Dry run all the programs and submit it in the next class

a)

```
int k,j;
   cout<<"Enter the Number"<<endl;// enter 6
   cin>>k;
   int z=0,i=1;
   while (i <= k){
      z=z+i;
      i=i+1;
   }
   while (k >=1){
      j=1;
      while (j <= k){
         cout<<z-k+j<<"  ";
         j=j+1;
      }
      z=z-k;
      cout<<endl;
      k=k-1;
   }
```

b)

```
int i=1;
int NoOfStars=1;
int NoOfSpace=6;
int NumberOfLines=9,j,space;
while (i<=NumberOfLines){
   j=1;
   while (j<=NoOfStars){
      if( i%2!=0)
         cout<< "*"<<" ";
      else
         cout<< " "<<"*";
      j+=1;
   }
   space=1;
   while (space<=NoOfSpace){
      cout<<" ";
      space+=1;
   }
   if (i==(NumberOfLines/2)+1)
      NoOfStars-=1;

   j=1;
   while (j<=NoOfStars){
      if (i%2==0)
         cout<<"*"<<" ";
      else
         cout<<" "<<"*";
      j+=1;
   }
   if (i==(NumberOfLines/2)+1)
      NoOfStars+=1;
   cout<<endl;

   if (i%2==0 && i<=(NumberOfLines/2)+1){
      NoOfStars+=1;
      NoOfSpace-=4;
   }
   else if (i%2!=0 && i>=(NumberOfLines/2)+1){
      NoOfStars-=1;
      NoOfSpace+=4;
   }
   i+=1;}
```

c)

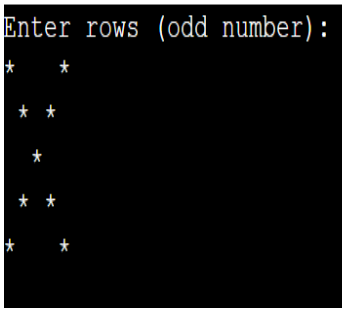
int height,mid,r,c;

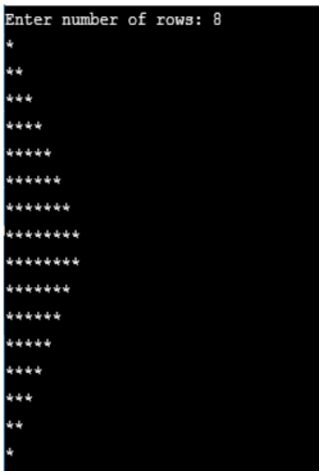
```
cout<<"Enter an odd integer as the height";
cin>>height; // Enter 7
if ((height<= 0) || ((height %2) == 0)){
   cout<<"Invalid Height"<<endl;
}
else{
   mid=height/2+1;
   r=mid;
   while (r>=1){
      c=1;
      while (c<=height){
         if(c==r || c==(height+1-r))
            cout<<'*';
         else
            cout<<' ';
         c+=1;
      }
      cout<<'\n';
      r-=1;
   }
   r=2;
   while (r<=mid){
      c=1;
      while (c<=height){
         if (c==r || c==(height+1-r))
            cout<<'*';
         else
            cout<<' ';
         c+=1;
         }
      cout<<'\n';
      r+=1;
      }
   }
```

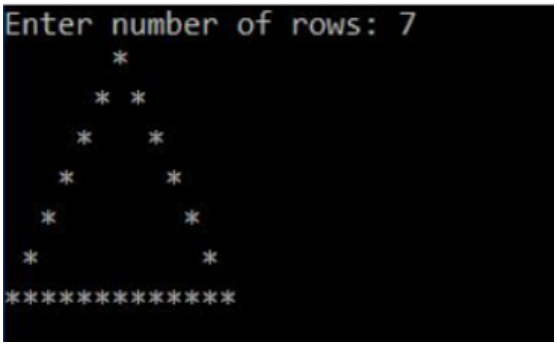
Practice Problems:

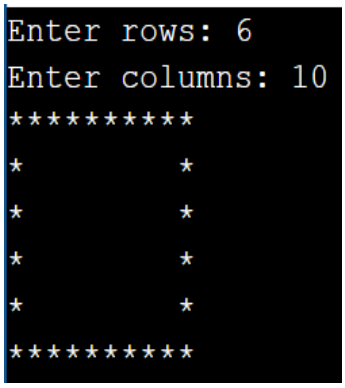
[Hint: Please use Pen & Paper to first design the Algorithm and then c++ compiler

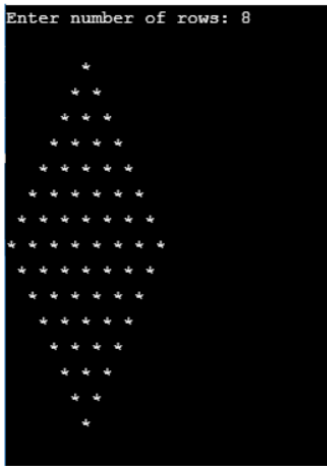
Q1: Write a C++ program to print the following patterns.

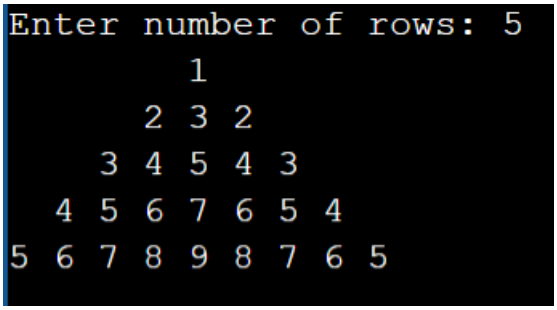












Q2: Write a C++ program to find those numbers which are divisible by 7 and multiple of 5, between 1500 and 2700 (both included).

Q3: Write a C++ program to guess a number between 1 to 9.
Note : User is prompted to enter a guess. If the user guess wrong then the prompt appears again until the guess is correct, on successful guess user will get a "Well guessed!" message, and the program will exit.

Note: use srand(time(0)) and rand() to generate guess number.

Q4: A Harshad number “is an integer that is divisible by the sum of its digits” (Wikipedia)
Example: 81 → 8 + 1 = 9 → 81/9 = 9 → Harshad!

Note: Numbers length unknown.

Q5: Write a C++ program to get the Fibonacci series between 0 to 50.
Note : The Fibonacci Sequence is the series of numbers :
0, 1, 1, 2, 3, 5, 8, 13, 21, ...
Every next number is found by adding up the two numbers before it.
Expected Output : 1 1 2 3 5 8 13 21 34

Q6: Write a C++ program to print the following series
2, 5, 7, 14, 26, 47, …
1^{st} => 2
2^{nd} => 5
3^{rd} => 7
… 6^{th} => 47
So print 100^{th} number.

Q7: Write a C++ program to print the following series
1, 2, 4, 8, 16, 32, 64, …
1^{st} => 1
2^{nd} => 2
… 7^{th} => 64
So print 100^{th} number.

Q8: A perfect number is a number that is equal to the sum of its proper divisors (excluding itself). Write a C++ program that finds all perfect numbers up to a given limit.

Q9: Pythagorean triples are sets of three integers a, b, and c such that $a^2+b^2=c^2$. Write a C++ program that finds Pythagorean triples within a certain range using nested loops.