Pascal Triangle

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1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

$(a+x)^0=1$

$(a+x)^1=1.a+1.x$

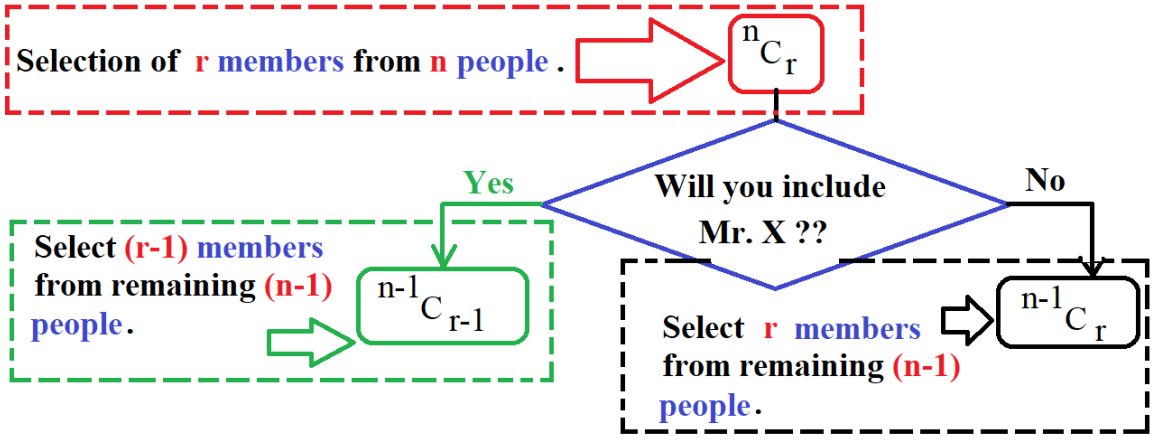
$(a+x)^2=1.a^2+2.ax+1.x^2$

$(a+x)^3=1.a^3+3.a^2x+3.ax^2+1.x^3$

The elements of Pascal Triangle are **Binomial Coefficients** or **Combinational Coefficients**.

$^{n}C_{r} = 1$ (if $r = 0$ or $r = n$)

$^{n}C_{r} = {}^{n-1}C_{r-1} + {}^{n-1}C_{r}$ (if $0<r<n$)



No. of blanks at the beginning

****1	n=0	4
***1 1	n=1	3
**1 2 1	n=2	2
*1 3 3 1	n=3	1
1 4 6 4 1	n=4=N-1	0

N = total no. of rows = 5

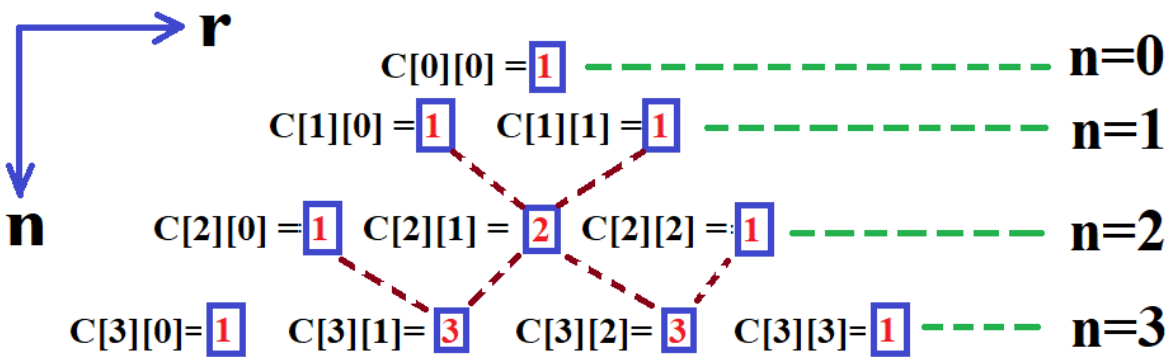
No. of blanks at the beginning of n th row = N-n-1

```
#include<stdio.h>
#include<conio.h>  /* for clrscr( ) */
#include<math.h>
#define MAX  10

void Pascal_Triangle (int );

 void main( )
{
  int  R;
  clrscr( );
  printf ("\n Enter the number of rows:");
  fflush(stdin);
  scanf ("%d",&R);
  Pascal_Triangle (R);
  getch( );
}
/*C[n][r] = element corresponding to n th row and r th column. */
```

```
void  Pascal_Triangle (int N)
{
    int  n, r, i, C[MAX][MAX];
    for (n=0; n<N; n++)
    {
       /* Go to new line at the beginning of a row.*/
       printf("\n");
      /*  There are N-n-1 no. of blanks at the beginning. */
       for (i=1; i<(N-n); i++)
            printf(" ");
      /*  There are (n+1) no. of combination coefficients at
n- th row. */
       for (r = 0; r<= n ; r++)
        {
          if (r==0||r ==n) /*1st and n th element must be 1.*/
                    C[n][r]=1;
          else
                    C[n][r]= C[n-1][r-1]+ C[n-1][r];
       /* C[n][r]= (r==0||r==n)? 1: C[n-1][r-1]+ C[n-1][r];*/
          printf ("%2d", C[n][r]);
         }
    }
}
```



$$^{n}C_{r} = 1 \quad (\text{if } r = 0 \text{ or } r = n)$$

$$^{n}C_{r} = {}^{n-1}C_{r} + {}^{n-1}C_{r-1} \quad (\text{if } 0 < r < n)$$

Here, C[n][r] = element corresponding to n th row and r th column.

```
if (r==0||r ==n)      /*1st and n th element must be 1.*/
      C[n][r] =1;
else
      C[n][r] = C[n-1][r-1]+ C[n-1][r];  /*  if 0 < r < n */
```

Alternative Statement Using Conditional Operator:

```
C[n][r] = (r = = 0 || r = = n)? 1 : C[n-1][r-1] + C[n-1][r];
```