ($?) { .\Binary
Binary.C++: In function 'void foo(int)':
Binary.C++:56:5: error: assignment of read-only parameter 'y'
   y=6;
     ^
```

For const return type: The return type of the function() is const and so it returns a const integer value to us. Below is the C++ program to implement the above approach:

C++

```
// C++ program for the above approach
#include <iostream>
using namespace std;

const int foo(int y)
{
    y--;
    return y;
}

int main()
{
    int x = 9;
    const int z = 10;
    cout << foo(x) << '\n'
         << foo(z);

    return 0;
}
```

8

Read Discuss(4) Courses Practice Video

There is no substantial issue to pass const or non-const variable to the function because the value that will be returned by the function will be constant automatically. As the argument of the function is non-const.

For const return type and const parameter: Here, both return type and parameter of the function are of const types. Below is the C++ program to implement the above approach:

C++

```
// C++ program for the above approach
#include <iostream>
using namespace std;

const int foo(const int y)
{
    // y = 9; it'll give CTE error as
    // y is const var its value can't
    // be change
    return y;
}

// Driver code
int main()
{
    int x = 9;
    const int z = 10;
    cout << foo(x) << '\n'
         << foo(z);

    return 0;
}
```

```
10
```


Explanation: Here, both const and non-const values can be passed as the const parameter to the function, but we are not allowed to then change the value of a passed variable because the parameter is const. **Otherwise, we'll face the error as below:**

// y=9; it'll give the compile-time error as y is const var its value can't be changed.

```
Binary.C++: In function 'const int foo(int)':
Binary.C++:6:5: error: assignment of read-only parameter 'y'
   y=9;   //it'll give CTE error as y is const var its value can't be change
     ^
PS E:\C++_prog>
```

C++ C++ to perform various

Read Discuss(4) Courses Practice Video

Related Articles

1. Difference between const char *p, char * const p and const char * const p
2. C++ | const keyword | Question 1
3. C++ | const keyword | Question 2
4. C++ | const keyword | Question 3
5. C++ | const keyword | Question 5
6. C++ | const keyword | Question 5
7. Function overloading and const keyword
8. Why copy constructor argument should be const in C++?
9. How to modify a const variable in C?
10. “static const” vs “#define” vs “enum”

madhav_mohan

@madhav_mohan

Vote for difficulty

Current difficulty : Medium

Easy Normal Medium Hard Expert

Improved By : suvendrapandey, CoderSaty, snaze01, akashpatil3640, gauravgupta050300

Article Tags : C++-const keyword, const keyword, Articles, C++, C++ Programs, Technical Scripter

Practice Tags : CPP