Computer Programming with C++
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1. C++ program to print Hello World

```
/*C++ program to print "Hello World". */
#include <iostream>
using namespace std;

int main()
{
	cout << "Hello World!";
	return 0;
}
```

2. Read character array as string using cin in C++

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

int main()
{
		char firstName[30], secondName[30];

		//input values
		cout<<"What is your first name? ";
		cin>>firstName;
		cout<<"What is your second name? ";
		cin>>secondName;

		//printing
		cout<<"Hi "<<firstName<<" "<<secondName<<endl;

		return 0;
}
```

3. cascading cout and cin example in C++.

```
/*C++ program to demonstrate example of cascading cout & cin.*/
#include	<iostream>
using namespace std;

int main()
{
	int a,b;
```

```
    //without cascading cout
    cout << "Enter value of a and b : ";

    //cascading cin
    cin >>a >>b;

    //cascading cout
    cout<< "A : " << a << ", B : " << b << endl;

    return 0;
}
```

4. C++ program to demonstrate use of reference variable

```
/*C++ program to demonstrate use of reference variable.*/
#include <iostream>
using namespace std;

int main()
{
    int a=10;

    /*reference variable is alias of other variable,
  It does not take space in memory*/

    int &b = a;

    cout << endl << "Value of a: " << a;
    cout << endl << "Value of b: " << b << endl;

    return 0;
}
```

5. C++ program to use function as a LVALUE using reference variable

```
/*C++ program to use function as a LVALUE using reference
variable.*/

#include   <iostream>
using namespace std;

int var ;

int& fun()
{
```

```
    return var;
}

int main()
{
    //Function used as LVALUE
    fun() = 10;

    cout << "Value of var : " << var << endl;

    return 0;
}
```

6. C++ program to demonstrate example of Inline Function

```
/*C++ program to demonstrate Inline Function.*/
#include   <iostream>
using namespace std;

//inline keyword is only use in declaration.
inline int fun();

int main()
{
    fun();
    return 0;
}

int fun()
{
    cout << "I am from inline function " << endl;
    return 0;
}
```

7. C++ program to demonstrate example of Default Argument

```
/*C++ program to demonstrate example of Default Argument.*/
#include   <iostream>
using namespace std;

//Default argument must be trailer.
int sum(int x, int y=10, int z=20)
{
    return (x+y+z);
}
```

```
int main()
{
	cout << "Sum is : " << sum(5)		<< endl;
	cout << "Sum is : " << sum(5,15)	<< endl;
	cout << "Sum is : " << sum(5,15,25) << endl;
	return 0;
}
```

8. C++ program to demonstrate methods of passing arguments in function:

Pass by value, Pass by reference, Pass by address.

```
/*C++ program to demonstrate methods of passing arguments in function.
  Pass by value, Pass by reference, Pass by address.
*/

#include	<iostream>
using namespace std;

void swapByValue( int a , int b	);
void swapByRef	( int &a, int &b );
void swapByAdr	( int *a, int *b );

int main()
{
	int x = 10;
	int y = 20;

	cout << endl;
	cout << "Value before Swapping x:" << x << " y:" << y << endl;
	swapByValue( x , y	); /*In call by value swapping does not reflect in calling function*/
	cout << "Value After	Swapping x:" << x << " y:" << y << endl << endl;

	cout << "Value before Swapping x:" << x << " y:" << y << endl;
	swapByRef( x , y	);	/*Swapping reflect but reference does not take space in
memory*/
	cout << "Value After	Swapping x:" << x << " y:" << y << endl << endl;

	x = 50;
	y = 100;

	cout << "Value before Swapping x:" << x << " y:" << y << endl;
	swapByAdr( &x , &y	); /*Swapping reflect but pointer takes space in memory*/
	cout << "Value After	Swapping x:" << x << " y:" << y << endl << endl;

	return 0;
}
```

```
void swapByValue( int a , int b    )
{
      int c;

      c = a;
      a = b;
      b = c;
}

void swapByRef( int &a , int &b    )
{
      int c;

      c = a;
      a = b;
      b = c;
}

void swapByAdr( int *a , int *b    )
{
      int c;

        c = *a;
      *a = *b;
      *b =    c;
}
```

9. C++ program to demonstrate example of function overloading

```
/*C++ program to demonstrate example of function overloading.*/
#include    <iostream>
using namespace std;

void printChar();
void printChar( char c );
void printChar( char c, int num );
void printChar(int num, char c);

int main()
{
      printChar();
      printChar('#');
      printChar(10,'$');
      printChar('@',10);

      cout<< endl;

      return 0;
```

```
}

void printChar()
{
        cout<< endl<<"%";
}
void printChar( char c )
{
        cout<< endl<< c;
}
void printChar( char c, int num )
{
    int i=0;

    cout<< endl;
    for(i=0; i< num; i++)
        cout<< c;
}
void printChar(int num, char c)
{
    int i=0;

    cout<< endl;
    for(i=0; i< num; i++)
        cout<< c;
}
```

10. C++ program to read string using cin.getline()

```
/*C++ program to read string using cin.getline().*/
#include   <iostream>
using namespace std;

//macro definitions for maximum length of variables
#define MAX_NAME_LENGTH        50
#define MAX_ADDRESS_LENGTH   100
#define MAX_ABOUT_LENGTH       200

using namespace std;

int main()
{
    char
name[MAX_NAME_LENGTH],address[MAX_ADDRESS_LENGTH],about[MAX_ABOUT_
LENGTH];

    cout << "Enter name: ";
    cin.getline(name,MAX_NAME_LENGTH);
```

```
    cout << "Enter address: ";
    cin.getline(address,MAX_ADDRESS_LENGTH);

    cout << "Enter about yourself (press # to complete): ";
    cin.getline(about,MAX_ABOUT_LENGTH,'#');      //# is a delimiter

    cout << "\nEntered details are:";
    cout << "Name: "    << name << endl;
    cout << "Address: " << address << endl;
    cout << "About: " << about << endl;

    return 0;
}
```

11. C++ program to generate random numbers

```
#include <stdio.h>
#include <stdlib.h>
#include <ctime>

int main() {
    srand((unsigned)time(0));
    for (int i = 1; i <= 20; i++) {
        printf("%d ", 1 + (rand() % 6));
        if (i % 5 == 0) {
            printf("\n");
        }
    }
}
```

12. Print Reverse Triangle Bridge Pattern for Characters in C++

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

int main()
{
        int i,j,n;
        cout<<"Enter Largest Alphabet Value(e.g C=3):";
        cin>>n;
        for(i=0;i<n;i++)
        {
                for(j=65;j<64+(2*n);j++)
                {
                        if(j>=(64+n)+i)
                                cout<<(char)((64+n)-(j%(64+n)));
                        else if(j<=(64+n)-i)
```

```
                                        cout<<(char)j;
                                else
                                        cout<<" ";
                        }
                        cout<<endl;
                }

                return 0;
}
```

Output

```
Enter Largest Alphabet Value(e.g C=3):7
ABCDEFGFEDCBA
ABCDEF FEDCBA
ABCDE   EDCBA
ABCD     DCBA
ABC       CBA
AB         BA
A           A
```

13. Write a C++ program to print Right oriented right-angled pyramid Print Reverse Triangle Bridge Pattern for Characters in C++

```
        1
     2  3
   4 5  6
 7 8 9 10
```

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

int main()
{

        int i, j, space, rows, k=1;

        cout<<"Enter the number of rows: ";
        cin>>rows;

        for(i=1; i<=rows; i++) {
                for(space=i; space<rows; space++) {
                        cout<<"\t";
                }
                for(j=1; j<=i; j++) {
                        cout<<k<<"\t";
```

```
                        k++;
                }
                cout<<"\n";
        }

        return 0;
}
```

2. Write a C++ program to print Lift oriented left-angled pyramid

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

int main()
{

        int i, rows, j, k=1;

        cout<<"Enter the number of rows: ";
        cin>>rows;

        for(i=1; i<=rows; i++) {
                for(j=1; j<=i; j++) {
                        cout<<k<<"\t";
                        k++;
                }
                cout<<"\n";
        }

        return 0;
}
```

14. Write a C++ Given an integer number and we must keep adding the digits until a single digit is not found.

Example:

Input: Enter a number: 147
Output: 3
Explanation: 147 → 1+4+7 = 12 → 1+2 = 3

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

int main()
```

```
{
        int number = 147; //Any number.
        int res;

        if(number)
                res = number % 9 == 0 ? 9 : number % 9 ;
        else
                res = 0;

        //print the result
        cout<<res;

        return 0;
}
```

15. How to skip some of the array elements using C++ program?

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

int main()
{
        int arr[10] = {1,2,3,4,5,6,7,8,9,10};
        int i;

        for(int i=0; i<10; i++)
        {
           if((i+1)%3 == 0)    //If index is every third element
                continue;    //Continue
           cout<<arr[i]<<" ";    //Print array element
        }

        return 0;
}
```

16. Declaring and printing different constant in C++?

In this program, we are declaring 4 constants:

1. String constant (character array constants): **MY_NAME** and **MY_ADDRESS**
2. Integer constant: **MY_AGE**
3. Float constant: **MY_WEIGHT**

```
#include <iostream>
```

```
using namespace std;

int main()
{
	//declaring constants
	const char		MY_NAME[]="Akter Fatin";
	const char		MY_ADDRESS[]="Kyoungdong University";
	const int	MY_AGE =20;
	const float		MY_WEIGHT = 50.25f;

	//printing the constants values
	cout<<"Name:	"<<MY_NAME<<endl;
	cout<<"Age:	"<<MY_AGE<<endl;
	cout<<"Weight: "<<MY_WEIGHT<<endl;
	cout<<"Address:"<<MY_ADDRESS<<endl;
	return 0;
}
```

17. C++ program to demonstrate example of delay() function

```
#include <iostream>
#include <Windows.h>

using namespace std;

int main() {
	cout << "Smart" << endl;
	Sleep(10000);
	cout << "Computing" << endl;

}
```

18. Sieve of Eratosthenes to find prime numbers

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

int main()
{
	int n;
	cout<<"Enter the number: ";
	cin>>n;

	vector<int> prime(n+1,1);
	for(int i=2;i*i<=n;i++)
	{
```

```
                if(prime[i]==1)
                {
                        for(int j=i;i*j<=n;j++)
                        {
                                prime[i*j]=0;
                        }
                }
        }

        cout<<"Prime number upto "<<n<<" are: ";
        for(unsigned i=2;i<=prime.size();i++)
        {
                if(prime[i]==1)
                {
                        cout<<i<<" ";
                }
        }
        cout<<endl;

        return 0;
}
```

19. Find last index of a character in a string using C++ program

```
#include <iostream>
#include <string.h>
using namespace std;

//function to get lastt index of a character
int getLastIndex(char *s, char c)
{
        int length;
        int i; //loop counter
        //get length
        length = strlen(s);

        //run loop from length-1 to 0
        for(i=(length-1); i>=0; i--)
        {
                //compare character with each charater of string
                if(s[i]==c)
                        return i; //character found return index
        }

        //if character not found return -1
        return -1;
}

//main programs
```

```
int main()
{
	char str[100]; //maximim 100 characters
	char ch; //character to find
	int index;	//to store index

	cout<<"Enter string: ";
	//read with spaces too
	cin.getline(str,100);

	cout<<"Enter character: ";
	cin>>ch;

	index = getLastIndex(str,ch);

	//if index is not -1 then print its index
	if(index!=-1)
		cout<<"Last index of \'"<<ch<<"\' is: "<<index<<endl;
	else
		cout<<"\'"<<ch<<"\' is not found in the string"<<endl;

	return 0;
}
```

Output

```
First run:
Enter string: Hello world!
Enter character: o
Last index of 'o' is: 7

Second run:
Enter string: Hello world!
Enter character: H
Last index of 'H' is: 0

Third run:
Enter string: Hello world!
Enter character: z
'z' is not found in the string
```

20. C++ program to get week day from given date

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

//function to get date and return weekday number [0-6]
int getWeekDay(int yy, int mm, int dd)
```

```
{
	//formula to get weekday number
	int rst =
		dd
		+ ((153 * (mm + 12 * ((14 - mm) / 12) - 3) + 2) / 5)
		+ (365 * (yy + 4800 - ((14 - mm) / 12)))
		+ ((yy + 4800 - ((14 - mm) / 12)) / 4)
		- ((yy + 4800 - ((14 - mm) / 12)) / 100)
		+ ((yy + 4800 - ((14 - mm) / 12)) / 400)
		- 32045;

	return (rst+1)%7 ;
}

//main program/code
int main()
{
	//declaring array of weekdays`
	const char *Names[] = {"Sunday","Monday", "Tuesday","Wednesday", "Thursday",
"Friday", "Saturday"};
	int day = 0;
	//calling function, storing weekday number in day
	day= getWeekDay(2017,6,24);
	//printing the weekday from given array
	cout<<"Day : "<<Names[day]<<endl;

	return 0;
}
```

21. C++ program to find total number of days in given month of year

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

//function will return total number of days
int   getNumberOfDays(int month, int year)
{
	//leap year condition, if month is 2
	if( month == 2)
	{
		if((year%400==0) || (year%4==0 && year%100!=0))
			return 29;
		else
			return 28;
	}
	//months which has 31 days
	else if(month == 1 || month == 3 || month == 5 || month == 7 || month == 8
```

```
        ||month == 10 || month==12)
                return 31;
        else
                return 30;
}

//Main program
int main()
{
        int days=0;

        days = getNumberOfDays(2, 2016);

        cout<<endl<<"Number of Days :    "<<days;

        return 0;
}
```

22. C++ program to check given string is numeric or not

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

int isNumericString(unsigned char *num)
{
        int i=0;
    while (*(num+i)) {
        if (*(num+i) >= '0' && *(num+i) <= '9')
            i++;
        else
            return 0;
    }
    return 1;
}

int main()
{
        int ret = 0;
        unsigned char str1[] = "123";
        unsigned char str2[] = "ABC";

        ret = isNumericString(str1);
        if(ret)
                cout<<"It is numeric string"<<endl;
        else
                cout<<"It is not numeric string"<<endl;
```

```
	ret = isNumericString(str2);
	if(ret)
		cout<<"It is numeric string"<<endl;
	else
		cout<<"It is not numeric string"<<endl;

	return 0;
}
```

23. C++ program to sort an array in Ascending Order

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

#define MAX 100

int main()
{
	//array declaration
	int arr[MAX];
	int n,i,j;
	int temp;

	//read total number of elements to read
	cout<<"Enter total number of elements to read: ";
	cin>>n;

	//check bound
	if(n<0 || n>MAX)
	{
		cout<<"Input valid range!!!"<<endl;
		return -1;
	}

	//read n elements
	for(i=0;i<n;i++)
	{
		cout<<"Enter element ["<<i+1<<"] ";
		cin>>arr[i];
	}

	//print input elements
	cout<<"Unsorted Array elements:"<<endl;
	for(i=0;i<n;i++)
		cout<<arr[i]<<"\t";
	cout<<endl;
```

```
	//sorting - ASCENDING ORDER
	for(i=0;i<n;i++)
	{
		for(j=i+1;j<n;j++)
		{
			if(arr[i]>arr[j])
			{
				temp	=arr[i];
				arr[i]=arr[j];
				arr[j]=temp;
			}
		}
	}

	//print sorted array elements
	cout<<"Sorted (Ascending Order) Array elements:"<<endl;
	for(i=0;i<n;i++)
		cout<<arr[i]<<"\t";
	cout<<endl;


	return 0;

}
```

24. C++ program that will read an integer number (up to four digits) and convert it into words.

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

int reverse(int v,int lim)	/*Method to reverse the number*/
{
	if(lim==1)
		return v;
	else
		return (((v%10)*pow(10,lim-1))+reverse(v/10,lim-1));
}

void print_c(int digit,int l,int r=12)		/*Method to print word equivalent of a number*/
{
	if(l!=2)					/*l is the length of number */
	{						/*digit is the digit being processed*/
		switch(digit)				/*TO print digit at ones place*/
		{
			case 1: cout<<"one ";
```

```
                        break;
                        case 2: cout<<"two ";
                        break;
                        case 3: cout<<"three ";
                        break;
                        case 4: cout<<"four ";
                        break;
                        case 5: cout<<"five ";
                        break;
                        case 6: cout<<"six ";
                        break;
                        case 7: cout<<"seven ";
                        break;
                        case 8: cout<<"eight ";
                        break;
                        case 9: cout<<"nine ";
                        break;
                }
        }
        else if(l==2)                   /*to print digit at tens place*/
        {
                switch(digit)
                {
                        case 1: switch(r)               /*TO print values such as
ten,thirteen etc.*/
                        {
                                case 0: cout<<"ten";
                                break;
                                case 1: cout<<"eleven";
                                break;
                                case 2: cout<<"twelve";
                                break;
                                case 3: cout<<"thirteen";
                                break;
                                case 4: cout<<"fourteen";
                                break;
                                case 5: cout<<"fifteen";
                                break;
                                case 6: cout<<"sixteen";
                                break;
                                case 7: cout<<"seventeen";
                                break;
                                case 8: cout<<"eighteen";
                                break;
                                case 9: cout<<"nineteen";
                                break;
                        }
                        break;
                        case 2: cout<<"twenty ";
                        break;
```

```
                                case 3: cout<<"thirty ";
                                break;
                                case 4: cout<<"fourty ";
                                break;
                                case 5: cout<<"fifty ";
                                break;
                                case 6: cout<<"sixty ";
                                break;
                                case 7: cout<<"seventy ";
                                break;
                                case 8: cout<<"eighty ";
                                break;
                                case 9: cout<<"ninty ";
                                break;
                                case 0: cout<<"";
                        break;

                        }
                }
}
int main()
{
        int num,temp,length=0,result,n,m=0;
        cout<<"Enter the number :";
        cin>>num;
        temp=num;

        for(;num>0;num/=10)
        {
          length++;
        }

        result=reverse(temp,length);
        while(result)
         {
                n=result%10;
                m=m*10+n;
                result/=10;
                if(length==1)
                {
                        print_c(n,length);          /*To print the digit at ones place*/
                }
                else if(length==2)
                {
                        if(n==1)
                        {
                                print_c(n,length,result); /*To print the digit at tens
place like ten,twelve etc.*/
                                break;
                        }
```

```
                        else
                        {
                                print_c(n,length);      /*To print the digit at tens
place like twenty,thirty etc.*/
                                length--;
                        }
                }
                else if(length==3)
                {
                        print_c(n,length);      /*To print the digit at hundred place*/
                        length--;
                        if(n!=0)
                        {
                                cout<<"hundred ";
                        }
                }
                else if(length==4)
                {
                        print_c(n,length);          /*To print the digit at thousand
place*/
                        length--;
                        cout<<"thousand ";
                }
        }

        return 0;
}
```

25. C++ program to sort an array in Descending Order

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

#define MAX 100

int main()
{
        //array declaration
        int arr[MAX];
        int n,i,j;
        int temp;

        //read total number of elements to read
        cout<<"Enter total number of elements to read: ";
        cin>>n;

        //check bound
```

```
        if(n<0 || n>MAX)
        {
                cout<<"Input valid range!!!"<<endl;
                return -1;
        }

        //read n elements
        for(i=0;i<n;i++)
        {
                cout<<"Enter element ["<<i+1<<"] ";
                cin>>arr[i];
        }

        //print input elements
        cout<<"Unsorted Array elements:"<<endl;
        for(i=0;i<n;i++)
                cout<<arr[i]<<"\t";
        cout<<endl;

        //sorting - Descending ORDER
        for(i=0;i<n;i++)
        {
                for(j=i+1;j<n;j++)
                {
                        if(arr[i]<arr[j])
                        {
                                temp    =arr[i];
                                arr[i]=arr[j];
                                arr[j]=temp;
                        }
                }
        }

        //print sorted array elements
        cout<<"Sorted (Descending Order) Array elements:"<<endl;
        for(i=0;i<n;i++)
                cout<<arr[i]<<"\t";
        cout<<endl;

        return 0;
}
```

26. C++ program to convert lowercase character to uppercase and vice versa

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

```
int main()
{
	char ch;

	cout<<"Please input a valid character (Alphabet): ";
	cin>>ch;

	//check for valid alphabet
	if((ch>='A' && ch<='Z') || (ch>='a' && ch<='z'))
	{
		//check case and convert into opposite case
		if(ch>='A' && ch<='Z')
			ch=ch+32;
		else if(ch>='a' && ch<='z')
			ch=ch-32;
		else
			;		//none

		cout<<"converted character is: "<<ch<<endl;

	}
	else
	{
		cout<<"Entered character is not a valid alphabet!!!"<<endl;
	}

	return 0;
}
```

27. C++ program to check leap year.

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

int main()
{
	int year;

	//read year
	cout<<"Enter a year: ";
	cin>>year;

	if((year%400==0) || (year%4==0 && year%100!=0))
		cout<<year<<" is Leap year"<<endl;
	else
		cout<<year<<" is not Leap year"<<endl;
```

```
        return 0;
}
```

28. Write a C++ Program for Sum of the digits of a given number

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

/* Function to get sum of digits */
   class gfg {
   public:
       int getSum(int n)
       {
           int sum = 0;
           while (n != 0) {
               sum = sum + n % 10;
               n = n / 10;
           }
           return sum;
       }
   };

   // Driver code
   int main()
   {
       gfg g;
       int n = 687;
       cout << g.getSum(n);
       return 0;
   }
```

29. Write a program that reads a three-digit number, calculates the new number by reversing its digits, and outputs a new number.

Sample Input 1: 320

Sample Output 1: 23

Sample Input 2: 976

Sample Output 2: 679

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

int main()
	{
		int x,op,tp;
		cout<<"Enter a number"<<endl;
		cin>>x;
		op=x%10;
		cout<<"the value in the once place is:"<<op<<endl;
		tp=x/10;
		cout<<"The value in the tens place is:"<<tp<<endl;
		return 0;
	}
```

30. Write a program in C++ to find Size of fundamental data types.

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

int main()
{
	cout << "\n\n Find Size of fundamental data types :\n";
		cout << "-----------------------------------------\n";
    cout << " The sizeof(char) is :              " << sizeof(char) << " bytes \n" ;
    cout << " The sizeof(short) is :             " << sizeof(short) << " bytes \n" ;
    cout << " The sizeof(int) is :               " << sizeof(int) << " bytes \n" ;
    cout << " The sizeof(long) is :              " << sizeof(long) << " bytes \n" ;
    cout << " The sizeof(long long) is :         " << sizeof(long long) << " bytes \n";
    cout << " The sizeof(float) is :             " << sizeof(float) << " bytes \n" ;
    cout << " The sizeof(double) is :            " << sizeof(double) << " bytes \n";
    cout << " The sizeof(long double) is :       " << sizeof(long double) << " bytes \n";
    cout << " The sizeof(bool) is :              " << sizeof(bool) << " bytes \n\n";
    return 0;

}
```

31. Write a program in C++ to print the following pattern.

Sample Output:

```
 xxxxx

x     x       x       x

x             x       x
```

```
x             xxxxxxx   xxxxxxx

x               x         x

x      x        x         x

 xxxxx
```

```
#include <iostream>

using namespace std;


int main()

{

    cout << "\n\n Print the following pattern:\n";

          cout << "-------------------------------\n";

          cout << " xxxxx\n";

          cout << "x      x        x         x\n";

          cout << "x               x         x\n";

          cout << "x           xxxxxxx   xxxxxxx\n";

          cout << "x               x         x\n";

          cout << "x      x        x         x\n";

          cout << " xxxxx\n";

}
```

32. Write a C++ program find the day using switch statement.

```
1. #include <iostream>
2.
3. using namespace std;
4.
5. int main()
```

```
{
    int weeknumber;

   //Reading week no from user
   cout<<"Enter week number(1-7): ";
   cin>>weeknumber;

    switch(weeknumber)
    {
        case 1: cout<<"Monday";
            break;
        case 2: cout<<"Tuesday";
            break;
        case 3: cout<<"Wednesday";
            break;
        case 4: cout<<"Thursday";
            break;
        case 5: cout<<"Friday";
            break;
        case 6: cout<<"Saturday";
            break;
        case 7: cout<<"Sunday";
            break;
        default: cout<<"Invalid input! Please enter week no. between 1-7.";
    }

    return 0;

}
```

33. Convert the number decimal to binary using for loop.

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

void main()
{
        int num, a[20], b[20], i, j, k;

        cout << "Enter any decimal number:";
        cin >> num;

        i = 0;
        while (num > 0)
        {
                a[i] = num % 2;
```

```
		i++;
		num = num / 2;
	}

	k = i - 1;
	cout << "\n\n";

	for (j = 0; j < i; j++)
	{
		b[j] = a[k--];
		cout << b[j];
	}

}
```

34. Convert the number binary to decimal using for loop.

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

void main()
{
	int b[20], i, j, k;
	long num;

	cout << "Enter any binary number:";
	cin >> num;

	i = 0;
	while (num > 0)
	{
		b[i++] = num % 10;
		num = num / 10;
	}

	j = i - 1;
	k = 0;

	while (j >= 0)
	{
		k = k + (b[j] * pow(2, j));
		j--;
	}
	cout << k;


}
```

35. Write a program in C++ to 2 Dimensional Array.

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

void main()
{
	int a[20][20], i, j, r, c;
	cout << "Enter order of the matrix a: ";
	cin >> r >> c;
	cout << "\n Enter " << r * c << " values :";
	for (i = 0; i < r; i++)
		for (j = 0; j < c; j++)
			cin >> a[i][j];
	cout << "\n Element of the array a: \n";
	for (i = 0; i < r; i++)
	{
		cout << "\n";
		for (j = 0; j < c; j++)
			cout << a[i][j] << " \t ";
	}
}
```

36. Write a program in C++ to add two matrix using array

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

int main()
{
    int r, c, a[100][100], b[100][100], sum[100][100], i, j;

    cout << "Enter number of rows (between 1 and 100): ";
    cin >> r;

    cout << "Enter number of columns (between 1 and 100): ";
    cin >> c;

    cout << endl << "Enter elements of 1st matrix: " << endl;

    // Storing elements of first matrix entered by user.
    for (i = 0; i < r; ++i)
        for (j = 0; j < c; ++j)
        {
            cout << "Enter element a" << i + 1 << j + 1 << " : ";
            cin >> a[i][j];
        }
```

```
        // Storing elements of second matrix entered by user.
        cout << endl << "Enter elements of 2nd matrix: " << endl;
        for (i = 0; i < r; ++i)
                for (j = 0; j < c; ++j)
                {
                        cout << "Enter element b" << i + 1 << j + 1 << " : ";
                        cin >> b[i][j];
                }

        // Adding Two matrices
        for (i = 0; i < r; ++i)
                for (j = 0; j < c; ++j)
                        sum[i][j] = a[i][j] + b[i][j];

        // Displaying the resultant sum matrix.
        cout << endl << "Sum of two matrix is: " << endl;
        for (i = 0; i < r; ++i)
                for (j = 0; j < c; ++j)
                {
                        cout << sum[i][j] << "    ";
                        if (j == c - 1)
                                cout << endl;
                }

        return 0;

}
```

37. Write a program in C++ to ASCII value

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

void main()
{
        int i;

        for (i = 0; i < 256; i++)
        {
                if (i != 26 && i != 29)
                        cout << i << " = " << (char)i << "\t";
        }
}
```

38. Write a program in C++ to factorial number.

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

```
void main()
{
        int i, num, f;

        cout << "enter the any numbers:";
        cin >> num;

        f = 1;

        for (i = num; i > 0; i--)
                f = f * i;
        cout << "Facorial of    " << num << "    :    " << f;



}
```

39. Write a program in C++ to grading system using function.

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

const char* findGrade(float[], int);

int main()
{
    int i, n;
    float mark[5];
    cout << "Enter Number of Subjects (max. 5): ";
    cin >> n;

    cout << "Enter Marks obtained in " << n << " Subjects: ";

    for (i = 0; i < n; i++)
        cin >> mark[i];

    cout << "\nGrade = " << findGrade(mark, n);
    cout << endl;

    return 0;
}
const char* findGrade(float mark[], int n)
{
    int i;
    float sum = 0, avg;
    for (i = 0; i < n; i++)
        sum = sum + mark[i];
    avg = sum / n;
    if (avg >= 91 && avg <= 100)
        return "A1";
```

```
    else if (avg >= 81 && avg < 91)
        return "A2";
    else if (avg >= 71 && avg < 81)
        return "B1";
    else if (avg >= 61 && avg < 71)
        return "B2";
    else if (avg >= 51 && avg < 61)
        return "C1";
    else if (avg >= 41 && avg < 51)
        return "C2";
    else if (avg >= 33 && avg < 41)
        return "D";
    else if (avg >= 21 && avg < 33)
        return "E1";
    else if (avg >= 0 && avg < 21)
        return "E2";
    else
        return "Invalid!";

}
```

40. Write a program in C++ to swapping.

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

void main()
{
        int i, j;

        cout << "Enter the any two numbers:";
        cin >> i >> j;

        /*cout << "You Entered Values:";
        cout << i << "    " << j;*/

        i = i + j;
        j = i - j;
        i = i - j;

        cout << "\n After Swapping:";
        cout << i << "    " << j;

}
```

41. Write a program in C++ to transposing matrix.

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

```
void main()
{
	int a[10][10];
	int x, y, t, r, c;

	cout << "Enter the order of the matrix:";
	cin >> r >> c;

	cout << "\n enter    " << r * c << "values:";

	for (x = 0; x < r; x++)
		for (y = 0; y < c; y++)
			cin >> a[x][y];


	cout << "\n element of matrix:";
	for (x = 0; x < r; x++)
	{
		cout << "\n";
		for (y = 0; y < c; y++)
			cout << a[x][y] << "\t";
	}

	if (r == c)
	{
		for (x = 0; x < r; x++)
		{
			for (y = 0; y < x; y++)
			{
				t = a[x][y];
				a[x][y] = a[y][x];
				a[y][x] = t;
			}
		}

		cout << "\n After transposing:";
		for (x = 0; x < r; x++)
		{
			cout << "\n";
			for (y = 0; y < c; y++)
				cout << a[x][y] << "\t";
		}
	}
	else
		cout << "\n transposing is not possible";

}
```

42. Write a program in C++ to upper & lower triangle using array

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

void main()
{
	int a[10][10];
	int x, y, r, c;

	cout << "Enter the order of the matrix:";
	cin >> r >> c;

	cout << "\n enter    " << r * c << "values:";
	for (x = 0; x < r; x++)
	{
		for (y = 0; y < c; y++)
			cin >> a[x][y];
	}

	cout << "\n element of matrix:";
	for (x = 0; x < r; x++)
	{
		cout << "\n";
		for (y = 0; y < c; y++)
			cout << a[x][y] << "\t";
	}

	if (r == c)
	{
		cout << "\n upper right triangle:";
		for (x = 0; x < r; x++)
		{
			cout << "\n";
			for (y = 0; y < c; y++)
			{
				if (y >= x)
					cout << a[x][y] << "\t";
				else
					cout << "\t";
			}
		}

		cout << "\n lower left triangle";
		for (x = 0; x < r; x++)
		{
			cout << "\n";
			for (y = 0; y < c; y++)
			{
				if (y <= x)
					cout << a[x][y] << "\t";
			}
```

```
                }
        }
        else
                cout << "\n not possible to print triangle";


}
```

43. Write a program in C++ to Check whether a given matrix is an identity matrix or not

```
#include<iostream>
using namespace std;
int main()
{
    int row_size, col_size;
    //Get size of matrix
    cout << "Enter the row Size Of the Matrix:";
    cin >> row_size;
    cout << "Enter the columns Size Of the Matrix:";
    cin >> col_size;

    int matrix[row_size][col_size];

    //Taking input of the matrix
    int i, j;
    cout << "Enter the Matrix Element:\n";
    for (i = 0; i < row_size; i++)
    {
        for (j = 0; j < col_size; j++)
        {
            cin >> matrix[i][j];
        }
    }
    //check Diagonal elements are 1 and rest elements are 0
    int point = 0;
    for (i = 0; i < row_size; i++)
    {
        for (j = 0; j < col_size; j++)
        {
            //check for diagonals element
            if (i == j && matrix[i][j] != 1)
            {
                point = 1;
                break;
            }
            //check for rest elements
            else if (i != j && matrix[i][j] != 0)
            {
                point = 1;
                break;
```

```
                }
            }
        }
        if (point == 1)
            cout << "Given Matrix is not an identity matrix.";
        else
            cout << "Given Matrix is an identity matrix.";
}
```

44. Write a program in C++ to LCM and GCD.

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

void lcm(int, int);
int gcd(int, int);

void main()
{
        int a, b;

        cout << "enter the numbers:";
        cin >> a >> b;

        if (a < b)
                cout << "\n GCD of " << a << " and " << b << " : " << gcd(a, b);
        else
                cout << "\n GCD of " << b << " and " << a << " : " << gcd(b, a);

        lcm(a, b);
}

int gcd(int c, int d)
{
        int r;
        r = d % c;
        while (r != 0)
        {
                d = c; c = r;
                r = d % c;
        }
        return(c);
}

void lcm(int x, int y)
{
        int l;
```

```
        if (x < y)
                l = (x * y) / gcd(x, y);
        else
                l = (x * y) / gcd(y, x);

        cout << "\n LCM of " << x << " and " << y << " : " << l;

}
```

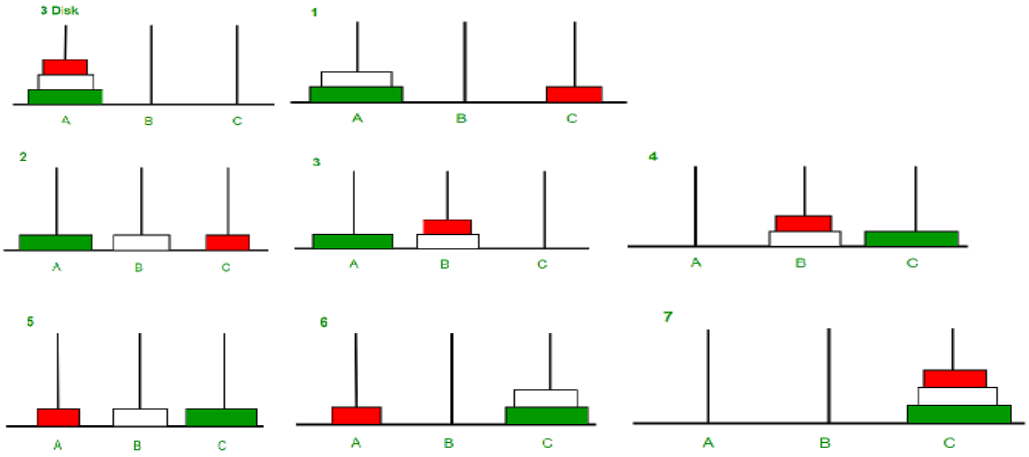
45. Write a program in C++ to Write C++ program for Tower of Hanoi.

Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:

Only one disk can be moved at a time.

Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack i.e. a disk can only be moved if it is the uppermost disk on a stack.

No disk may be placed on top of a smaller disk




```
// C++ recursive function to
// solve tower of hanoi puzzle
#include <bits/stdc++.h>
using namespace std;

void towerOfHanoi(int n, char from_rod,
                  char to_rod, char aux_rod)
{
    if (n == 1)
    {
        cout << "Move disk 1 from rod " << from_rod <<
                        " to rod " << to_rod<<endl;
        return;
```

```
    }
    towerOfHanoi(n - 1, from_rod, aux_rod, to_rod);
    cout << "Move disk " << n << " from rod " << from_rod <<
                        " to rod " << to_rod << endl;
    towerOfHanoi(n - 1, aux_rod, to_rod, from_rod);
}

// Driver code
int main()
{
    int n = 4; // Number of disks
    towerOfHanoi(n, 'A', 'C', 'B'); // A, B and C are names of rods
    return 0;
}

// This is code is contributed by rathbhupendra
```