Assignment Solution

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Section	D
Assignment No.	1

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Q1: Write a program to print the following text on the console screen.

Welcome to C++

CODE:

```cpp
#include<iostream>//header file of input output stream
using namespace std;
int main()//pre-defined function of c++
{


//console output
cout<<"Welcome to C++";


return 0;
}
```

OUTPUT:

```
Welcome to C++
--------------------------------
Process exited after 0.05088 seconds with return value 0
Press any key to continue . . .
```

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Q2: Using escape sequences to print the text in following fashion.

Welcome
to
C++

CODE:

```
#include<iostream>//header file of input output stream
using namespace std;
int main()//pre-defined function of c++
{


//console output
cout<<"Welcome"<<"\nto"<<"\nC++";//using escape sequence


return 0;
}
```

OUTPUT:

```
Welcome
to
C++
--------------------------------
Process exited after 0.05207 seconds with return value 0
Press any key to continue . . .
```

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Q3: Write a program that takes two integer numbers from the user and print their sum on console screen.

CODE:

```cpp
#include<iostream>//header file of input output stream
using namespace std;
int main()//pre-defined function of c++
{
//variable decleration
int num1,num2;


//input phase
cout<<"Enter first integer ";
cin>>num1;
cout<<"Enter second integer ";
cin>>num2;


//basic arithmetic operation
cout<<"Sum of above two integer inputs are "<<num1+num2<<endl;

return 0;
}
```

OUTPUT:

```
Enter first integer 5
Enter second integer 10
Sum of above two integer inputs are 15

--------------------------------
Process exited after 7.858 seconds with return value 0
Press any key to continue . . .
```

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Q4: What are Arithmetic operators? Write the rule of precedence for the Arithmetic operators.

ARITHMETIC OPERATORS:

Arithmetic operators are used to perform arithmetic operations on variables and data .Arithmetic operators compute the result of specific arithmetic operation and returns its result. The arguments are not modified. There are various arithmetic operators in C++.

- Addition(+)
- Sustration(-)
- Multiplication(*)
- Division(/)
- Modulo operator (%)

RULE OF PRECEDENCE IN ARITHEMETIC OPERATORS:

The order of precedence of arithmetic operators in C++ is:

- Multiplication (*), division (/), modulus (%)
- Addition(+),subtraction(-)

Q5: How C++ program is compiled into an executable?

C++ COMPILED INTO AN EXECUTABLE:

The compilation of a c++ program involves three steps:
Preprocessing: the preprocessor takes a C++ source code file and deals with the #includes, #define s and other preprocessor directives. Linking: the linker takes the object files produced by the compiler and produces either a library or an executable file.

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Q6: Write a program that take two numbers and operation to perform on those numbers as input from the user and print the result of operation on console screen.
(Hint: Use *if*-statements to identify the required operation)

CODE:

```
#include<iostream>//header file of input output stream
using namespace std;
int main()//pre-defined function of c++
{
//variable decleration
double num1,num2;
char operation;


//input phase
cout<<"Enter first operand ";
cin>>num1;

cout<<"Enter second operand ";
cin>>num2;

cout<<"enter operation ";
cin>>operation;

//decision making for operation
//if-if construct
if(operation=='+')
{
cout<<num1<<"+"<<num2<<"="<<num1+num2;
}

if(operation=='-')
{
cout<<num1<<"-"<<num2<<"="<<num1-num2;
}

if(operation=='/')
{
cout<<num1<<"/"<<num2<<"="<<num1/num2;
}

if(operation=='*')
{
cout<<num1<<"*"<<num2<<"="<<num1*num2;
}


return 0;
}
```

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OUTPUT:

```
Enter first operand 5
Enter second operand 2
enter operation *
5*2=10
--------------------------------
Process exited after 6.772 seconds with return value 0
Press any key to continue . . .
```

Q7: Write a program that asks user to enter two integers, obtains the numbers from the user,

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and then prints the larger number followed by the words "is larger." If the numbers are equal, print the message "These numbers are equal."

CODE:

```cpp
#include<iostream>//header file of input output stream
using namespace std;
int main()//pre-defined function of c++
{
//variable decleration
int num1,num2;

//input phase
cout<<"Enter first integer ";
cin>>num1;
cout<<"Enter second integer ";
cin>>num2;

//decision making for larger number
//if-if construct
if(num1>num2)
{
cout<<num1<<" is Larger";

}

if(num2>num1)
{
cout<<num2<<" is Larger";

}

if(num1==num2)
{
cout<<"These Numbers Are Equal";//for equal numbers

}
return 0;
}
```

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OUTPUT:

Output case 1:

```
Enter first integer 5
Enter second integer 9
9 is Larger
--------------------------------
Process exited after 4.938 seconds with return value 0
Press any key to continue . . .
```

Output case 2:

```
Enter first integer 5
Enter second integer 5
These Numbers Are Equal
--------------------------------
Process exited after 3.687 seconds with return value 0
Press any key to continue . . .
```

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Q8: Write a program that inputs three integers from the keyboard and prints the sum, average, product, smallest and largest of these numbers. The screen dialog should appear as follows:

```
Input three different integers: 13 27 14
Sum is 54
Average is 18
Product is 4914
Smallest is 13
Largest is 27
```

CODE:

```
#include<iostream>//header file of input output stream
using namespace std;
int main()//pre-defined function of c++
{
//variable decleration
int num1,num2,num3;


//input phase
cout<<"Input three different integers: ";
cin>>num1>>num2>>num3;


//Basic Arithmetic operation
cout<<"Sum is "<<num1+num2+num3<<endl;
cout<<"Average is "<<float(num1+num2+num3)/2<<endl;
cout<<"Product is  "<<num1*num2*num3<<endl;
//if-if construct

if(num1<num2&&num1<num3)
{
cout<<"Smallest is "<<num1<<endl;

}

if(num2<num1&&num2<num3)
{
cout<<"Smallest is "<<num2<<endl;

}

if(num3<num1&&num3<num2)
{
cout<<"Smallest is "<<num3<<endl;

```

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```
36  }
37
38  if(num1>num2&&num1>num3)
39  {
40  cout<<"Largest is "<<num1;
41
42  }
43
44  if(num2>num1&&num2>num3)
45  {
46  cout<<"Largest is "<<num2;
47
48  }
49
50  if(num3>num1&&num3>num2)
51  {
52  cout<<"Largest is "<<num3;
53
54  }
55  return 0;
56  }
```

OUTPUT:

```
Input three different integers: 13 27 14
Sum is 54
Average is 27
Product is  4914
Smallest is 13
Largest is 27
--------------------------------
Process exited after 16.9 seconds with return value 0
Press any key to continue . . .
```

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Q9: Write a program that reads an integer and determines and prints whether its odd or even.

CODE:

```
#include<iostream>//header file of input output stream
using namespace std;
int main()//pre-defined function of c++
{
//variable decleration
int num1;


//input phase
cout<<"Enter Any integer ";
cin>>num1;


//if-if construct

if(num1%2==0)
{
cout<<num1<<" is Even Number";

}

if(num1%2!=0)
{
cout<<num1<<" is Odd Number";

}

return 0;
}
```

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OUTPUT:

Output case 1:

```
Enter Any integer 5
5 is Odd Number
--------------------------------
Process exited after 3.177 seconds with return value 0
Press any key to continue . . .
```

Output case 2:

```
Enter Any integer 2
2 is Even Number
--------------------------------
Process exited after 3.881 seconds with return value 0
Press any key to continue . . .
```

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Q10: Write a program that inputs a five digit integer, separates the integer into its digit and prints them separated by three spaces each. For example, if the user types in 42339, the program should print:

4 2 3 3 9

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;
int main()
{
//variable decleration
int a;

//input phase
cout<<"Enter five digit integer ";
cin>>a;

//algorithm
cout<<a/10000<<"   ";
a=a%10000;
cout<<a/1000<<"   ";
a=a%1000;
cout<<a/100<<"   ";
a=a%100;
cout<<a/10<<"   ";
a=a%10;
cout<<a;
return 0;
}
```

OUTPUT:

```
Enter five digit number: 42339
4 2 3 3 9
--------------------------------
Process exited after 34.87 seconds with return value 0
Press any key to continue . . .
```

Q11: Develop a C++ program that uses a while statement to determine the gross pay for each of several employees. The company pays “straight time” for the first 40 hours worked by each

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employee and pays "time-and-a-half" for all hours worked in excess of 40 hours. You are given a list of the employees of the company, the number of hours each employee worked last week and the hourly rate of each employee.

Your program should input this information for each employee and should determine and display the employes gross pay.

Sample Output:

```
Enter hours worked (-1 to end): 39
Enter hourly rate of the employee: 10.00 Salary is
390.00 Rs.

Enter hours worked (-1 to end): 40
Enter hourly rate of the employee: 10.00 Salary is
400.00 Rs.

Enter hours worked (-1 to end): 41
Enter hourly rate of the employee: 10.00 Salary is
415.00 Rs.

Enter hours worked (-1 to end): -1
```

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CODE:

```
#include<iostream>//header file of input output stream
#include<iomanip>//header file for formatting
#include<conio.h>
using namespace std;
int main()//pre-defined function of c++
{
//variable decleration
double hoursworked,rate,pay;

//input phase
cout<<"Enter hours worked (-1 to end): ";
cin>>hoursworked;

//while loop
while(hoursworked>=0)
{
cout<<"Enter hourly rate of the employee: ";
cin>>rate;

//if-if construct

if(hoursworked<=40)
{
pay=(hoursworked*rate);
}

if(hoursworked>40)
{
pay=(40*rate)+((hoursworked-40)*(rate*1.5));
}
//showing result

cout<<"Salary is  "<<fixed<<setprecision(2)<<pay<< " Rs"<<endl;
cout<<"\nEnter hours worked (-1 to end): ";//manipulation
cin>>hoursworked;
}
getch();//to pause the program
return 0;
}//end of main function
```

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OUTPUT:

```
Enter hours worked (-1 to end): 39
Enter hourly rate of the emolyee: 10.00
Salary is  390.00 Rs

Enter hours worked (-1 to end): 40
Enter hourly rate of the emolyee: 10.00
Salary is  400.00 Rs

Enter hours worked (-1 to end): 41
Enter hourly rate of the emolyee: 10.00
Salary is  415.00 Rs

Enter hours worked (-1 to end): -1
```

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Q12: Write a program that ask user to enter an integer number and evaluates its factorial. Your program should print the output as below,

```
Enter an integer : 5
5 x 4 x 3 x 2 x 1 = 120
```

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{

//variable decleration
int x,product;


//variable intialization
product=1;


//input phase
cout<<"Enter an integer : ";
cin>>x;


//factorial of an integer
//for loop
for(int i=x; i>=1; i--)
{
product=product*i;
cout<<i<<" * ";
}

cout<<"\b\b= "<<product;
return 0;
}//end of main function
```

OUTPUT:

```
Enter an integer : 5
5 * 4 * 3 * 2 * 1 = 120
--------------------------------
Process exited after 2.682 seconds with return value 0
Press any key to continue . . .
```

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Q13: Write a program that ask user to input the number of elements in a Fibonacci sequence and then generates a Fibonacci sequence up-to the given number of elements.
(Hint: In Fibonacci sequence, the next element is the sum of two previous values)

Sample Output:

Enter number of elements: 10 0 1 1 2
3 5 8 13 21 34

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
int sum,newterm,prevterm,x;

//variable intialization
newterm=1;
prevterm=0;

//input phase
cout<<"Enter number of elements : ";
cin>>x;

//generating fibbonacci series
cout<<prevterm<<" ";

//for loop
for(int i=2; i<=x; ++i)
{
cout<<newterm<<" ";
sum=newterm+prevterm;
prevterm=newterm;
newterm=sum;
}
return 0;
}
```

OUTPUT:

```
Enter number of elements : 10
0 1 1 2 3 5 8 13 21 34
--------------------------------
Process exited after 2.604 seconds with return value 0
Press any key to continue . . .
```

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Q14: Write a program that reads three non-zero double values and determines and prints whether they could represents sides of triangle.

[Hint: *a*,*b* and *c* represents sides of triangle if following criteria is met,

$a + b > c$

$a + c > b$

$b + c > a$]

Sample Output:

Enter length of three sides: 3 4 5 They are
sides of triangle.

Enter length of three sides: 2 2 5 They are not
sides of triangle.

Enter length of three sides: 2.4 3.8 5.5 They are sides
of triangle.

CODE:

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```
#include <iostream>//header file for input output stream
using namespace std;
int main ()//pre-defined function of C++
{
//variable decleration
double a,b,c;
//for loop
for(int i=1;i<=3;++i)
{

//input phase
cout<<"Enter length of three sides: ";
cin>>a>>b>>c;

//decision making
if(((a+b)>c)&&((b+c)>a)&&((a+c)>b))
{
cout<<"They are sides of triangle.\n"<<endl<<endl;
}
else
{
cout<<"They are not sides of triangle.\n"<<endl<<endl;
}

}



return 0;
}//end of main function
```

OUTPUT:

```
Enter length of three sides: 3 4 5
They are sides of triangle.


Enter length of three sides: 2 2 5
They are not sides of triangle.


Enter length of three sides: 2.4 3.8 5.5
They are sides of triangle.



--------------------------------
Process exited after 21.05 seconds with return value 0
Press any key to continue . . .
```

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Q15: Write a program that reads three non-zero double values and determines and prints whether they are sides of right triangle. The program should verify the results up to 4 decimal places.
[Hint: Use Pythagoras theorem to determine whether the three sides form right triangle.]

Sample Output:

Enter length of three sides: 3 4 5 The sides represents right triangle.

Enter length of three sides: 4 5 6.403
The sides don't represents right triangle.

Enter length of three sides: 4 5 6.4031 The sides represents right triangle.

CODE:

```cpp
#include <iostream>//header file for input output stream
#include<cmath>//header file for advanced arithmetic functions
using namespace std;
int main ()//pre-defined function of C++
{
//variable decleration
double a,b,c;

//for loop
for(int i=1;i<=3;++i)
{
//input phase
cout<<"Enter length of three sides: ";
cin>>a>>b>>c;

//decision making
if((pow(a,2)==pow(b,2)+pow(c,2))||(pow(c,2)==pow(b,2)+pow(a,2))||(pow(b,2)==pow(a,2)+pow(c,2)))
{
cout<<"The sides represents right triangle.\n"<<endl<<endl;
}
else
{
cout<<"The sides don't represents right triangle.\n"<<endl<<endl;
}

}



return 0;//end of main function
}
```

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OUTPUT:

```
Enter length of three sides: 3 4 5
The sides represents right triangle.


Enter length of three sides: 4 5 6.403
The sides don't represents right triangle.


Enter length of three sides: 4 5 6.4031
The sides don't represents right triangle.


--------------------------------
Process exited after 39.98 seconds with return value 0
Press any key to continue . . .
```

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Q16: Write a program that ask user to input a floating point number and computes exponential of that number using Taylor series as below,

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

Also, prompt the user for desired accuracy of *e* (i.e., the number of terms in summation).

Sample Output:

Enter a value whose exponential needs to be evaluated: 1 Enter number of terms for evaluation: 20
Result is: 2.71828

CODE:

```cpp
#include<iostream>//header file for input output stream
#include<cmath>//header file for advanced arithmetic functions
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
double x;
int n;
int fact;
double exp;


//variable intialization
fact=1;
exp=1.0;

//input phase
cout<<"Enter a value whose exponential needs to be evaluated: ";
cin>>x;
cout<<"Enter number of terms for evaluation: ";
cin>>n;


//processing using for loop
for(int i=1;i<=n;i++)
{
fact=fact*i;
exp=exp+(pow(x,i))/fact;
}

//showing results
cout<<"Result is: "<<exp;

return 0;
}
```

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OUTPUT:

```
Enter a value whose exponential needs to be evaluated: 1
Enter number of terms for evaluation: 20
Result is: 2.71828
--------------------------------
Process exited after 45.72 seconds with return value 0
Press any key to continue . . .
```

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Q17: Write a program that ask user to input angle in radians and computes its sine using Taylor series as below,

$$\sin(x)=\sum_{n=0}^{\infty}\frac{(-1)^n}{(2n+1)!}x^{2n+1}$$

Also, prompt the user for desired accuracy of *sine*. (i.e., the number of terms in summation).

Sample Output:

Enter a value for sin evaluation: 2
Enter number of terms in the summation: 10 Result
is: 0.909297

CODE:

```cpp
#include<iostream>//header file for input output stream
#include<cmath>//header file for advanced arithmetic functions
using namespace std;
int main()
{
//variable decleration
double x,a,b;
int n;
int fact;
double sinx;

//variable intialization
fact=1;
sinx=0.0;

//input phase
cout<<"Enter a value for sine evaluation: ";
cin>>x;
cout<<"Enter number of terms in the summation: ";
cin>>n;

//processing using for loop
for(int i=1;i<=n;i++)
{
fact*=(2*i)+1;
a=pow(-1,i);
b=pow(x,((2*i)+1));
sinx=sinx+(a*b)/fact;

}

//showing results
cout<<"Result is: "<<sinx;

return 0;
```

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OUTPUT:

```
Enter a value for sine evaluation: 2
Enter number of terms in the summation: 10
Result is: -1.35772
--------------------------------

Process exited after 13.15 seconds with return value 0
Press any key to continue . . .
```

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Q18: Write a program that prints the following pattern as shown below,

```
*           **********  **********          *
**          *********    *********         **
***         ********      ********        ***
****        *******        *******       ****
*****       ******          ******      *****
******      *****            *****     ******
*******     ****              ****    *******
********    ***                ***     ********
*********   **                  **      *********
**********  *                    *      **********
```

You can make separate programs for all these four patterns. *Extra Credit*: If all the four patterns are printed in a single program.
[Hint: Use nested for loop].

FIRST PATTERN:

CODE:

```cpp
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
char star;
//variable intialization
star='*';
//nested for loop
for(int i=1; i<=10; ++i)//for ten rows
{
for(int j=1;j<=i; ++j)//for ten columns
{
cout<<star;
}
cout<<endl;
}
return 0;
}//ending of main function
```

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OUTPUT:

```
*
**
***
****
*****
******
*******
********
*********
**********
**********

--------------------------------
Process exited after 0.04541 seconds with return value 0
Press any key to continue . . .
```

SECOND PATTERN:

CODE:

```cpp
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
char star;
//variable intialization
star='*';
//nested for loop
for(int i=10; i>=1; --i)//for rows
{
for(int j=1; j<=i; ++j)//for columns
{
cout<<star;
}
cout<<endl;
}
return 0;
}
```

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OUTPUT:

```
**********
*********
********
*******
******
*****
****
***
**
*

--------------------------------
Process exited after 0.07436 seconds with return value 0
Press any key to continue . . .
```

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THIRD PATTERN:

CODE:

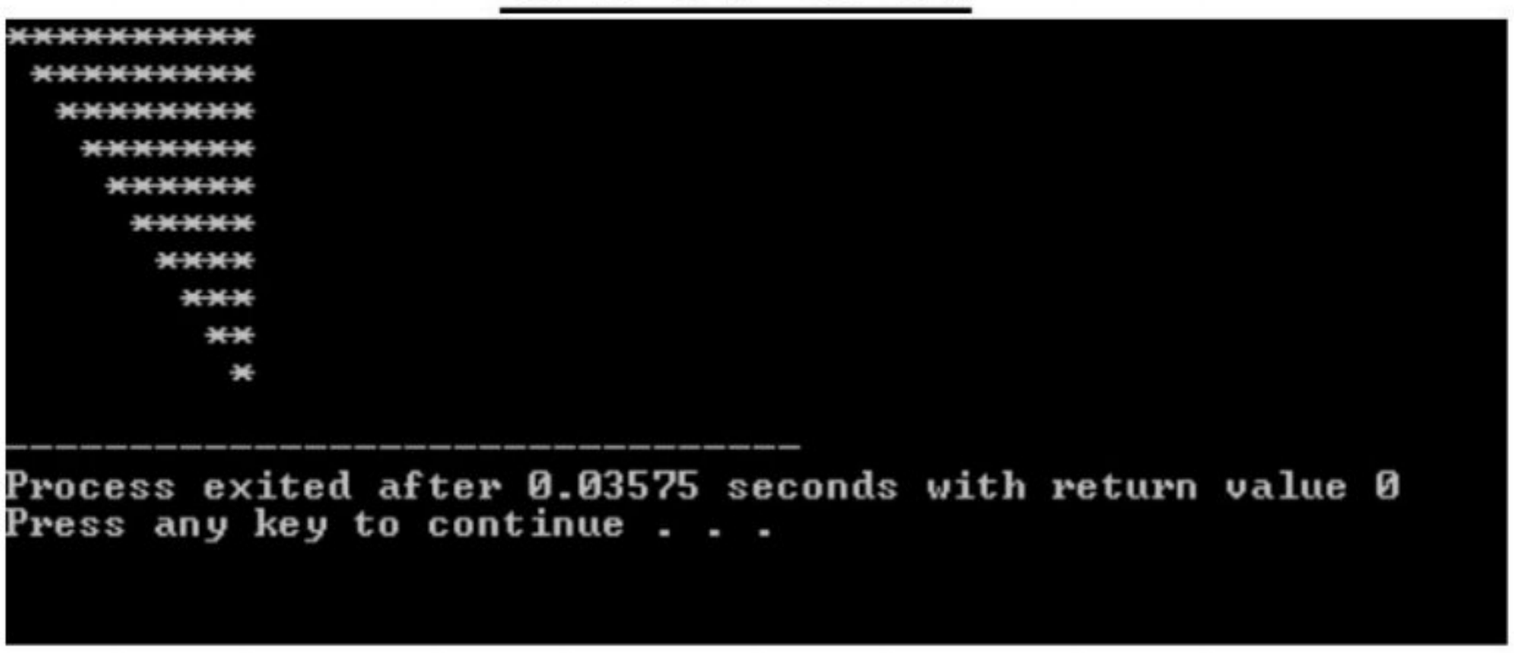
```
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
char star;

//variable intialization
star='*';

//nested for loop
for(int i=10; i>=1; --i)//for rows
{
for(int j=1; j<=10-i; ++j)//spaces for ten rows
{
cout<<" ";
}
for(int k=1; k<=i; ++k)//for columns
{
cout<<star;
}
cout<<endl;
}

return 0;
}//ending of main function
```

OUTPUT:



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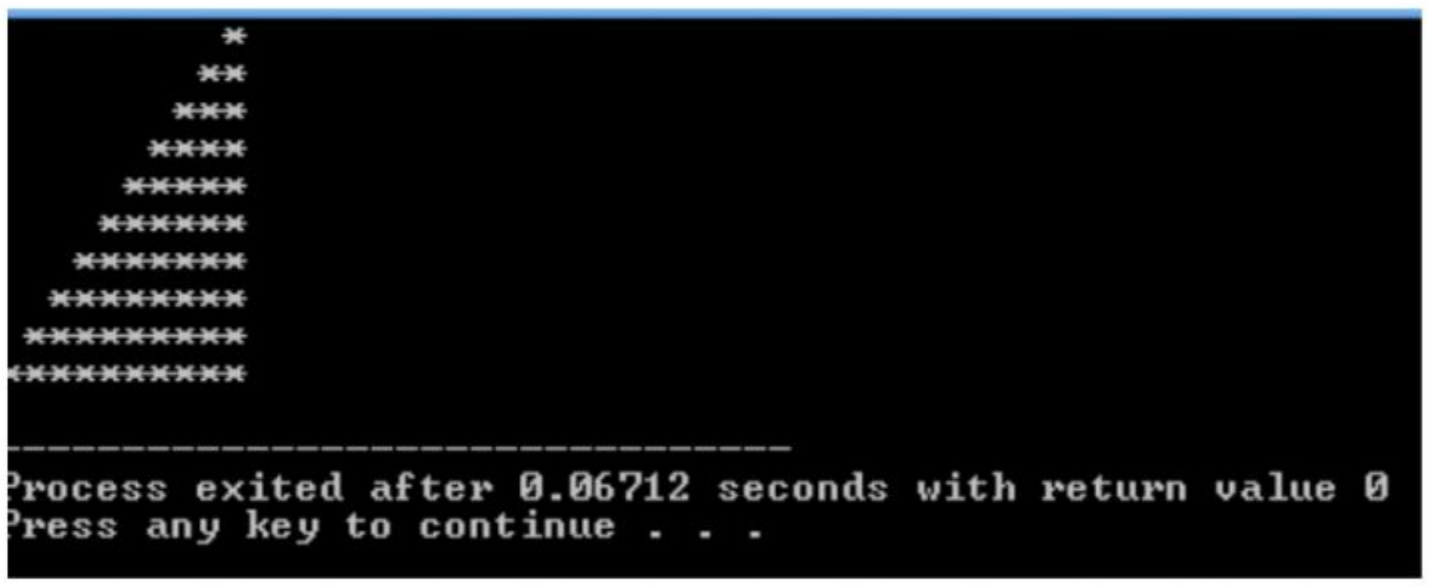
FOURTH PATTERN:

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
char star;
//variable intialization
star='*';
//nested for loop
for(int i=1; i<=10; ++i)//for rows
{
for(int j=1; j<=10-i; ++j)//for spaces in ten rows
{
cout<<" ";
}
for(int k=1; k<=i;++k)//for columns
{
cout<<star;
}
cout<<endl;
}

return 0;
}//ending of main function
```

OUTPUT:



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FOUR PATTERNS IN SINGLE PROGRAM :

CODE:

```
#include <iostream>
#include <cmath>
using namespace std;
int main()
{
 int row, column, space;

 for ( row = 1; row <= 10; ++row ) {


 for ( column = 1; column <= row; ++column )
cout << '*';

 for ( space = 1; space <= 10 - row; ++space )
cout << ' ';

 cout << '\t';


 for ( column = 10; column >= row; --column )
 cout << '*';

for ( space = 1; space < row; ++space )
 cout << ' ';

 cout << '\t';


 for ( space = 10; space > row; --space )
 cout << ' ';

 for ( column = 1; column <= row; ++column )
 cout << '*';

 cout << '\t';
```

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```
36
37
38      for ( space = 1; space < row; ++space )
39      cout << ' ';
40
41    for ( column = 10; column >= row; --column )
42      cout << '*';
43
44      cout <<endl;
45    }
46    return 0;
47  }
```

OUTPUT:

```
*           **********          *          **********
**          *********          **          *********
***         ********          ***          ********
****        *******          ****          *******
*****       ******          *****          ******
******      *****          ******          *****
*******     ****          *******          ****
********    ***          ********          ***
*********   **          *********          **
**********  *          **********          *

--------------------------------
Process exited after 0.04143 seconds with return value 0
Press any key to continue . . .
```

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Q19: Write a program that prints the following diamond shape.
[Hint: Use nested for loop].

```
    *
   ***
  *****
 *******
*********
 *******
  *****
   ***
    *
```

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
char star;

//variable intialization
star='*';

//nested for loop
for(int i=1; i<=5; ++i)//for first five rows
{
for(int j=1; j<=9-i; ++j)//spaces for first five rows
{
cout<<" ";
}
for(int k=1; k<=2*i-1;++k)//for columns(five rows)
{
cout<<star;
}
cout<<endl;
}


//nested for loop
for(int i=4; i>=1; --i)//last four rows
{
for(int j=1; j<=9-i; ++j)//spaces for last four rows
{
cout<<" ";
}
for(int k=1; k<=2*i-1; ++k)//for columns
{
cout<<star;
}
cout<<endl;
}
return 0;
}
```

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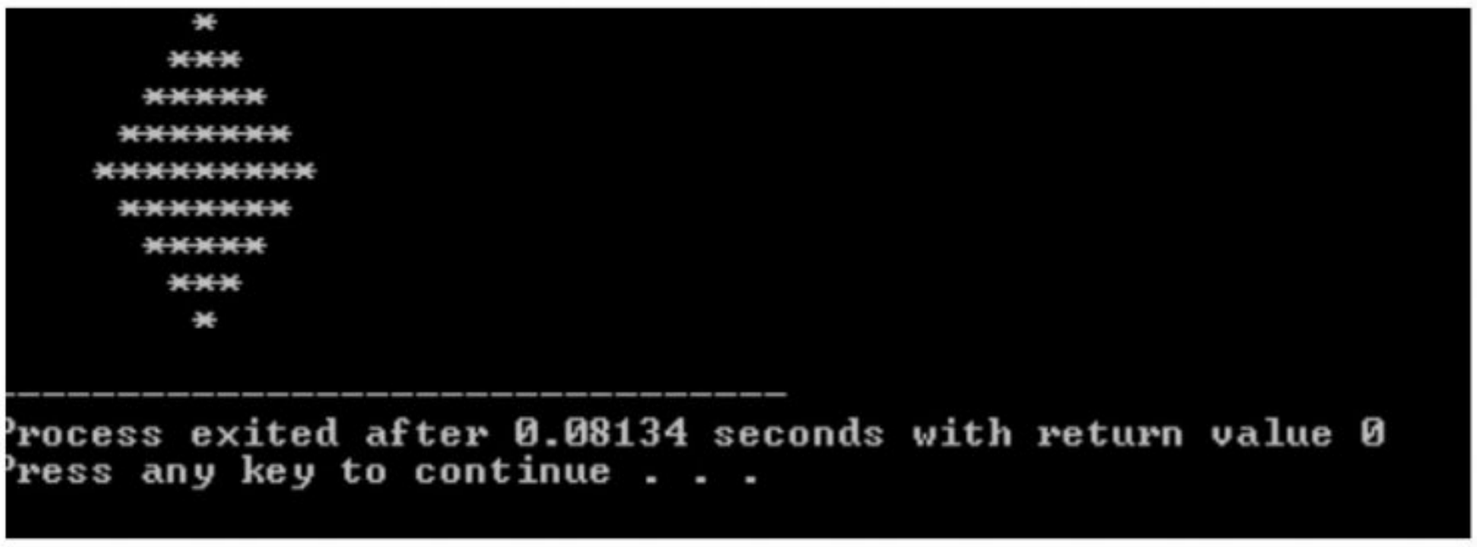
OUTPUT:



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Q20: Modify the program in Q19 to read an odd number in the range of 1 to 19 to specify the number of rows in the diamond, then display a diamond of appropriate size.

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;
int main()//pre-defined function of C++
{
//variable decleration
char star;
int totalrows;
int halfrows;

//input phase
cout<<"Enter total no of rows of diamond in odd number of range(1-19): ";
cin>>totalrows;

//variable intialization
star='*';
halfrows=(totalrows/2);

//nested for loop for half part of diamond
for(int i=1; i<=halfrows; i++)//for half rows of diamond
{
for(int j=1; j<=totalrows-i; ++j)//spaces for half rows of diamond
{
cout<<" ";
}
for(int k=1; k<=2*i-1;++k)//for columns(half rows)
{
cout<<star;
}
cout<<endl;
}


//nested for loop for last half part of diamond
for(int i=totalrows-halfrows; i>=1; --i)//last half rows of diamond
{
for(int j=1; j<=totalrows-i; ++j)//spaces for last half rows of diamond
{
cout<<" ";
}
for(int k=1; k<=2*i-1; ++k)//for columns
{
cout<<star;
}
cout<<endl;
}
return 0;
}//end function main
```

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OUTPUT:

```
Enter total no of rows of diamond in odd number of range(1-19): 19
                    *
                   ***
                  *****
                 *******
                *********
               ***********
              *************
             ***************
            *****************
           *******************
          *********************
            *****************
             ***************
              *************
               ***********
                *********
                 *******
                  *****
                   ***
                    *

--------------------------------
Process exited after 2.714 seconds with return value 0
Press any key to continue . . .
```

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Q21: A right triangle can have sides that are all integers. A set of three integer values for the sides of a right triangle is called a Pythagorean triple. These three sides must satisfy the relationship that the sum of the squares of two of the sides is equal to the square of the hypotenuse. Find all Pythagorean triples for side1, side2 and hypotenuse all no larger than 500. Use a triple-nested for loop that tries all possibilities.

CODE:

```cpp
#include<iostream>//header file for input output stream
using namespace std;//header file for advanced arithmetic functions
int main()//pre-defined function of C++
{
//variable decleration
int hyptSquared;
int sidesSquared;


// triple nested-for loop for pythagorean triple
for(int side1=1; side1<500; side1++)
{
for(int side2=1; side2<500; side2++)
{
for(int hypt=1; hypt<500; hypt++)
{
hyptSquared=hypt*hypt;
sidesSquared=side1*side1+side2*side2;

if(hyptSquared==sidesSquared&&hypt<=500)
{
cout<<side1<<"\t"<<side2<<"\t"<<hypt<<endl;//showing results
    }
}
    }

}


}//ending of main function
```

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OUTPUT:

```
207     224     305
207     276     345
208     105     233
208     156     260
208     306     370
208     390     442
209     120     241
210     72      222
210     112     238
210     176     274
210     200     290
210     280     350
210     416     466
212     159     265
213     284     355
216     63      225
216     90      234
216     162     270
216     195     291
216     288     360
216     405     459
219     292     365
220     21      221
220     165     275
220     192     292
220     231     319
221     60      229
222     296     370
224     30      226
224     132     260
224     168     280
224     207     305
224     360     424
224     420     476
225     120     255
225     140     265
225     272     353
225     300     375
228     95      247
228     171     285
228     304     380
228     325     397
231     108     255
231     160     281
231     220     319
231     308     385
231     392     455
232     174     290
232     435     493
234     88      250
234     312     390
236     177     295
237     316     395
238     240     338
240     44      244
240     54      246
240     70      250
240     100     260
240     117     267
240     128     272
240     161     289
240     180     300
240     238     338
240     252     348
240     275     365
240     320     400
240     364     436
240     418     482
```

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Q22: Write a program that asks user to enter a sequence of 10 elements and then use insertion sort algorithm to sort the sequence in ascending order. Create a function named insertion_sort() that takes unsorted sequence as an input and return a pointer that points to the sorted sequence.

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;

// making insertion_sort function
void insertion_sort(double array[],int size)
{cout<<"\t UNSORTED SEQUENCE\n";

//taking input from user in unsorted sequence
for(int index=0;index<size;index++)
{
cout<<"\nenter element no:"<<index<<"=";
cin>>array[index];
}

//insertion_sort algorithm
int b=0;
int key;
for(int a=1; a<size; a++)
{
key=array[a];//picking the element
b=a-1;
while(b>=0 && array[b]>key)
{
array[b+1]=array[b];
b=b-1;

}
array[b+1]=key;
}

cout<<"\n\tSORTED SEQUENCE\n";

//displaying  content of sorted array
for(int i=0; i<size; i++)
```

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```
{
cout<<"\nelement no:"<<i<<"="<<array[i]<<endl;
}
}

#define elements 10


int main()//pre-defined function of C++
{
//decleration of array
double my_array[elements];

//recalling insertion_sort function
insertion_sort(my_array,elements);

return 0;
}//ending of main function
```

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OUTPUT:

```
          UNSORTED SEQUENCE
enter element no:0=5
enter element no:1=7
enter element no:2=9
enter element no:3=7
enter element no:4=4
enter element no:5=2
enter element no:6=8
enter element no:7=9
enter element no:8=7
enter element no:9=8
```

```
         SORTED SEQUENCE
element no:0=2
element no:1=4
element no:2=5
element no:3=7
element no:4=7
element no:5=7
element no:6=8
element no:7=8
element no:8=9
element no:9=9

--------------------------------
Process exited after 8.8 seconds with return value 0
```

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Q23: Write a program that asks user to enter a sequence of 10 elements and then use selection sort algorithm to sort the sequence in ascending order. Create a function named selection_sort() that takes unsorted sequence as an input and return a pointer that points to the sorted sequence.

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;

// making selection_sort function
void selection_sort(double array[],int size)
{cout<<"\t UNSORTED SEQUENCE\n";

//taking input from user in unsorted sequence
for(int index=0;index<size;index++)
{
cout<<"\nenter element no:"<<index<<"=";
cin>>array[index];
}

//selection_sort algorithm
for(int a=0; a<size-1; a++)
{
int min=a;//set current element as minimum

//check the element to be minimum
for(int b=a+1; b<size; b++)
{
if(array[b]<array[min])
{
min=b;

}
}
//swap the minimumelement and current element
if(min!=a)
{
int temp=array[min];
array[min]=array[a];
array[a]=temp;
```

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```
35  }
36  }
37  cout<<"\n\tSORTED SEQUENCE\n";
38
39  //displaying  content of sorted array
40  for(int i=0; i<size; i++)
41  {
42  cout<<"\nelement no:"<<i<<"="<<array[i]<<endl;
43  }
44  }
45
46  #define elements 10
47
48
49  int main()//pre-defined function of C++
50  {
51  //decleration of array
52  double my_array[elements];
53
54  //recalling selection_sort function
55  selection_sort(my_array,elements);
56
57  return 0;
58  }//ending of main function
```

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OUTPUT:

```
          UNSORTED SEQUENCE
enter element no:0=9
enter element no:1=8
enter element no:2=7
enter element no:3=6
enter element no:4=5
enter element no:5=4
enter element no:6=3
enter element no:7=2
enter element no:8=1
enter element no:9=0
```

```
         SORTED SEQUENCE
element no:0=0
element no:1=1
element no:2=2
element no:3=3
element no:4=4
element no:5=5
element no:6=6
element no:7=7
element no:8=8
element no:9=9
```

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Q24: Write a program that asks user to enter a sequence of 10 elements and then use bubble sort algorithm to sort the sequence in ascending order. Create a function named bubble_sort() that takes unsorted sequence as an input and return a pointer that points to the sorted sequence.

CODE:

```
#include<iostream>//header file for input output stream
using namespace std;

//bubble sort function
void bubblesort(double arr[],int size)
{cout<<"\t UNSORTED SEQUENCE\n";//formatting
//taking input from user
//unsorted sequence
for(int index=0;index<size;index++)
{
cout<<"\nenter element no:"<<index<<"=";
cin>>arr[index];
}
//swapping numbers
for(int i=0; i<size; i++)
{
for(int j=0; j<(size-i-1); j++)
{
if(arr[j]>arr[j+1])
{
double temp=arr[j];
arr[j]=arr[j+1];
arr[j+1]=temp;
    }
}
}
cout<<"\n\tSORTED SEQUENCE\n";//formatting
//displaying sorted array
for(int i=0; i<size; i++)
{
cout<<"\nelement no:"<<i<<"="<<arr[i]<<endl;
}
}

#define max 10

int main()//pre-defined function of C++
{
//array decleration
double myarray[max];
//recalling bubblesort function
bubblesort(myarray,max);
return 0;
}//ending of main function
```

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OUTPUT:

```
          UNSORTED SEQUENCE
enter element no:0=56
enter element no:1=6
enter element no:2=87
enter element no:3=67
enter element no:4=5
enter element no:5=9
enter element no:6=87
enter element no:7=9
enter element no:8=76
enter element no:9=6
         SORTED SEQUENCE
element no:0=5
element no:2=6
element no:3=9
element no:4=9
element no:5=56
element no:6=67
element no:7=76
element no:8=87
element no:9=87
--------------------------------
Process exited after 15.23 seconds with return value 0
Press any key to continue . . .
```

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Q25: Write a program that inputs an integer, separates the integer into its digit and prints them separated by three spaces each. [Hint: Use vectors to store the separated digits]

CODE:

```
#include <iostream>//header file for input output stream
#include <vector> //header file of vector
using namespace std;
int main()//pre-defined function of C++
{                                       //INTEGER SEPARATOR FOR FOUR DIGIT INTEGER
//variable decleration
int a,num1,num2,num3,num4;
//input phase
cout<<"Enter four digit integer ";
cin>>a;

//algorithm
num1=a/1000;
a=a%1000;
num2=a/100;
a=a%100;
num3=a/10;
a=a%10;
num4=a;

// Declaring Vector 'a' of integer type
vector<int> b; //Declaration of vector in C++
b.push_back(num1);
b.push_back(num2);
b.push_back(num3);
b.push_back(num4);

//printing digits separately
    for (int i = 0; i < b.size(); i++)
{
    cout<<b[i]<<"   ";
}

return 0;
}//end of main function
```

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OUTPUT:

```
Enter four digit integer 4359
4   3   5   9
--------------------------------
Process exited after 6.104 seconds with return value 0
Press any key to continue . . .
```

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Q26: Write a C++ program that creates a class Array having following member functions:

1. Constructor Array() for declaring array of specific size

2. insert_element() for inserting desired element in the array

3. index_element_replace() for replacing the element at the index with desired value 4. index_find_replace() that finds the specific value in the array and replace it with desired value

5. index_element_remove() for removing the value at the index

6. find_element() that finds the index of desired value if present in the array 7. display() for displaying the current content of the array

Execute following in the main() function:

a. Declare an object of the class Array having size of 10 elements and insert the following data, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Also, display the content of array on console after inserting data.

b. Replace the value 12 in the array with 30 and display the content of array on console. c. Replace the value at index 9 with 30 and display the content of the array on console. d. Find the index of the value 18 in an array and print the index on console.

e. Remove the 5th element from the array and display the content of the array on console.

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CODE:

```
#include<iostream>//header file for input output stream
using namespace std;

//insert_element function
void insert_element(int arr[],int size)
{
for(int i=0;i<size; i++)
{
cout<<"element no."<<i<<"=";
cin>>arr[i];
cout<<endl;
}
cout<<endl;
}

//index_element_replace function
void index_element_replace(int arr[],int size)
{
cout<<endl;
int index;
cout<<"enter index which you want to replace: ";
cin>>index;
cout<<endl;
cout<<"enter new value for index: ";
cin>>arr[index];
cout<<endl;
}


//index_find_replace function
void index_find_replace(int arr[],int size)
{
cout<<endl;
int flag;
int element;
```


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```
36    cout<<"enter element to search and change its value: ";
37    cin>>element;
38    cout<<endl;
39    for(int i=0; i<size; i++)
40    {
41    if(arr[i]==element)
42    {flag==1;
43    cout<<"number "<<element<<"found at index "<<i;
44    cout<<endl;
45    cout<<"\nnow enter new value for this index: ";
46    cin>>arr[i];
47    }
48    }
49    cout<<endl;
50
51    }
52
53    //index_element_remove function
54    void index_element_remove(int arr[],int size)
55    {
56    int index;
57    cout<<"enter index which you want to delete: ";
58    cin>>index;
59    for(int i=index; i<size; i++)
60    {
61    int temp=arr[i];
62    arr[i]=arr[i+1];
63    arr[i+1]=temp;
64    }
65    }
66
67    //find_element function
68    void find_element(int arr[],int size)
69    {int flag;
70    int element;
```


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```
71      cout<<"\nenter element to search: ";
72      cin>>element;
73      cout<<endl;
74      for(int i=0; i<size; i++)
75      {
76      if(arr[i]==element)
77      {flag==1;
78      cout<<"number "<<element<<"found at index "<<i;
79      cout<<endl;
80      break;
81      }
82      }
83
84      }
85
86
87
88      //display function
89      void display(int arr[],int size)
90      {cout<<"\t\tCONTENTS OF ARRAY";
91      for(int i=0; i<size; i++)
92      {
93      cout<<"\nelement no."<<i<<"="<<arr[i]<<endl;
94      }
95      }
96      #define elements 10
97
98
99      int main()//pre-defined function of C++
100     {
101     //array decleration
102     int myarray[elements];
103
104     //inserting desired elements
105     insert_element(myarray,elements);
```


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```
106
107   //displaying content of array after inserted desired elements
108   display(myarray,elements);
109
110   //for replacing values
111   index_find_replace(myarray,elements);
112
113   //after replacing displaying contents of array
114   display(myarray,elements);
115
116   //now replace value of desired index with new desired value
117   index_element_replace(myarray,elements);
118
119   //after replacing showing content of array on console
120   display(myarray,elements);
121
122   //finding desired element
123   find_element(myarray,elements);
124
125   //removing element from array
126   index_element_remove(myarray,elements);
127
128   //after removing displaying content of array
129   display(myarray,elements-1);
130
131   return 0;
132   }//ending of main function
```

#define elements 10 - 23.cpp (46) - Ctrl+Click for more info

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OUTPUT:

```
element no.0=2
element no.1=4
element no.2=6
element no.3=8
element no.4=10
element no.5=12
element no.6=14
element no.7=16
element no.8=18
element no.9=20
```

```
                CONTENTS OF ARRAY
element no.0=2
element no.1=4
element no.2=6
element no.3=8
element no.4=10
element no.5=12
element no.6=14
element no.7=16
element no.8=18
element no.9=20
enter element to search and change its value: 12
number 12found at index 5
```


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```
now enter new value for this index: 30
                    CONTENTS OF ARRAY
element no.0=2
element no.1=4
element no.2=6
element no.3=8
element no.4=10
element no.5=30
element no.6=14
element no.7=16
element no.8=18
element no.9=20
```

```
enter index which you want to replace: 9
enter new value for index: 30
                    CONTENTS OF ARRAY
element no.0=2
element no.1=4
element no.2=6
element no.3=8
element no.4=10
element no.5=30
element no.6=14
element no.7=16
element no.8=18
element no.9=30
```


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```
number 18found at index 8
enter index which you want to delete: 4
                CONTENTS OF ARRAY
element no.0=2

element no.1=4

element no.2=6

element no.3=8

element no.4=30

element no.5=14

element no.6=16

element no.7=18

element no.8=30

--------------------------------
Process exited after 337.3 seconds with return value 0
Press any key to continue . . .
```


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