Question Pascals Triangle

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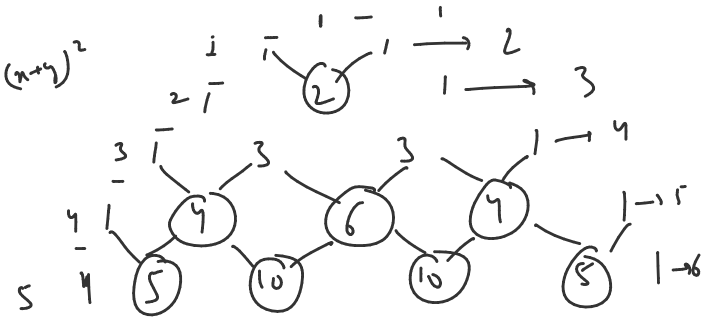
Pascal's Triangle



Pascals triangle

no. of numbers → each row

→ = row no.

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task ✓ space, numbers

$n = 5$.

1

1 2 1

1 3 3 1

1 4 6 4 1

for row no. spaces = $\boxed{n - \text{row no.}}$

1	4
2	3
3	2
4	1
5	0.

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numbers → equal to row no:

^nC_r →

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x ki power decreasing $(x+y)^n$

y increasing

in accordings coefficients.

$(x+y)^2 = x^2 + 2xy + y^2$

$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$

1 3 3 1

^{4} $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$

$(x+y)^4 = x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$

0, 1, 2, 3, 4   1   4   6   4   1

$^nC_r \rightarrow \dfrac{n!}{r!(n-r)!}$

1

1   1

$r=0$: 1 $r=1$: 2 $r=2$: 1 $\longrightarrow n=2$

1   3   3   1 $\longrightarrow n=3$

1   4   6   4   1 $\longrightarrow n=4$

$\dfrac{2!}{0!(2-0)!} = \dfrac{\cancel{2!}}{\cancel{2!}} = 1$ $r = [0, n]$

$\dfrac{2!}{1!(2-1)!} = \dfrac{2!}{1!1!} = 2$.

$^4C_2 \longrightarrow \dfrac{4!}{2!\,2!} = \dfrac{\cancel{4}^{2} \times 3 \times \cancel{2!}}{\cancel{2!} \times \cancel{2!}} = 6$

1

1   1

$^2C_0$ 1 $^2C_1$ 2 $^2C_2$ 1

$^3C_0$ 1 $^3C_1$ 3 $^3C_2$ 3 $^3C_3$ 1

$^4C_0$ 1 $^4C_1$ 4 $^4C_2$ 6 $^4C_3$ 4 $^4C_4$ 1

$^2C_0 + {}^2C_1 \longrightarrow {}^3C_1$

$^2C_1 + {}^2C_2 \longrightarrow {}^3C_2$

$^3C_1 + {}^3C_2 \longrightarrow {}^4C_2$

$$\boxed{{}^{(n-1)}C_{r-1} + {}^{n-1}C_r = {}^nC_r}$$

$^nC_r \rightarrow \dfrac{n!}{(r)!(n-r)!}$

$^nC_{(r+1)} \longrightarrow \dfrac{n!}{(r+1)!(n-(r+1))!}$

$\dfrac{n!}{}$

$$\frac{n!}{(r+1)!\,(n-r-1)!}$$

$$\frac{{}^nC_{(r+1)}}{{}^nC_r} = \frac{\frac{\cancel{n!}}{(r+1)!\,(n-r-1)!}}{\frac{\cancel{n!}}{r!\,(n-r)!}}$$

$$\frac{{}^nC_{r+1}}{{}^nC_r} = \boxed{\frac{n-r}{r+1}} \qquad \frac{\cancel{r!}\,(n-r)\,(n-\cancel{r-1})!}{(r+1)\,(\cancel{r!})\,(n-\cancel{r-1})!}$$

$${}^nC_{r+1} = \boxed{\frac{n-r}{r+1} \times {}^nC_r} \qquad {}^3C_1 = \frac{3-0}{1} \times 1 = 3$$

1

1 1 $n=1$

$\underset{0}{1}$ $\underset{1}{2}$ $\underset{2}{1}$ $n=2$

$\rightarrow$ $\underset{0}{1}$ $\underset{1}{3}$ $\underset{2}{3}$ $\underset{3}{1}$ $n=3$

no. of lines $\rightarrow$ lines.

no. of numbers / powes $\rightarrow$ n.

$0 \rightarrow$ ~~n~~ $\rightarrow$ r

$r=1$

$\rightarrow$ $\underset{{}^3C_0}{1}$ $\underset{{}^3C_1}{3}$ $\underset{{}^3C_2}{3}$ $\underset{{}^3C_3}{1}$ 3

$r=1$ ${}^3C_0 \rightarrow {}^3C_1$

$${}^3C_1 = {}^3C_0 \times \frac{n-r}{r+1} = 3 \rightarrow 3$$

$${}^3C_2 = {}^3C_1 \times \frac{n-r}{r+1} \rightarrow 3.$$

$$3 \times \frac{3-1}{1+1} = \frac{\cancel{2}}{\cancel{2}} \times 3$$

$r=1$

$\underset{{}^4C_0}{1}$ $\underset{{}^4C_1}{4}$ $\underset{{}^4C_2}{6}$ $\underset{{}^4C_3}{4}$ $\underset{{}^4C_4}{1}$ $\rightarrow 4.$

$${}^4C_1 = {}^4C_0 \times \frac{n-r}{r+1}$$

$r+1 \rightarrow r$

$${}^nC_r = {}^nC_{r-1} \times \frac{n-(r-1)}{r}$$

$r+1 \rightarrow r$

$r \rightarrow r-1$

$^{n}C_{r} = {}^{n}C_{r-1} \times \frac{n-(r-1)}{r}$

$$\boxed{{}^{n}C_{r+1} = {}^{n}C_{r} \times \frac{n-r}{r+1}}$$

$r \rightarrow r-1$

$^{n}C_{\cancel{r-1}\,\cancel{+1}} = {}^{n}C_{r-1} \times \frac{n-(r-1)}{r-\cancel{1}\,\cancel{+1}}$

power $\rightarrow$ $$\boxed{{}^{n}C_{r} = \boxed{{}^{n}C_{r-1} \times \frac{n-r+1}{r}}} \rightarrow$$

$^{1}C_{0}$ $^{1}C_{1}$

1 1

$^{2}C_{1}$ $^{2}C_{2}$ $r=1$

$^{2}C_{0}$

$\rightarrow r=1$, $ct=0$

for (ct = 0; ct <= n; ct++)

o/p $\rightarrow$ r.

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n = 4

1 $\rightarrow$ 1 $\rightarrow$ 0

$\rightarrow$ 1 1 $\rightarrow$ 1

$\rightarrow$ 1 2 1 $\rightarrow$ 2

1 3 3 1 $\rightarrow$ 3

read n.

// power = n-1

for (int i=1; i<=n; i++)

{ for each row we have to print power coefficient

power = i-1 $\rightarrow$ i-1 st power i=3

ct = 1, r = 1

for (; ct <= i; ct++)

{ o/p 'r'

r $\leftarrow$

power = 2

1 2 1

$\frac{1 \times (power-1)}{1+1}$

	1	2	3	4	5	6	7	8	9	10	11	12	13
1							1						
2					2	1		1	2				
3			3	2	1				1	2	3		
4	4	3	2	1						1	2	3	4

4 3 2 1

$\longmapsto$ 1

total rows $\rightarrow$ 4

rowno. space bef. nos., space b/w, nos

$2 \times (n-r-2-1$

$2(n-r) - 1$

$2 \times (r-1) - 1$

$2 \times (r-1)$ -

$2 \times 4 - 2 \times r = 2(n-r)$

total rows → 4

rowno. → space bef. nos., space b/w, nos

rowno.	space bef. nos.	nos.	space b/w	nos
1	6	1	0	0
2	4	2	1	2
3	2	3	3	3
4	0	4	5	4

left nos → rowno.

right nos → rowno. (except 1st row)

number start left → row no.

→ 1 =

right number start → 1 → rowno.

left spaces = 2x (n - rowno.)

middle spaces =

rno.	mid spaces
~~1~~	~~0~~
2	1
3	3
4	5
5	7

n = 4

2(n - r) - 1

2(r-1) -1

n = 4.

r = 2 → 1

2(n - r) - r

.. c.r - 3

5 → 7

0
1
3
5
7

2(n - 1)
2 × c·r − 3
$\boxed{2 \times r - 3}$

$${}^{n}C_r = {}^{n}C_{r-1} \times \frac{n-r+1}{r}$$

power

r value

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

it is denoting coefficient of power 2

left spaces → n − r

total numbers → r

$${}^{2}C_1 = {}^{2}C_0 \frac{n-r+1}{r}$$

r ②

$$1 \times \frac{2 - 1 + 1}{1}$$

1 → 2

r = 0   r = 1

val = 1

for (int i = 1; i <= rowno; i++)

i − i + 1

1, 2, 1

for (int i =

cout r.

$r = r \times \frac{rowno. - i + 1}{i}$

~~for curr. rowno = 3~~ 4

val = ~~1~~ ~~3~~ 1

for (int i = 1 ; i <= curr.rowno.; i++)

1, 3, 3, 1

→ cout val,

$val = val \times \frac{(curr.rowno.) - i + 1}{i}$

power, coef no.

1, 3, 3, 1

$1 \times \frac{3 - \cancel{1} + \cancel{1}}{1}$ $\boxed{\cancel{1}}$ ~~2~~ ~~3~~ 4

$3 \times \frac{3 - \cancel{2} + 1}{\cancel{2}}$ $3 \times \frac{3 - 3 + 1}{3} = \frac{\cancel{3} \times 1}{\cancel{3}}$

$^nC_r = {^nC_{r-1}} \times \frac{n - r + 1}{r}$

val, (rowno − 1), i [1 ≤ i <= rowno.]

for rowno = 3

power = 2 val = 1

$^nC_0 \rightarrow 1$ $^nC_n \rightarrow 1$

$^nC_1 = {^nC_0} \times \frac{n - r + 1}{1}$

$^{power}C_{coefno} = {^{power}C_{coefno - 1}} \times \frac{power - coefno + 1}{coef no.}$

val = 1

cout << val.

$val = val \times \left(\frac{power - coefno + 1}{coefno.}\right)$ i