

Comsats University Islamabad, Vehari Campus



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Section: "B"

Subject: Data Structure and Algorithm

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```
#include <iostream>

int main() {

    int num = 42;    // Declare an integer variable 'num' and assign a value to it

    int* ptr = &num; // Declare a pointer to an integer and assign the address of 'num' to it

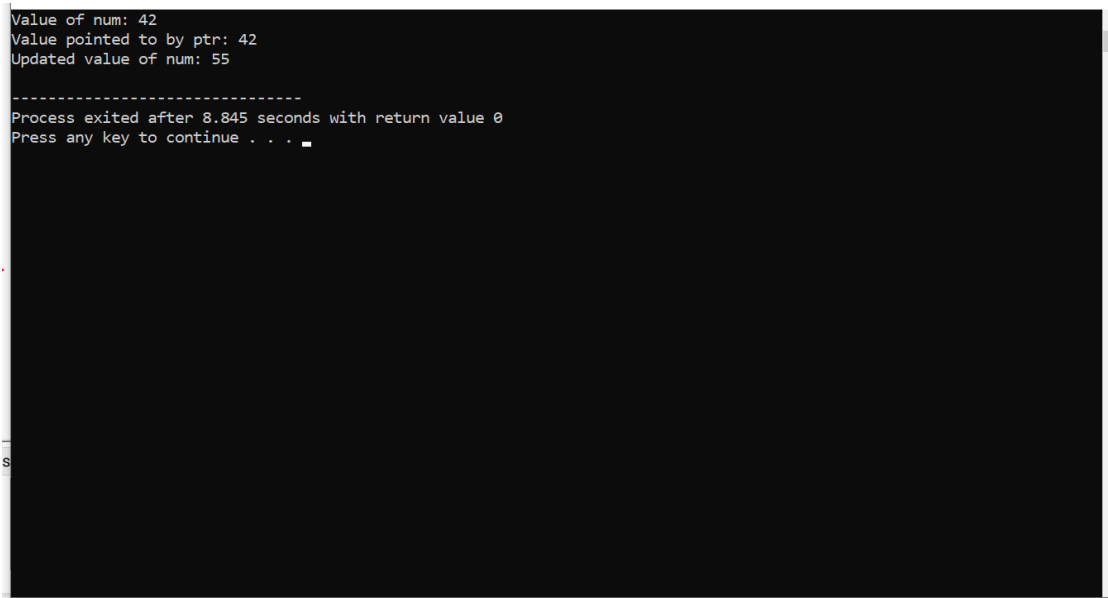

    // Print the value of 'num' and the value pointed to by 'ptr'
    std::cout << "Value of num: " << num << std::endl;
    std::cout << "Value pointed to by ptr: " << *ptr << std::endl;


    // Modify the value of 'num' through the pointer 'ptr'
    *ptr = 55;


    // Print the updated value of 'num'
    std::cout << "Updated value of num: " << num << std::endl;


    return 0;
}
```

Output:

A screenshot of a terminal window showing the output of the C++ program. The output consists of four lines: 'Value of num: 42', 'Value pointed to by ptr: 42', 'Updated value of num: 55', and a separator line of dashes. Below the dashes, it says 'Process exited after 8.845 seconds with return value 0' and 'Press any key to continue . . .'.

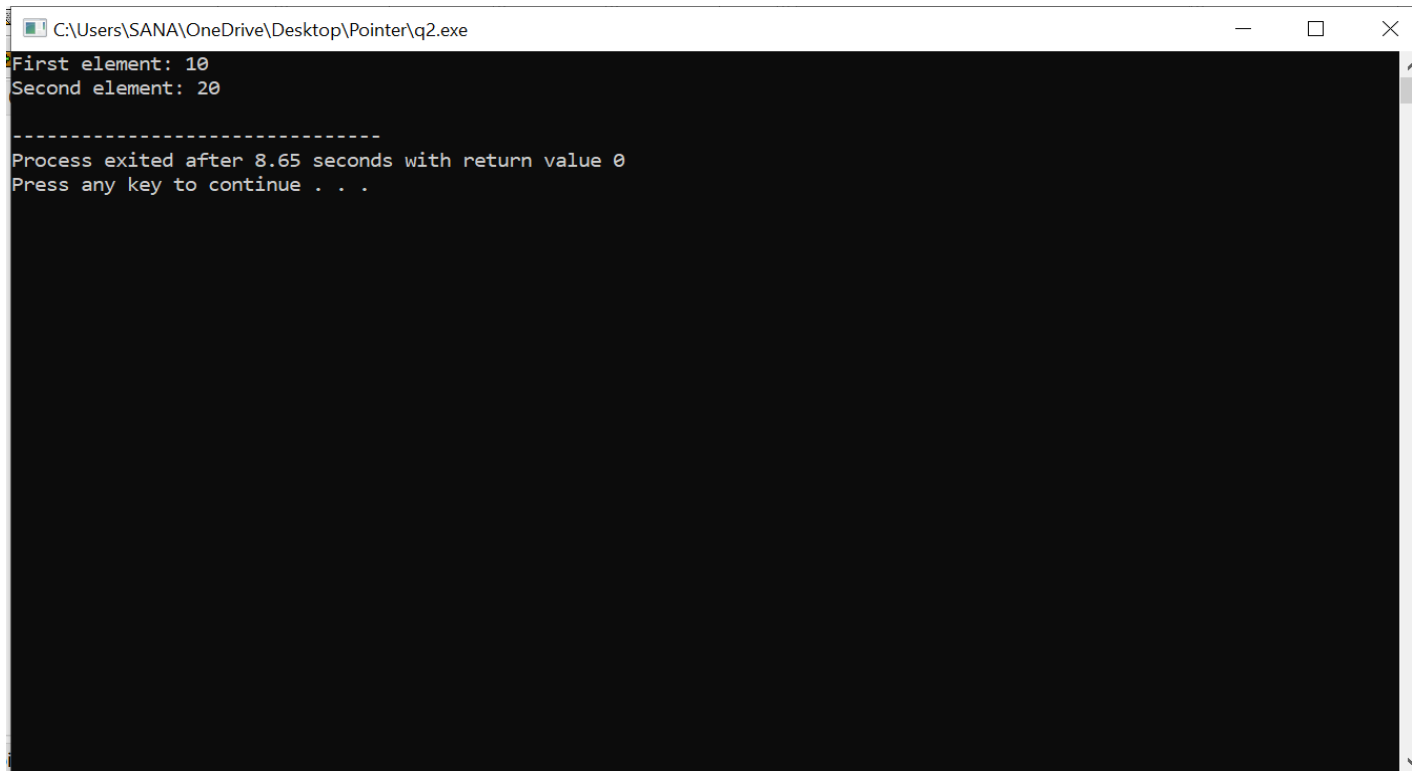
```
Value of num: 42
Value pointed to by ptr: 42
Updated value of num: 55
-----
Process exited after 8.845 seconds with return value 0
Press any key to continue . . .
```

Problem: 2

```
#include <iostream>
```

```
int main() {  
    int arr[] = {10, 20, 30, 40};  
    int* ptr = arr;  
    std::cout << "First element: " << *ptr << std::endl;  
    ptr++; // Move to the next element  
    std::cout << "Second element: " << *ptr << std::endl;  
    return 0;  
}
```

Output:



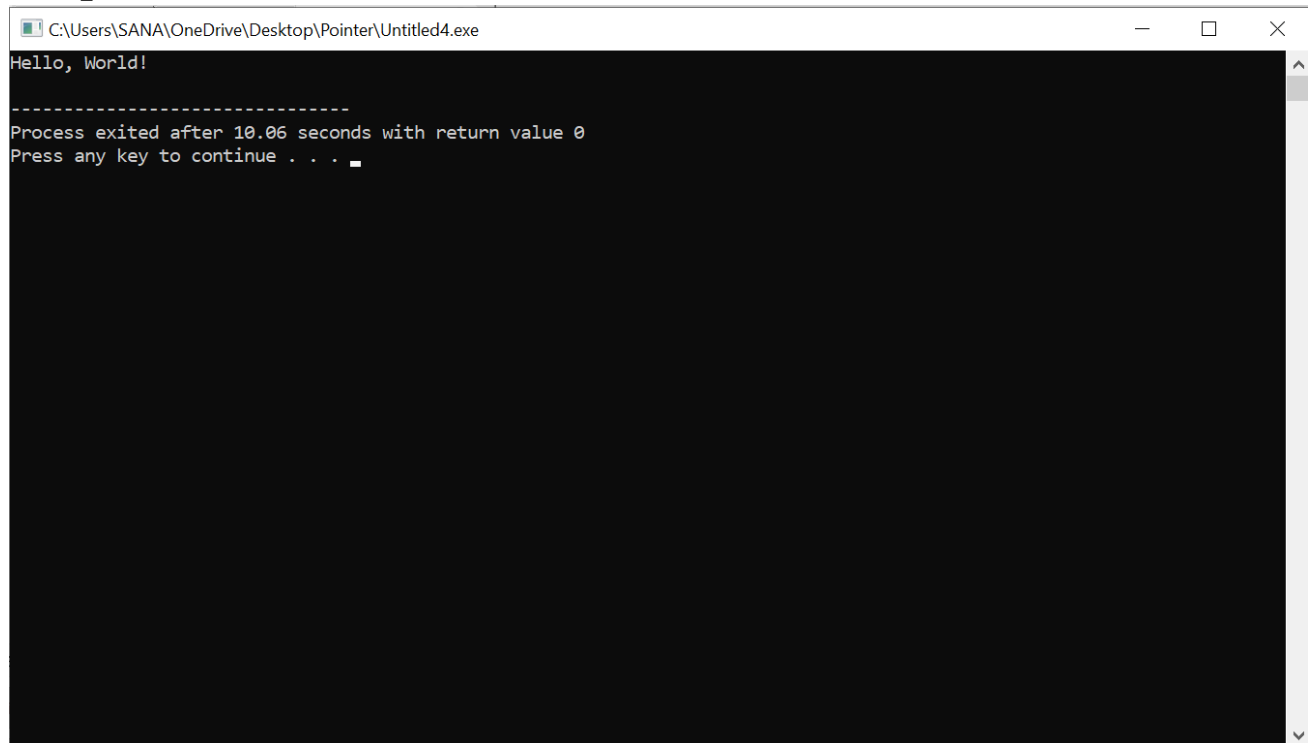
```
C:\Users\SANA\OneDrive\Desktop\Pointer\q2.exe  
First element: 10  
Second element: 20  
-----  
Process exited after 8.65 seconds with return value 0  
Press any key to continue . . .
```

Problem: 3

```
#include <iostream>
```

```
void greet() {  
    std::cout << "Hello, World!" << std::endl;  
}  
  
int main() {  
    void (*functionPtr)() = greet;  
    functionPtr(); // Call the function through the pointer  
    return 0;  
}
```

Output:



The screenshot shows a Windows command prompt window titled "C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled4.exe". The output of the program is displayed in white text on a black background. It starts with "Hello, World!" followed by a line of dashes. Below that, it says "Process exited after 10.06 seconds with return value 0" and "Press any key to continue . . .". A cursor is visible at the end of the last line.

```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled4.exe  
Hello, World!  
-----  
Process exited after 10.06 seconds with return value 0  
Press any key to continue . . .
```

Problem: 4

```
#include <iostream>
```

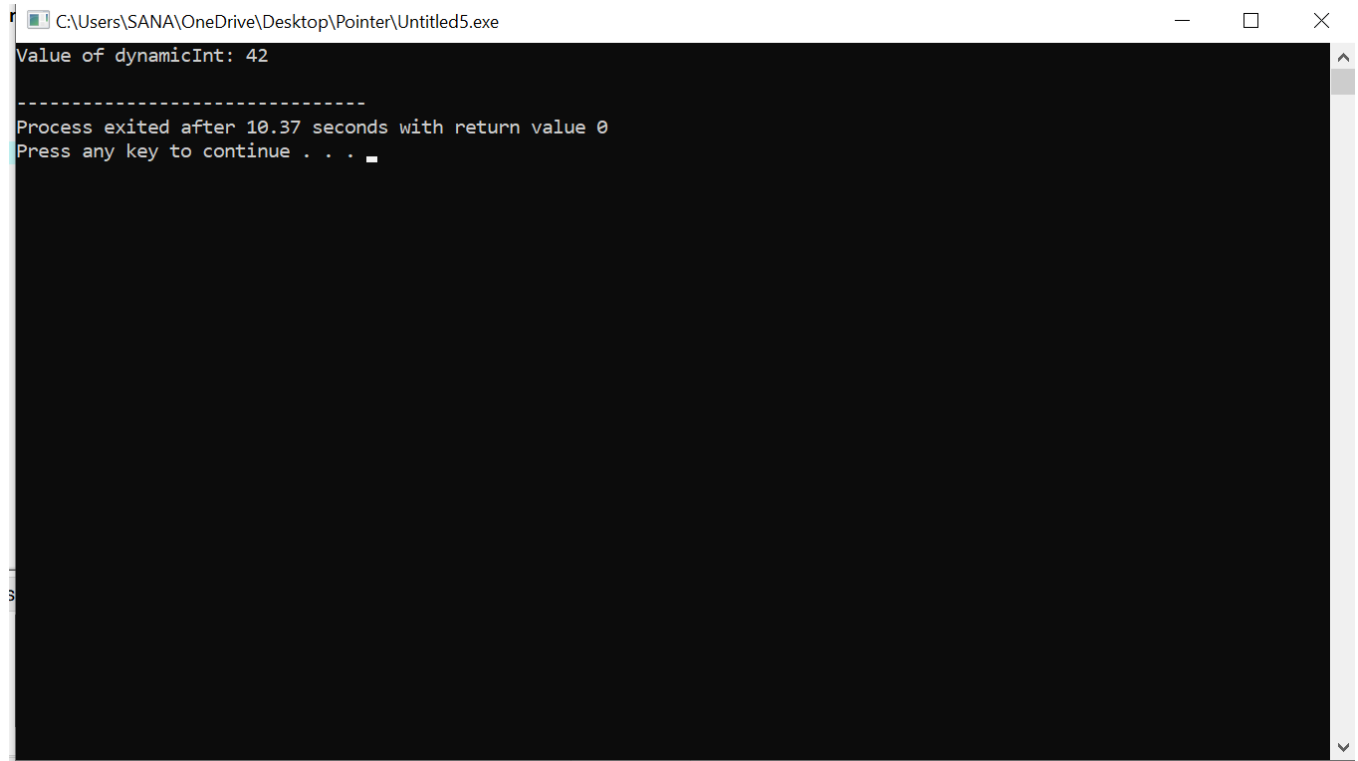
```
int main() {
```

```

int* dynamicInt = new int(42);
std::cout << "Value of dynamicInt: " << *dynamicInt << std::endl;
delete dynamicInt; // Free the allocated memory
return 0;
}

```

Output:



```

C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe
Value of dynamicInt: 42
-----
Process exited after 10.37 seconds with return value 0
Press any key to continue . . .

```

Problem:5

```
#include <iostream>
```

```
int main() {
```

```
    int numbers[] = {1, 2, 3, 4, 5};
```

```
    int* ptr = numbers;
```

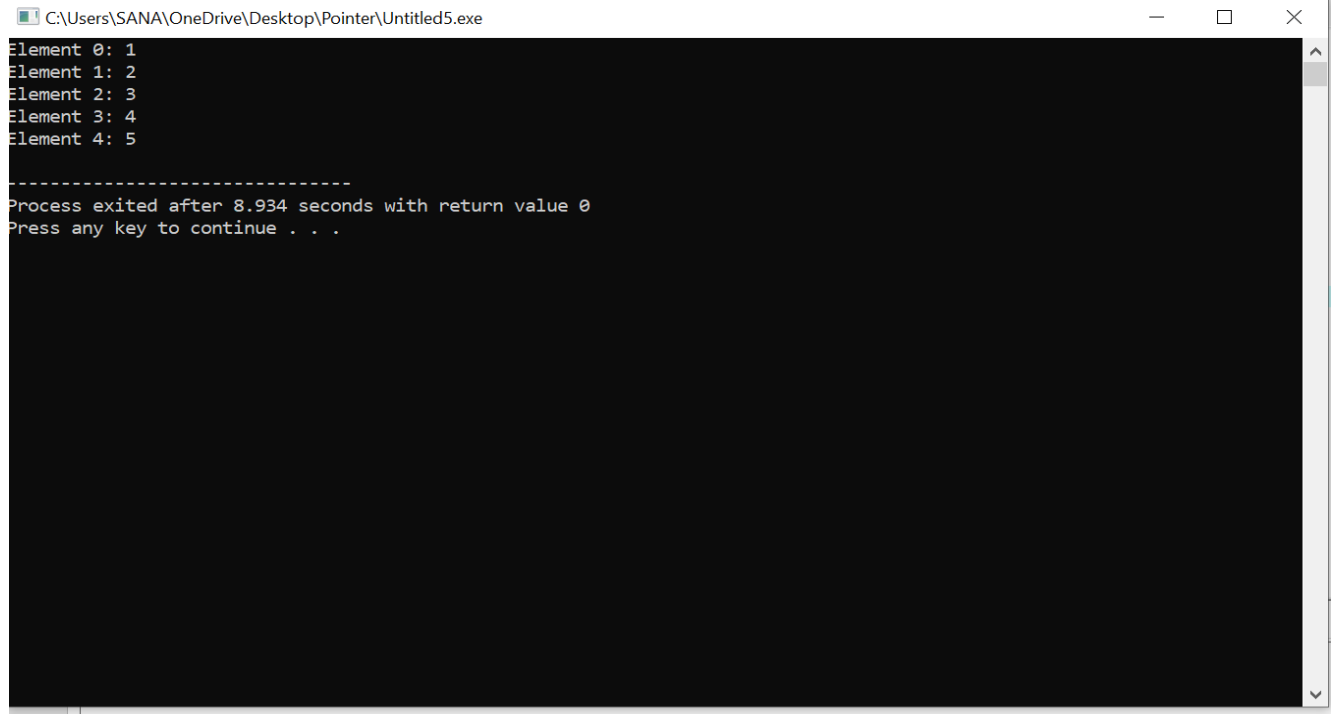
```
    for (int i = 0; i < 5; i++) {
```

```
        std::cout << "Element " << i << ": " << *(ptr + i) << std::endl;
```

```
    }
```

```
    return 0;
}
```

Output:

A screenshot of a Windows command prompt window titled "C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe". The window has standard Windows window controls (minimize, maximize, close) in the top right corner. The output text is as follows:

```
Element 0: 1
Element 1: 2
Element 2: 3
Element 3: 4
Element 4: 5

-----
Process exited after 8.934 seconds with return value 0
Press any key to continue . . .
```

Problem: 6

```
#include <iostream>
```

```
int main() {
```

```
    int* nullPtr = nullptr;
```

```
    if (nullPtr == nullptr) {
```

```
        std::cout << "nullPtr is a null pointer." << std::endl;
```

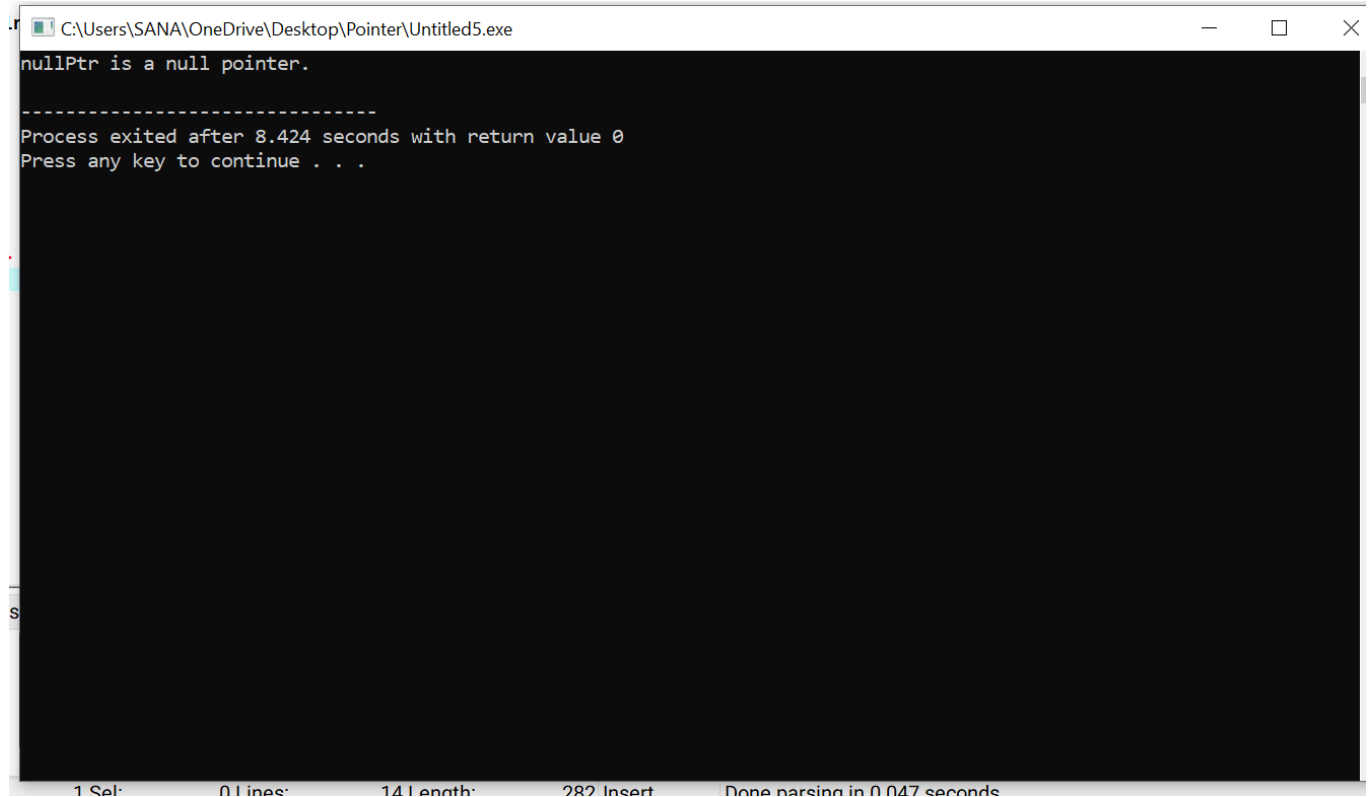
```
    } else {
```

```
        std::cout << "nullPtr is not a null pointer." << std::endl;
```

```
    }
```

```
    return 0;
}
```

Output:



```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe
nullPtr is a null pointer.
-----
Process exited after 8.424 seconds with return value 0
Press any key to continue . . .
```

Problem:7

```
#include <iostream>
```

```
int main() {
```

```
    int num = 42;
```

```
    int* ptr1 = &num;
```

```
    int** ptr2 = &ptr1;
```

```
    std::cout << "Value of num: " << num << std::endl;
```

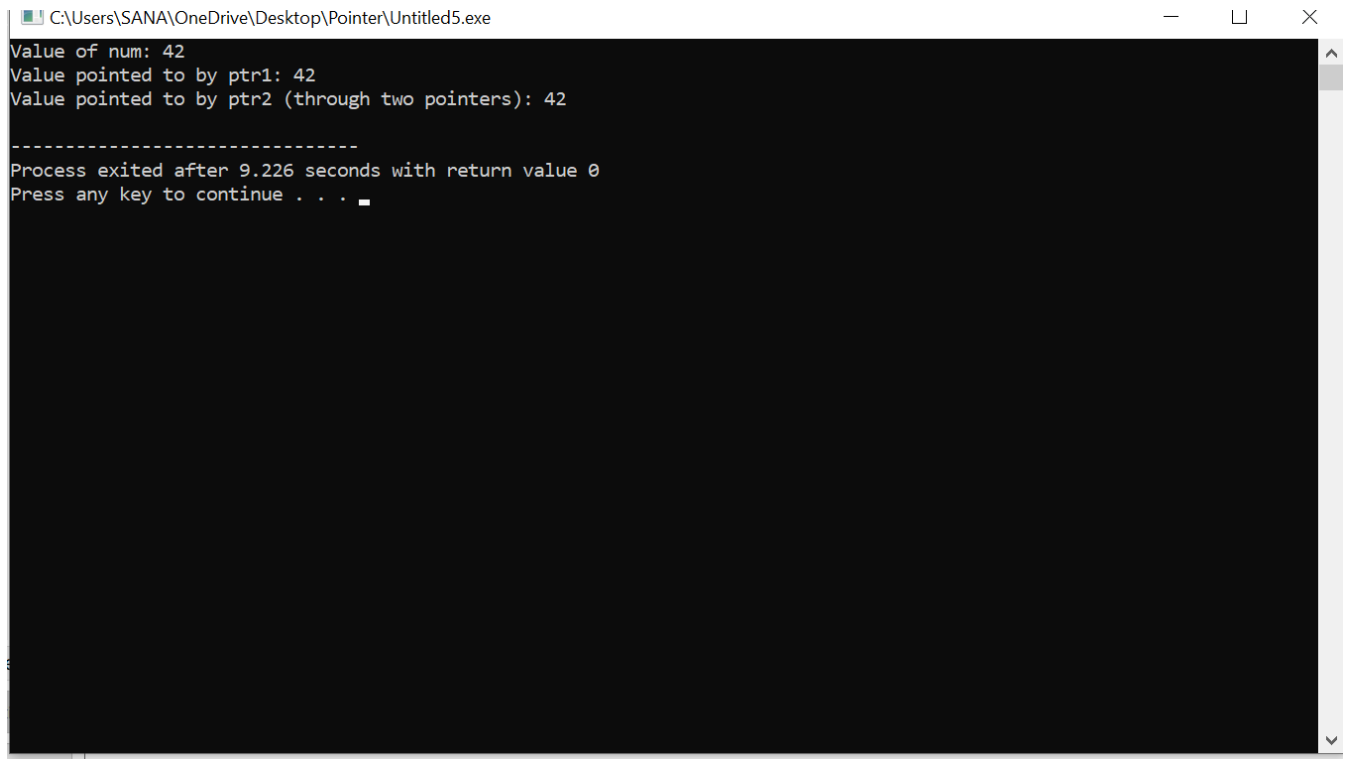
```
std::cout << "Value pointed to by ptr1: " << *ptr1 << std::endl;

std::cout << "Value pointed to by ptr2 (through two pointers): " <<
**ptr2 << std::endl;

return 0;

}
```

Output:



```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe
Value of num: 42
Value pointed to by ptr1: 42
Value pointed to by ptr2 (through two pointers): 42

-----
Process exited after 9.226 seconds with return value 0
Press any key to continue . . .
```

Problem: 8

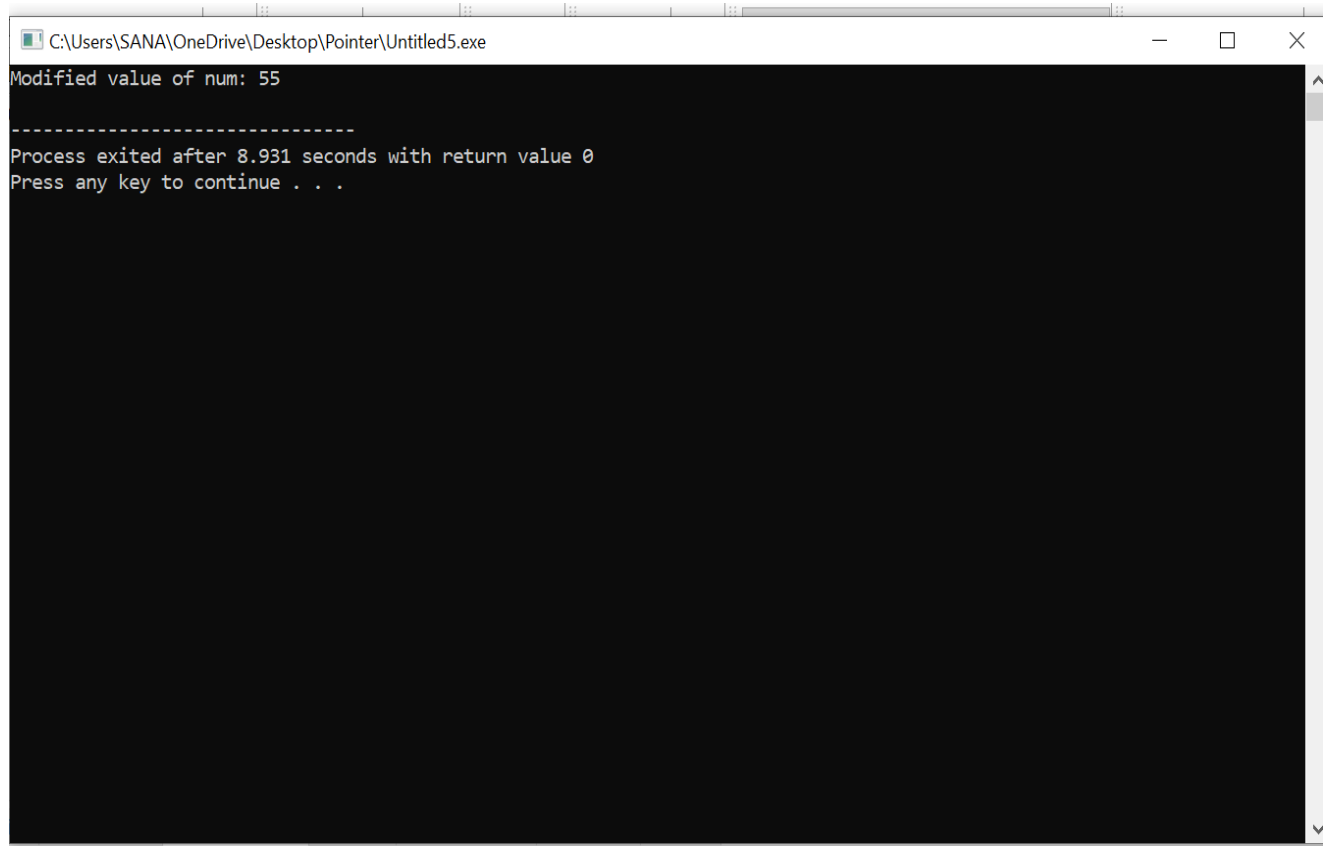
```
#include <iostream>
```

```
void modifyValue(int* ptr) {
    *ptr = 55;
}
```



```
int main() {  
    int num = 42;  
    modifyValue(&num);  
    std::cout << "Modified value of num: " << num << std::endl;  
    return 0;  
}
```

Output:



```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe  
Modified value of num: 55  
-----  
Process exited after 8.931 seconds with return value 0  
Press any key to continue . . .
```

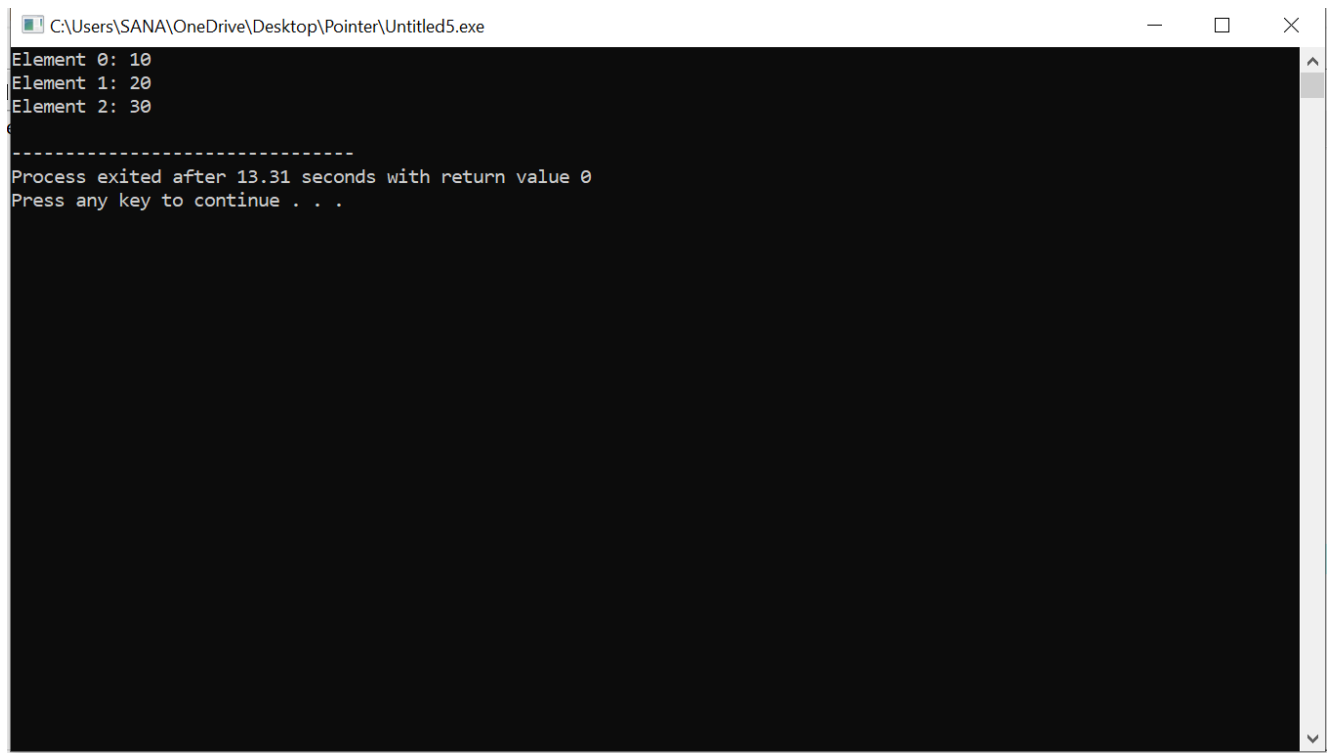
Problem: 9

```
#include <iostream>
```

```
int main() {  
    int num1 = 10, num2 = 20, num3 = 30;  
    int* arr[3] = {&num1, &num2, &num3};
```

```
    for (int i = 0; i < 3; i++) {  
        std::cout << "Element " << i << ": " << *arr[i] << std::endl;  
    }  
    return 0;  
}
```

Output:



```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe  
Element 0: 10  
Element 1: 20  
Element 2: 30  
-----  
Process exited after 13.31 seconds with return value 0  
Press any key to continue . . .
```

Problem: 10

```
#include <iostream>
```

```
int main() {
```

```
    const int num = 42;
```

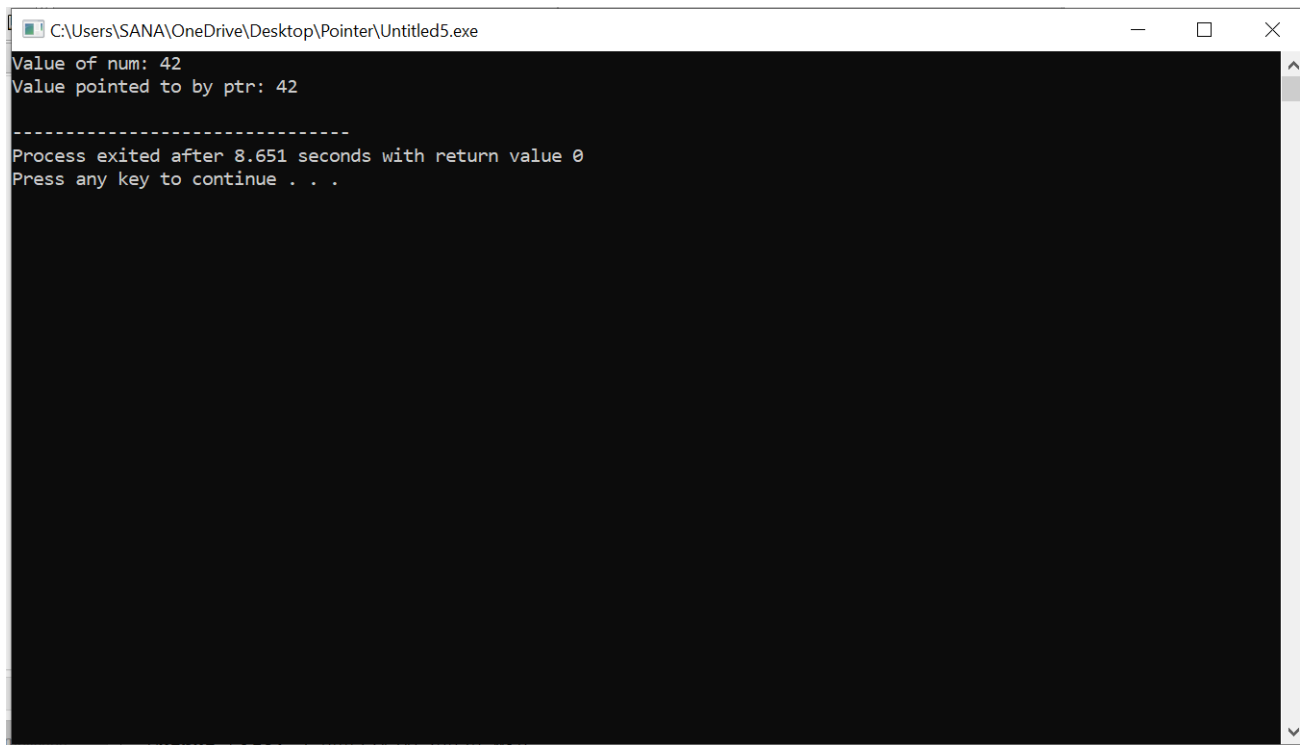
```
    const int* ptr = &num; // Pointer to a constant integer
```

```
std::cout << "Value of num: " << num << std::endl;
std::cout << "Value pointed to by ptr: " << *ptr << std::endl;

// Uncommenting the line below would result in a compilation error.
// *ptr = 55; // Error: Cannot modify a constant through a pointer

return 0;
}
```

Output:



Problem:11

```
#include <iostream>
```

```
int main() {
    int num = 42;
```

```
int* const ptr = &num; // Constant pointer to an integer
```

```
std::cout << "Value of num: " << num << std::endl;
```

```
std::cout << "Value pointed to by ptr: " << *ptr << std::endl;
```

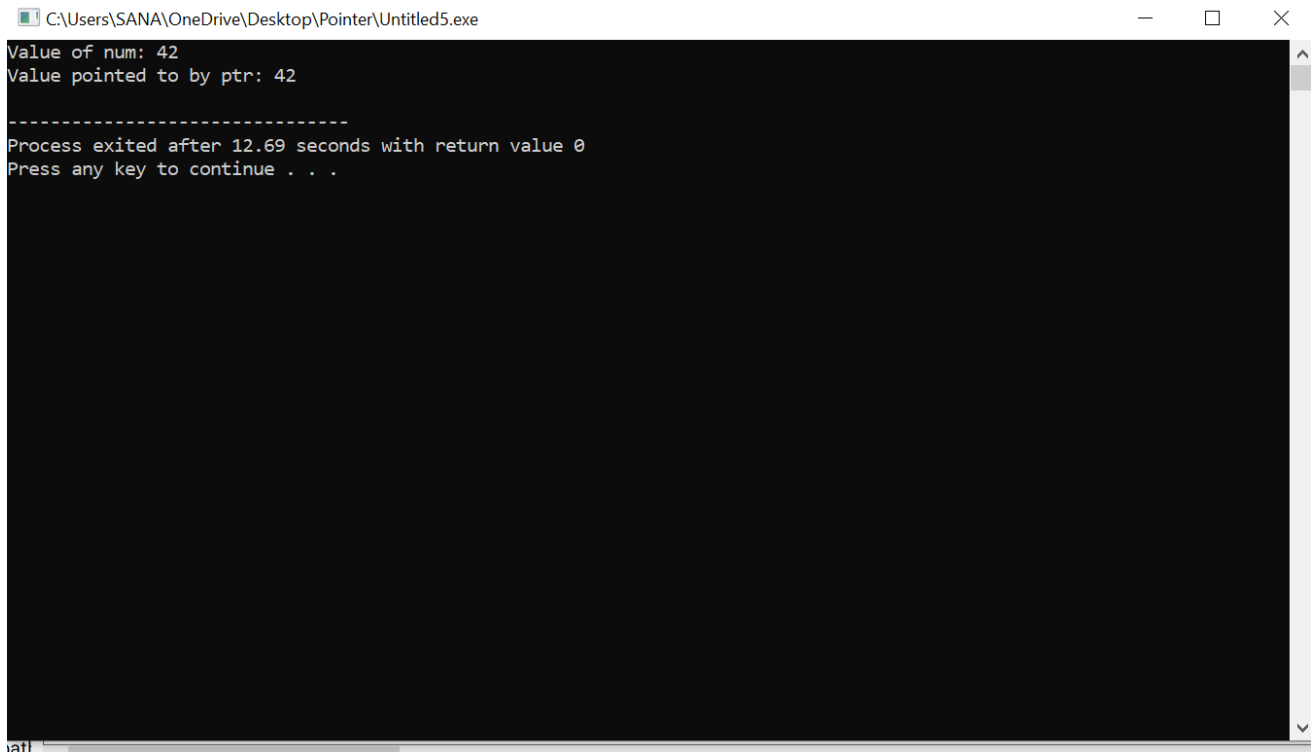
```
// Uncommenting the line below would result in a compilation error.
```

```
// ptr = nullptr; // Error: Cannot change the value of a constant pointer
```

```
return 0;
```

```
}
```

Output:



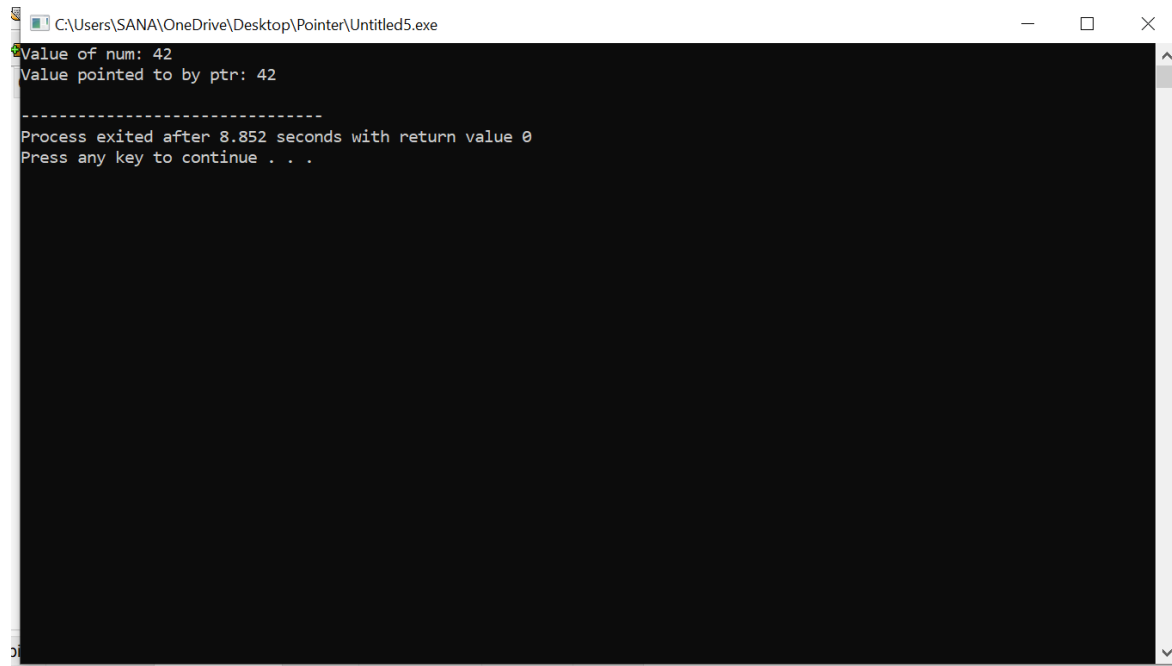
```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe
Value of num: 42
Value pointed to by ptr: 42
-----
Process exited after 12.69 seconds with return value 0
Press any key to continue . . .
```

Problem: 12

```
#include <iostream>
```

```
int main() {  
    const int num = 42;  
    const int* const ptr = &num; // Constant pointer to a constant integer  
  
    std::cout << "Value of num: " << num << std::endl;  
    std::cout << "Value pointed to by ptr: " << *ptr << std::endl;  
  
    // Uncommenting either of the lines below would result in a  
    // compilation error.  
    // *ptr = 55; // Error: Cannot modify a constant through a pointer  
    // ptr = nullptr; // Error: Cannot change the value of a constant pointer  
  
    return 0;  
}
```

Output:



```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe  
Value of num: 42  
Value pointed to by ptr: 42  
-----  
Process exited after 8.852 seconds with return value 0  
Press any key to continue . . .
```

Problem:13

```
#include <iostream>
```

```
#include <string>
```

```
class Person {
```

```
public:
```

```
    Person(const std::string& name) : name_(name) { }
```

```
    void introduce() {
```

```
        std::cout << "Hello, my name is " << name_ << std::endl;
```

```
    }
```

```
private:
```

```
    std::string name_;
```

```
};
```

```
int main() {
```

```
    Person person("Alice");
```

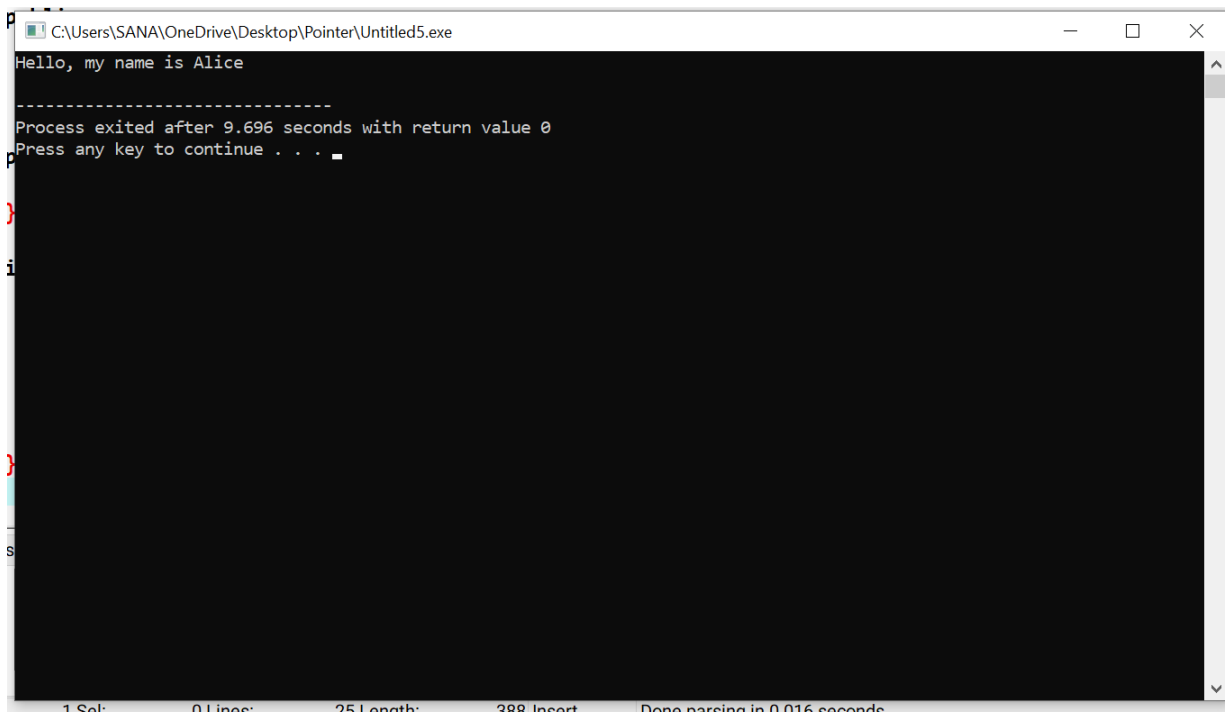
```
    Person* ptr = &person;
```

```
    ptr->introduce();
```

```
    return 0;
```

```
}
```

Output:



```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe
Hello, my name is Alice
-----
Process exited after 9.696 seconds with return value 0
Press any key to continue . . .
```

Problem: 14

```
#include <iostream>
```

```
class MyClass {
```

```
public:
```

```
    int data = 42;
```

```
    void printData() {
```

```
        std::cout << "Data: " << data << std::endl;
```

```
    }
```

```
};
```

```
int main() {
```

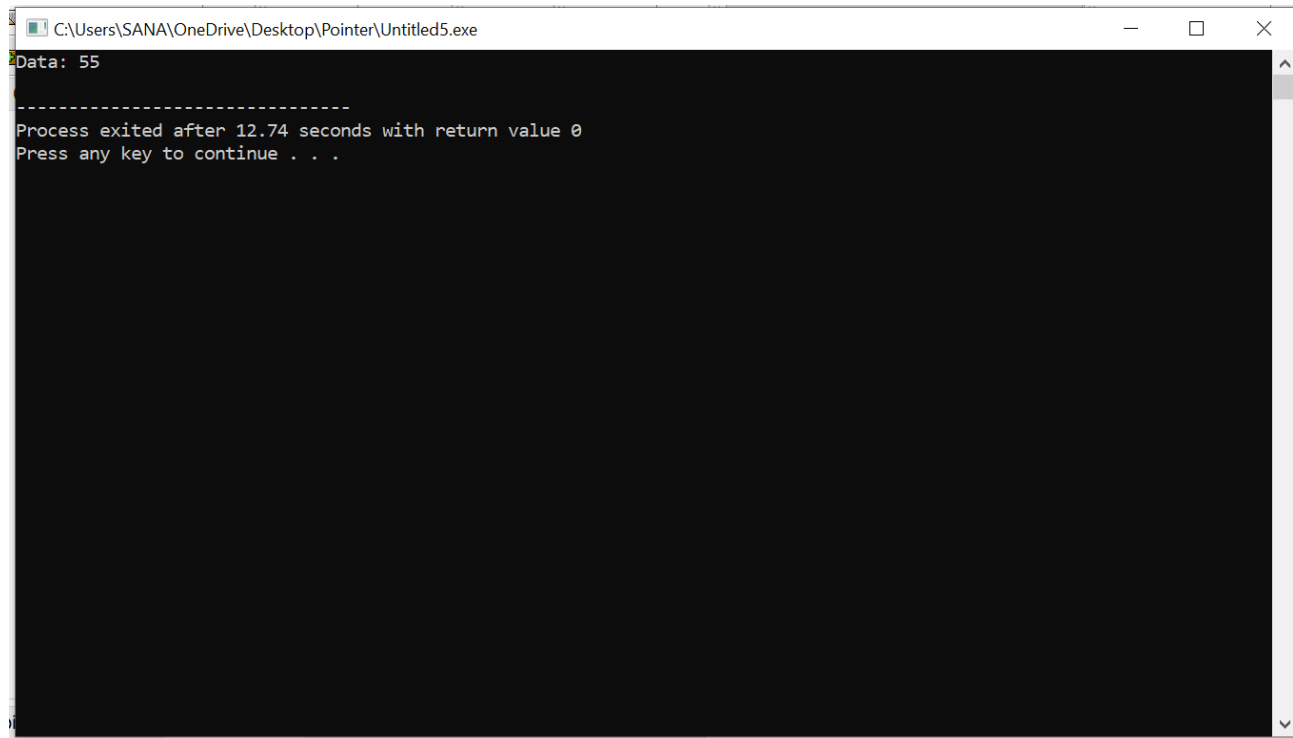
```
    MyClass obj;
```

```
    MyClass* ptr = &obj;
```

```
ptr->data = 55;
ptr->printData();

return 0;
}
```

Output:



```
C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe
Data: 55
-----
Process exited after 12.74 seconds with return value 0
Press any key to continue . . .
```

Problem: 15

```
#include <iostream>
```

```
class Base {
public:
    virtual void show() {
        std::cout << "This is the Base class." << std::endl;
    }
}
```



```
};
```

```
class Derived : public Base {
```

```
public:
```

```
    void show() override {
```

```
        std::cout << "This is the Derived class." << std::endl;
```

```
    }
```

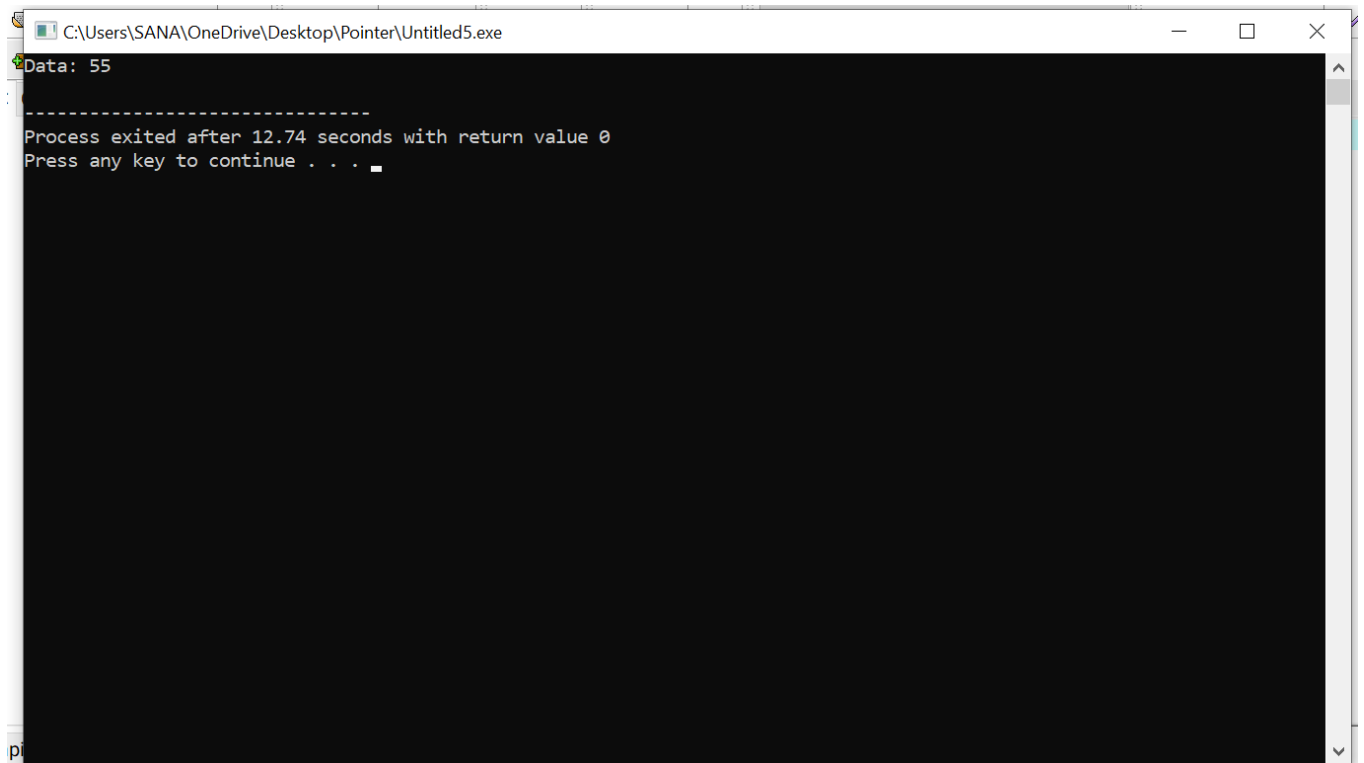
```
};
```

```
int main() {
```

```
    Base baseObj;
```

```
    Derived derivedObj;
```

Output:



The screenshot shows a Windows command prompt window titled "C:\Users\SANA\OneDrive\Desktop\Pointer\Untitled5.exe". The output text is as follows:

```
Data: 55
-----
Process exited after 12.74 seconds with return value 0
Press any key to continue . . .
```