DSA_LAB ASSIGNMENT

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DATE:	11-09-2023
SUBIECT:	DATA STR.LAB
SECTION:	“A”

COMSATS,VEHARI CAMPUS

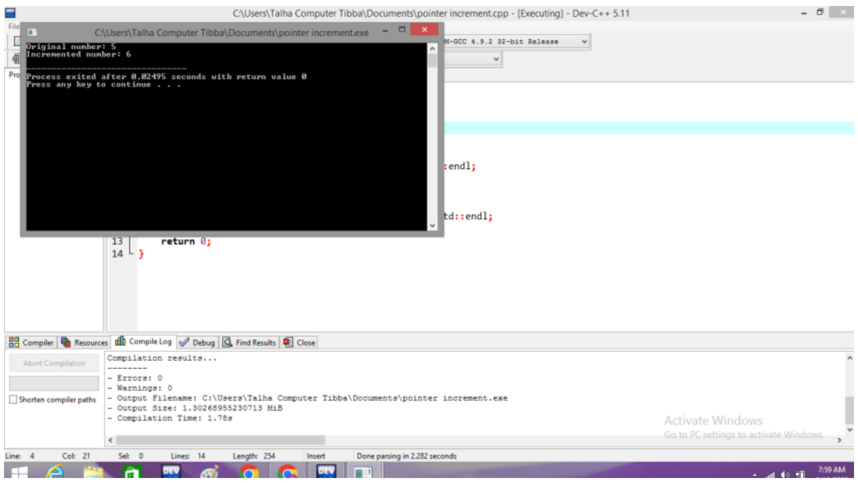
Program No: 1

Pointer Increment

Input:

```
#include <iostream>


int main() {
    int number = 5;
    int *ptr = &number;


    std::cout << "Original number: " << number << std::endl;


    (*ptr)++;


    std::cout << "Incremented number: " <<
number << std::endl;


    return 0;
}
```

Output:



C:\Users\Talha Computer Tibba\Documents\pointer increment.cpp - [Executing] - Dev-C++ 5.11

C:\Users\Talha Computer Tibba\Documents\pointer increment.exe

```
Original number: 5
Incremented number: 6

--------------------------------
Process exited after 0.02495 seconds with return value 0
Press any key to continue . . .
```

```
    return 0;
}
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\pointer increment.exe
- Output Size: 1.30268955230713 MiB
- Compilation Time: 1.78s
```

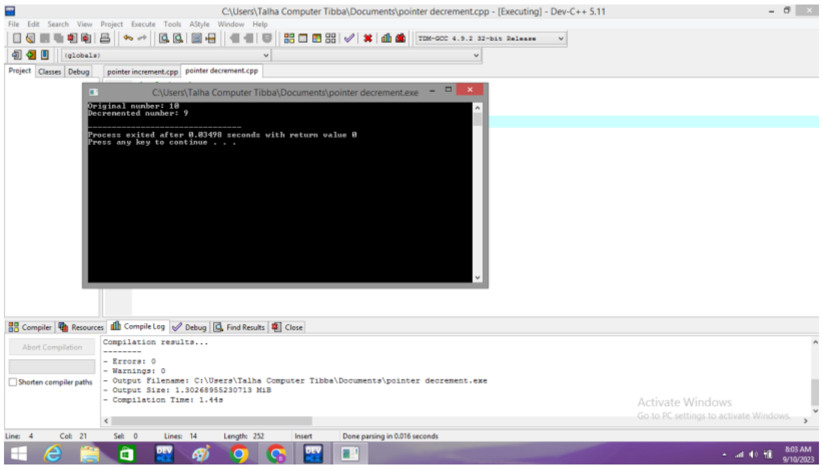
Program No:2

Pointer Decrement

Input:

```
#include <iostream>

int main() {
    int number = 10;
    int *ptr = &number;

    std::cout << "Original number: " << number << std::endl;

    (*ptr)--;

    std::cout << "Decremented number: " << number << std::endl;

    return 0;
}
```

Output:


C:\Users\Talha Computer Tibba\Documents\pointer decrement.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
(globals)
Project Classes Debug
pointer increment.cpp pointer decrement.cpp
C:\Users\Talha Computer Tibba\Documents\pointer decrement.exe
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Line: 4 Col: 21 Sel: 0 Lines: 14 Length: 252 Insert Done parsing in 0.016 seconds
Activate Windows
Go to PC settings to activate Windows.
8:03 AM
9/10/2023

```
Original number: 10
Decremented number: 9

--------------------------------
Process exited after 0.03498 seconds with return value 0
Press any key to continue . . .
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\pointer decrement.exe
- Output Size: 1.30268955230713 MiB
- Compilation Time: 1.44s
```

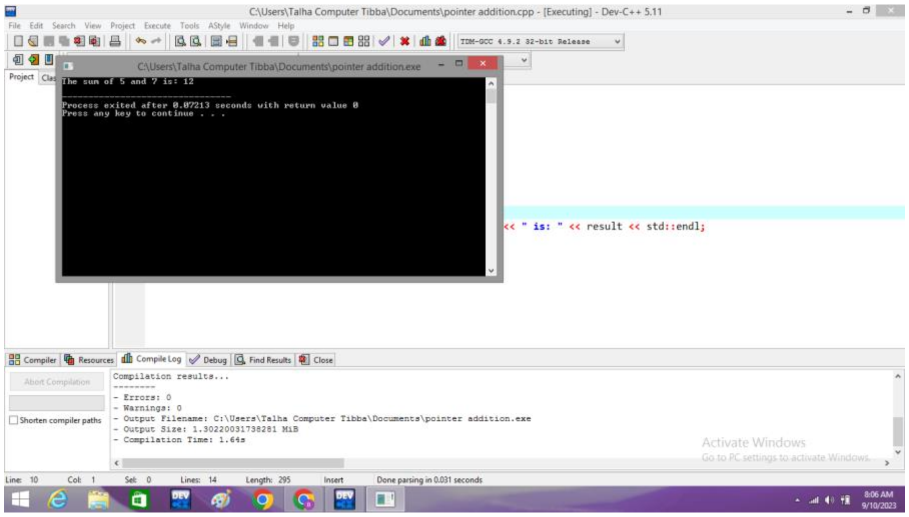
Program No:3

Pointer Arithmetic for DS

Input:

```
#include <iostream>

int main() {
    int num1 = 10;
    int num2 = 4;
    int result;
    int *ptr1 = &num1;
    int *ptr2 = &num2;

    result = (*ptr1) + (*ptr2);
    std::cout << "Addition: " << *ptr1 << " + " << *ptr2 << " = " << result << std::endl;

    result = (*ptr1) - (*ptr2);
    std::cout << "Subtraction: " << *ptr1 << " - " << *ptr2 << " = " << result << std::endl;

    result = (*ptr1) * (*ptr2);
    std::cout << "Multiplication: " << *ptr1 << " * " << *ptr2 << " = " << result << std::endl;

    if (*ptr2 != 0) {
        result = (*ptr1) / (*ptr2);
        std::cout << "Division: " << *ptr1 << " / " << *ptr2 << " = " << result << std::endl;
    } else {
        std::cout << "Division by zero is not allowed." << std::endl;
    } return 0;}
```

Output:



C:\Users\Talha Computer Tibba\Documents\pointer addition.cpp - [Executing] - Dev-C++ 5.11

C:\Users\Talha Computer Tibba\Documents\pointer addition.exe

```
The sum of 5 and 7 is: 12

--------------------------------
Process exited after 0.07213 seconds with return value 0
Press any key to continue . . .
```

```
<< " is: " << result << std::endl;
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\pointer addition.exe
- Output Size: 1.30220031738281 MiB
- Compilation Time: 1.64s
```

File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
Project Clas
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Activate Windows
Go to PC settings to activate Windows.
Line: 10 Col: 1 Sel: 0 Lines: 14 Length: 295 Insert Done parsing in 0.031 seconds
8:06 AM
9/10/2023

Program No:4

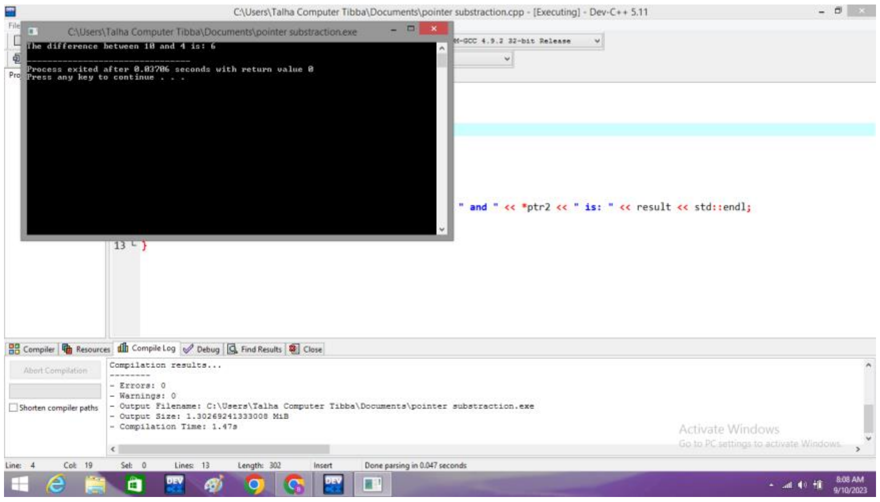
Pointer Arithmetic with struct and classes

Input:

```
#include <iostream>

struct ArithmeticStruct {
    int num1;
    int num2;
    ArithmeticStruct(int n1, int n2) : num1(n1), num2(n2) {}

    int add() const {
        return num1 + num2;
    }

    int subtract() const {
        return num1 - num2;
    }

    int multiply() const {
        return num1 * num2;
    }

    int divide() const {
        if (num2 != 0) {
            return num1 / num2;
        } else {
            std::cout << "Division by zero is not allowed." << std::endl;
            return 0;
        }
    }
};

class ArithmeticClass {
private:
    int num1;
    int num2;

public:

    ArithmeticClass(int n1, int n2) : num1(n1), num2(n2) {}

    int add() const {
        return num1 + num2;
    }

    int subtract() const {
        return num1 - num2;
    }

    int multiply() const {
        return num1 * num2;
    }

    int divide() const {
        if (num2 != 0) {
            return num1 / num2;
        } else {
            std::cout << "Division by zero is not allowed." << std::endl;
            return 0;
        }
    }
};
```

```
int main() {

    ArithmeticStruct structInstance(10, 4);
    ArithmeticClass classInstance(10, 4);

    const ArithmeticStruct* structPtr = &structInstance;
    const ArithmeticClass* classPtr = &classInstance;

    std::cout << "Using struct:" << std::endl;
    std::cout << "Addition: " << structPtr->add() << std::endl;
    std::cout << "Subtraction: " << structPtr->subtract() << std::endl;
    std::cout << "Multiplication: " << structPtr->multiply() << std::endl;
    std::cout << "Division: " << structPtr->divide() << std::endl;

    std::cout << "\nUsing class:" << std::endl;
    std::cout << "Addition: " << classPtr->add() << std::endl;
    std::cout << "Subtraction: " << classPtr->subtract() << std::endl;
    std::cout << "Multiplication: " << classPtr->multiply() << std::endl;
    std::cout << "Division: " << classPtr->divide() << std::endl;

    return 0;
}
```

Output:



```
C:\Users\Talha Computer Tibba\Documents\pointer substraction.cpp - [Executing] - Dev-C++ 5.11
```

```
The difference between 10 and 4 is: 6
--------------------------------
Process exited after 0.03706 seconds with return value 0
Press any key to continue . . .
```

```
" and " << *ptr2 << " is: " << result << std::endl;
}
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\pointer substraction.exe
- Output Size: 1.30269241333008 MiB
- Compilation Time: 1.47s
```

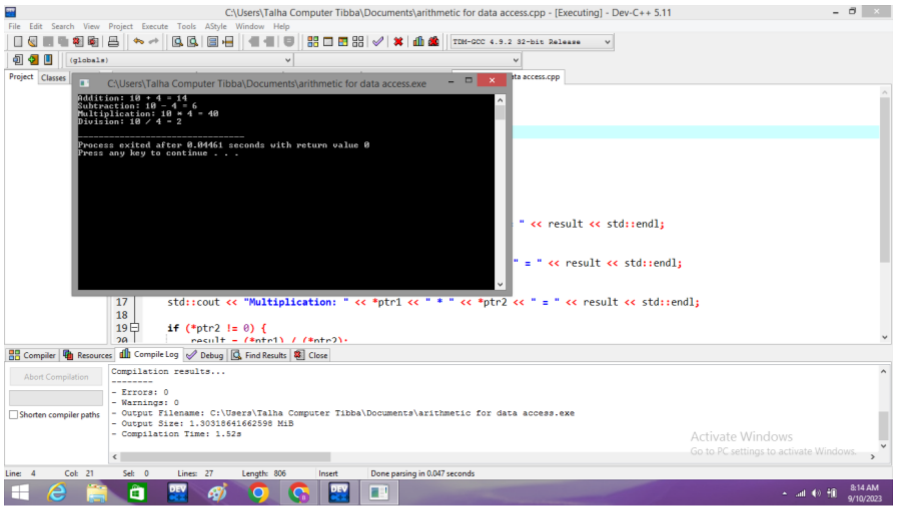
Program No:5

Pointer Arithmetic for byte level manipulation

Input:

```
#include <iostream>


int main() {
    int* dynamicArray;
    int arraySize;


    std::cout << "Enter the size of the dynamically allocated array: ";
    std::cin >> arraySize;
    dynamicArray = new int[arraySize];


    for (int i = 0; i < arraySize; ++i) {
        dynamicArray[i] = i * 2;
    }
    for (int i = 0; i < arraySize; ++i) {
        dynamicArray[i] *= 3;
    }
    std::cout << "Arithmetic operations on the dynamically allocated array:" << std::endl;
    for (int i = 0; i < arraySize; ++i) {
        std::cout << dynamicArray[i] << " ";
    }
    std::cout << std::endl;
    delete[] dynamicArray;

    return 0;
```

Output:



```
C:\Users\Talha Computer Tibba\Documents\arithmetic for data access.exe
Addition: 10 + 4 = 14
Subtraction: 10 - 4 = 6
Multiplication: 10 * 4 = 40
Division: 10 / 4 = 2

--------------------------------
Process exited after 0.04461 seconds with return value 0
Press any key to continue . . .
```

```
std::cout << "Multiplication: " << *ptr1 << " * " << *ptr2 << " = " << result << std::endl;

if (*ptr2 != 0) {
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\arithmetic for data access.exe
- Output Size: 1.30318641662598 MiB
- Compilation Time: 1.52s
```

C:\Users\Talha Computer Tibba\Documents\arithmetic for data access.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Line: 4 Col: 21 Sel: 0 Lines: 27 Length: 806 Insert Done parsing in 0.047 seconds
8:14 AM 9/10/2023

Program No:6

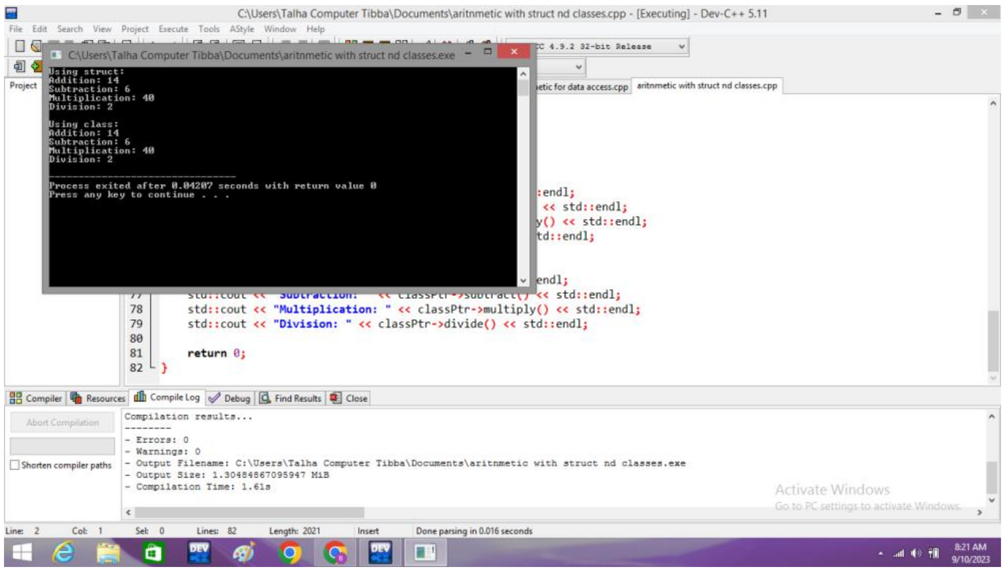
Pointer Arithmetic for dynamic memoryallocation

Input:

```
#include <iostream>
```

```
int main() {
    int num1 = 5;
    int num2 = 7;


    int* ptr1 = &num1;
    int* ptr2 = &num2;


    if (ptr1 == ptr2) {
        std::cout << "ptr1 and ptr2 point to the same address." << std::endl;
    } else {
        std::cout << "ptr1 and ptr2 point to different addresses." << std::endl;
```

Output:



C:\Users\Talha Computer Tibba\Documents\aritnmetic with struct nd classes.cpp - [Executing] - Dev-C++ 5.11

C:\Users\Talha Computer Tibba\Documents\aritnmetic with struct nd classes.exe

```
Using struct:
Addition: 14
Subtraction: 6
Multiplication: 40
Division: 2

Using class:
Addition: 14
Subtraction: 6
Multiplication: 40
Division: 2

--------------------------------
Process exited after 0.04207 seconds with return value 0
Press any key to continue . . .
```

```
    std::cout << "Multiplication: " << classPtr->multiply() << std::endl;
    std::cout << "Division: " << classPtr->divide() << std::endl;

    return 0;
}
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\aritnmetic with struct nd classes.exe
- Output Size: 1.30484867095947 MiB
- Compilation Time: 1.61s
```

Compiler
Resources
Compile Log
Debug
Find Results
Close
Line: 2 Col: 1 Sel: 0 Lines: 82 Length: 2021 Insert Done parsing in 0.016 seconds
8:21 AM
9/10/2023

Program No:7

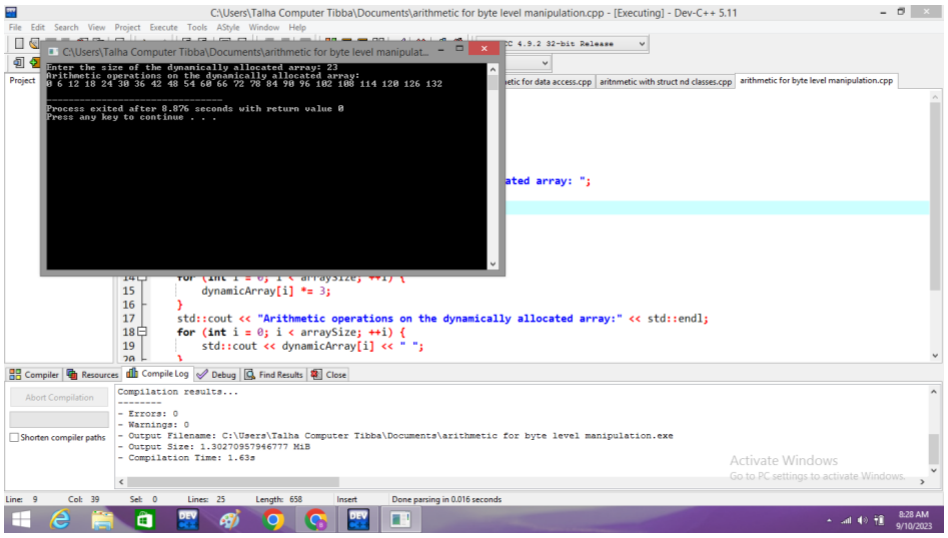
Pointer Comparison

Input:

```
#include <iostream>
```

```
int main() {
    int number = 10;
    int *ptr = &number;
    std::cout << "Original number: " << number << std::endl;
    std::cout << "Address of number: " << ptr << std::endl;
    *ptr = 20;
    std::cout << "Modified number: " << number << std::endl;
    std::cout << "Address of number: " << ptr << std::endl;

    return 0;}
```

Output:



C:\Users\Talha Computer Tibba\Documents\arithmetic for byte level manipulation.cpp - [Executing] - Dev-C++ 5.11

```
Enter the size of the dynamically allocated array: 23
Arithmetic operations on the dynamically allocated array:
0 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96 102 108 114 120 126 132

--------------------------------
Process exited after 8.876 seconds with return value 0
Press any key to continue . . .
```

```
        dynamicArray[i] *= 3;
    }
    std::cout << "Arithmetic operations on the dynamically allocated array:" << std::endl;
    for (int i = 0; i < arraySize; ++i) {
        std::cout << dynamicArray[i] << " ";
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\arithmetic for byte level manipulation.exe
- Output Size: 1.30270957946777 MiB
- Compilation Time: 1.63s
```

File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
aritnmetic with struct nd classes.cpp
arithmetic for byte level manipulation.cpp
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Line: 9 Col: 39 Sel: 0 Lines: 25 Length: 658 Insert Done parsing in 0.016 seconds
Activate Windows
Go to PC settings to activate Windows.
8:28 AM 9/10/2023

Program No:8

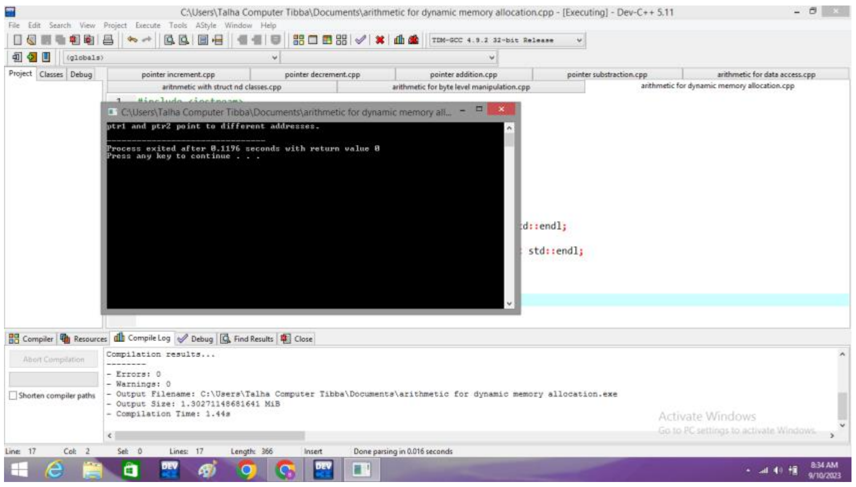
Pointer Addition

Input:

```
#include <iostream>
```

```
int main() {
    int num1 = 5;
    int num2 = 7;
    int result;
    int *ptr1 = &num1;
    int *ptr2 = &num2;
    result = (*ptr1) + (*ptr2);

    std::cout << "The sum of " << *ptr1 << " and " << *ptr2 << " is: " << result << std::endl;

    return 0;}
```

Output:



C:\Users\Talha Computer Tibba\Documents\arithmetic for dynamic memory allocation.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
(globals)
Project Classes Debug
pointer increment.cpp
pointer decrement.cpp
pointer addition.cpp
pointer substraction.cpp
arithmetic for data access.cpp
aritnmetic with struct nd classes.cpp
arithmetic for byte level manipulation.cpp
arithmetic for dynamic memory allocation.cpp
C:\Users\Talha Computer Tibba\Documents\arithmetic for dynamic memory all...
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Line: 17 Col: 2 Sel: 0 Lines: 17 Length: 366 Insert Done parsing in 0.016 seconds
Activate Windows
Go to PC settings to activate Windows.
8:34 AM
9/10/2023

```
ptr1 and ptr2 point to different addresses.

--------------------------------
Process exited after 0.1196 seconds with return value 0
Press any key to continue . . .
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\arithmetic for dynamic memory allocation.exe
- Output Size: 1.30271148681641 MiB
- Compilation Time: 1.44s
```

Program No:9

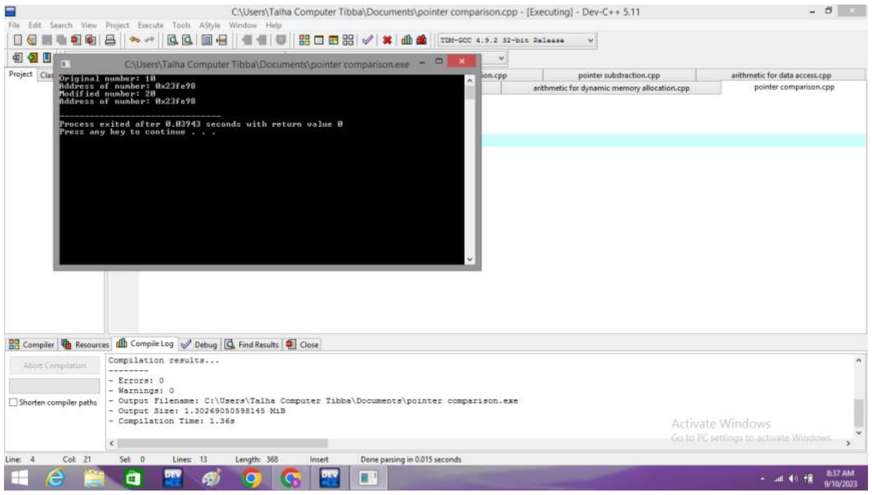
Pointer Substraction

Input:

```
#include <iostream>
```

```
int main() {
   int num1 = 10;
   int num2 = 4;
   int result;
   int *ptr1 = &num1;
   int *ptr2 = &num2;
   result = (*ptr1) - (*ptr2);
   std::cout << "The difference between " << *ptr1 << " and " << *ptr2 << " is: " << result <<
std::endl;


   return 0;
}
```

Output:



C:\Users\Talha Computer Tibba\Documents\pointer comparison.exe

```
Original number: 10
Address of number: 0x23fe98
Modified number: 20
Address of number: 0x23fe98

--------------------------------
Process exited after 0.03943 seconds with return value 0
Press any key to continue . . .
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\pointer comparison.exe
- Output Size: 1.30269050598145 MiB
- Compilation Time: 1.36s
```

C:\Users\Talha Computer Tibba\Documents\pointer comparison.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
pointer substraction.cpp
arithmetic for data access.cpp
arithmetic for dynamic memory allocation.cpp
pointer comparison.cpp
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Line: 4 Col: 21 Sel: 0 Lines: 13 Length: 368 Insert Done parsing in 0.015 seconds
8:37 AM 9/10/2023

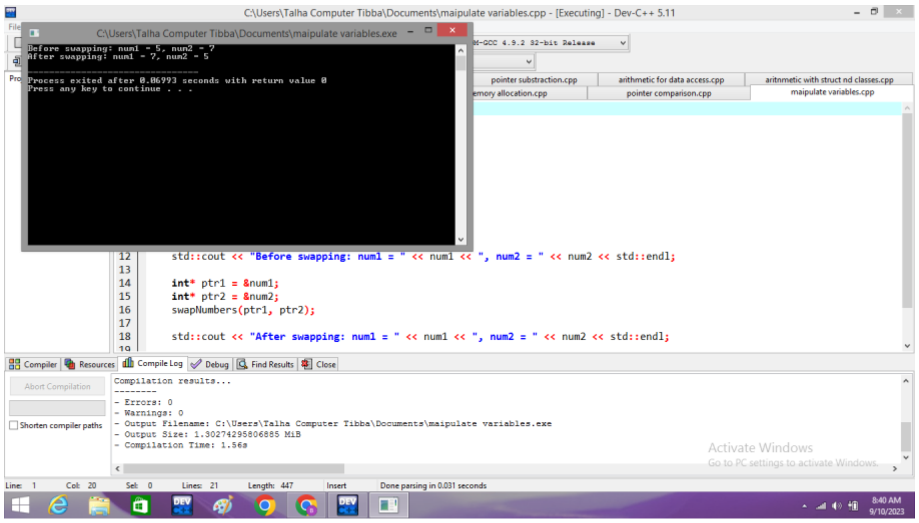
Program No:10

Input:

```
#include <iostream>
void swapNumbers(int* a, int* b) {
   int temp = *a;
```

```cpp
    *a = *b;
    *b = temp;
}

int main() {
    int num1 = 5;
    int num2 = 7;

    std::cout << "Before swapping: num1 = " << num1 << ", num2 = " << num2 << std::endl;

    int* ptr1 = &num1;
    int* ptr2 = &num2;
    swapNumbers(ptr1, ptr2);

    std::cout << "After swapping: num1 = " << num1 << ", num2 = " << num2 << std::endl;

    return 0;
}
```

Output:



C:\Users\Talha Computer Tibba\Documents\maipulate variables.cpp - [Executing] - Dev-C++ 5.11

C:\Users\Talha Computer Tibba\Documents\maipulate variables.exe

```
Before swapping: num1 = 5, num2 = 7
After swapping: num1 = 7, num2 = 5

--------------------------------
Process exited after 0.06993 seconds with return value 0
Press any key to continue . . .
```

```cpp
    std::cout << "Before swapping: num1 = " << num1 << ", num2 = " << num2 << std::endl;

    int* ptr1 = &num1;
    int* ptr2 = &num2;
    swapNumbers(ptr1, ptr2);

    std::cout << "After swapping: num1 = " << num1 << ", num2 = " << num2 << std::endl;
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\maipulate variables.exe
- Output Size: 1.30274295806885 MiB
- Compilation Time: 1.56s
```

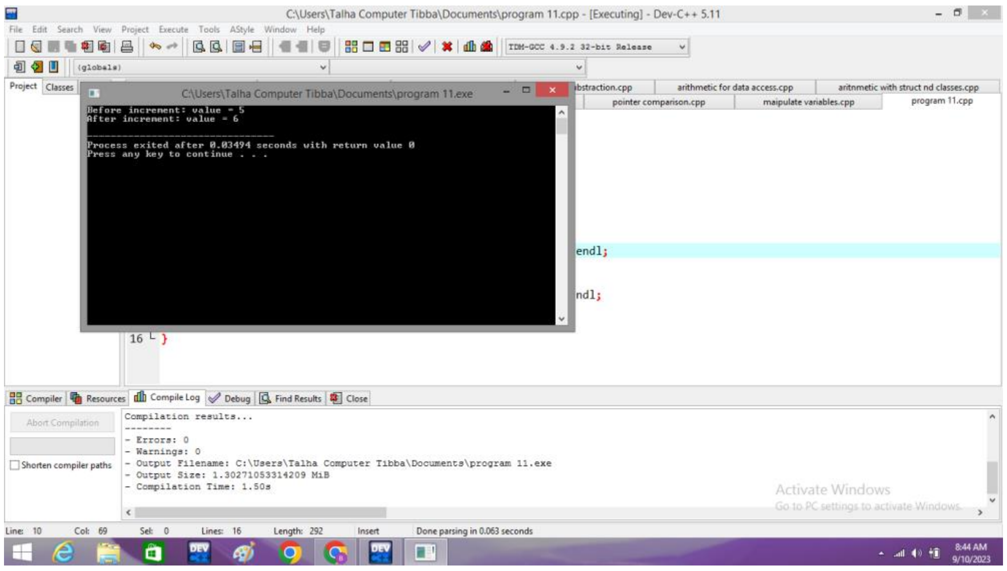
Line: 1   Col: 20   Sel: 0   Lines: 21   Length: 447   Insert   Done parsing in 0.031 seconds

Program No:11

Input:

```
#include <iostream>

void increment(int* num) {
    (*num)++;
}

int main() {
    int value = 5;

    std::cout << "Before increment: value = " << value << std::endl;
    increment(&value);

    std::cout << "After increment: value = " << value << std::endl;

    return 0;
}
```

Output:


C:\Users\Talha Computer Tibba\Documents\program 11.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 32-bit Release
(globals)
Project Classes
C:\Users\Talha Computer Tibba\Documents\program 11.exe
bstraction.cpp
arithmetic for data access.cpp
aritnmetic with struct nd classes.cpp
pointer comparison.cpp
maipulate variables.cpp
program 11.cpp
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Activate Windows
Go to PC settings to activate Windows.
Line: 10 Col: 69 Sel: 0 Lines: 16 Length: 292 Insert Done parsing in 0.063 seconds
8:44 AM
9/10/2023

```
Before increment: value = 5
After increment: value = 6

--------------------------------
Process exited after 0.03494 seconds with return value 0
Press any key to continue . . .
```

```
endl;

ndl;
}
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\program 11.exe
- Output Size: 1.30271053314209 MiB
- Compilation Time: 1.50s
```

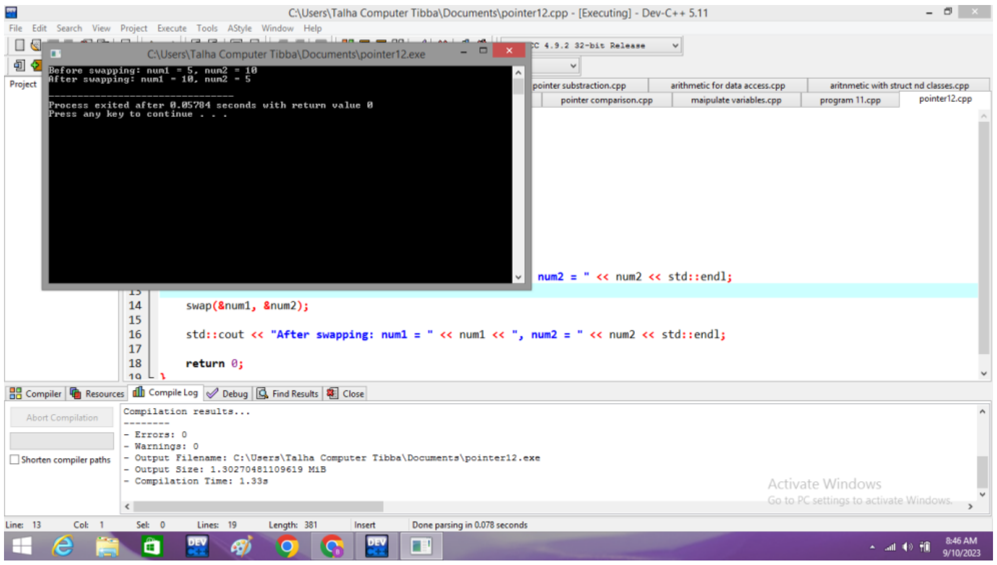
Program No:12

Input:

```
#include <iostream>


void swap(int* a, int* b) {

   int temp = *a;

   *a = *b;

   *b = temp;

}


int main() {

   int num1 = 5, num2 = 10;
```

```cpp
    std::cout << "Before swapping: num1 = " << num1 << ", num2 = " << num2 << std::endl;

    swap(&num1, &num2);

    std::cout << "After swapping: num1 = " << num1 << ", num2 = " << num2 << std::endl;

    return 0;
}
```

Output:



```
Before swapping: num1 = 5, num2 = 10
After swapping: num1 = 10, num2 = 5

--------------------------------
Process exited after 0.05784 seconds with return value 0
Press any key to continue . . .
```

```
num2 = " << num2 << std::endl;

    swap(&num1, &num2);

    std::cout << "After swapping: num1 = " << num1 << ", num2 = " << num2 << std::endl;

    return 0;
}
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\pointer12.exe
- Output Size: 1.30270481109619 MiB
- Compilation Time: 1.33s
```

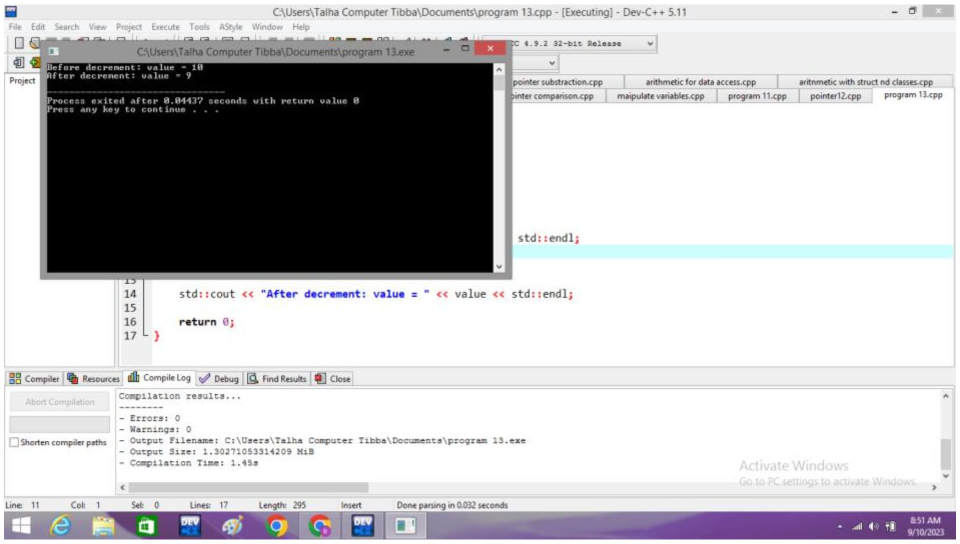
C:\Users\Talha Computer Tibba\Documents\pointer12.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
C:\Users\Talha Computer Tibba\Documents\pointer12.exe
pointer substraction.cpp
arithmetic for data access.cpp
aritnmetic with struct nd classes.cpp
pointer comparison.cpp
maipulate variables.cpp
program 11.cpp
pointer12.cpp
Compiler
Resources
Compile Log
Debug
Find Results
Close
Abort Compilation
Shorten compiler paths
Line: 13 Col: 1 Sel: 0 Lines: 19 Length: 381 Insert Done parsing in 0.078 seconds
Activate Windows
Go to PC settings to activate Windows.
8:46 AM
9/10/2023

Program No:13

Input:

```
#include <iostream>


void decrement(int* num) {
    (*num)--;
}


int main() {
    int value = 10;


    std::cout << "Before decrement: value = " << value << std::endl;


    decrement(&value);


    std::cout << "After decrement: value = " << value << std::endl; return 0;
```

Output:



C:\Users\Talha Computer Tibba\Documents\program 13.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
C:\Users\Talha Computer Tibba\Documents\program 13.exe
pointer substraction.cpp
arithmetic for data access.cpp
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pointer comparison.cpp
maipulate variables.cpp
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program 13.cpp
Compiler
Resources
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Shorten compiler paths
Activate Windows
Go to PC settings to activate Windows.

```
Before decrement: value = 10
After decrement: value = 9

--------------------------------
Process exited after 0.04437 seconds with return value 0
Press any key to continue . . .
```

```
    std::endl;

    std::cout << "After decrement: value = " << value << std::endl;

    return 0;
}
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\program 13.exe
- Output Size: 1.30271053314209 MiB
- Compilation Time: 1.45s
```

Line: 11   Col: 1   Sel: 0   Lines: 17   Length: 295   Insert   Done parsing in 0.032 seconds

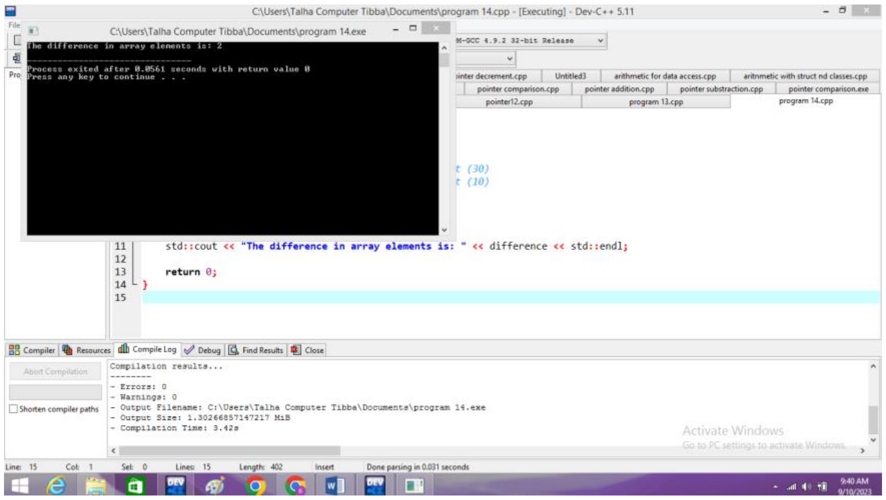
8:51 AM 9/10/2023

Program No:14

Input:

```
#include <iostream>


int main() {
    int arr[] = {10, 20, 30, 40, 50};
    int* ptr1 = &arr[2]; // Points to the third element (30)
    int* ptr2 = &arr[0]; // Points to the first element (10)


    // Calculate the difference between ptr1 and ptr2
    int difference = ptr1 - ptr2;


    std::cout << "The difference in array elements is: " << difference << std::endl;


    return 0;
}
```

Output:



C:\Users\Talha Computer Tibba\Documents\program 14.cpp - [Executing] - Dev-C++ 5.11

C:\Users\Talha Computer Tibba\Documents\program 14.exe

```
The difference in array elements is: 2

--------------------------------
Process exited after 0.0561 seconds with return value 0
Press any key to continue . . .
```

```
    std::cout << "The difference in array elements is: " << difference << std::endl;

    return 0;
}
```

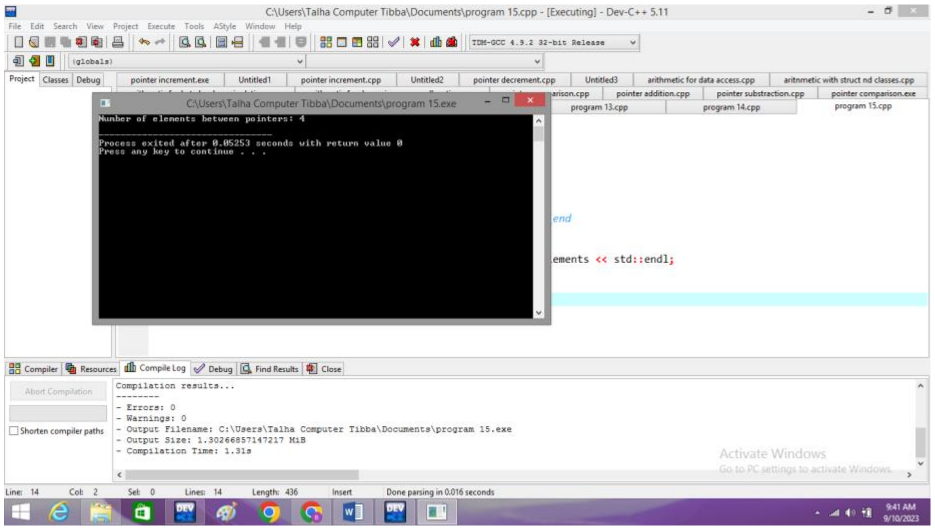
```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\program 14.exe
- Output Size: 1.30266857147217 MiB
- Compilation Time: 3.42s
```

Program No:15

Input:

```
#include <iostream>


int main() {
   int arr[] = {1, 2, 3, 4, 5};
   int* ptr_start = &arr[1]; // Points to the second element (2)
   int* ptr_end = &arr[4];   // Points to the fifth element (5)


   // Calculate the number of elements between ptr_start and ptr_end
   int num_elements = ptr_end - ptr_start + 1;


   std::cout << "Number of elements between pointers: " << num_elements << std::endl;


   return 0;
}
```

Output:



```
Number of elements between pointers: 4

--------------------------------
Process exited after 0.05253 seconds with return value 0
Press any key to continue . . .
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\Talha Computer Tibba\Documents\program 15.exe
- Output Size: 1.30266857147217 MiB
- Compilation Time: 1.31s
```