

# Total Number of BST from n-nodes: →

no. of nodes      no. of possible BST      BST Arrangements

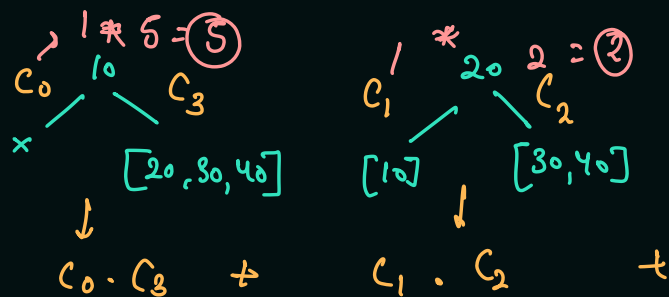
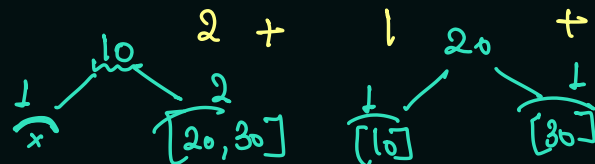
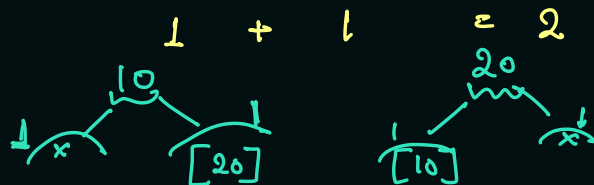
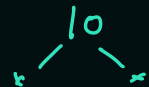
0      1

1 [10]      1

2 [10, 20]      2

3 [10, 20, 30]      5

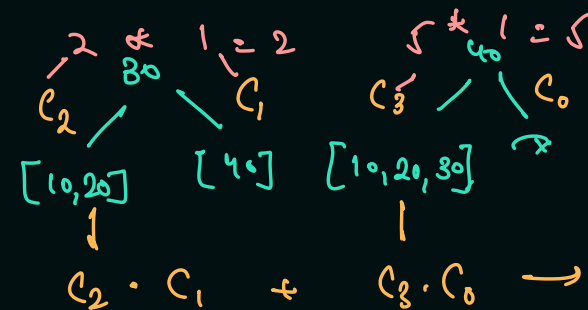
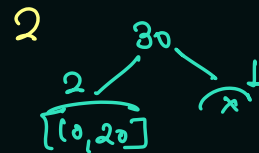
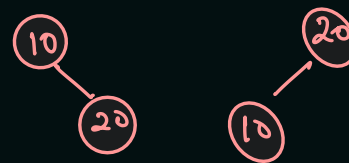
4 [10, 20, 30, 40] →  $C_4$   
14



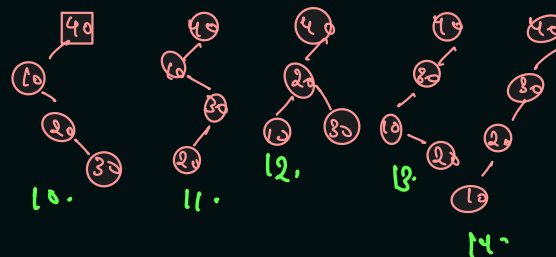
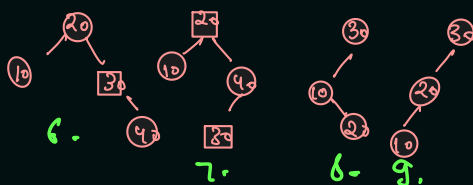
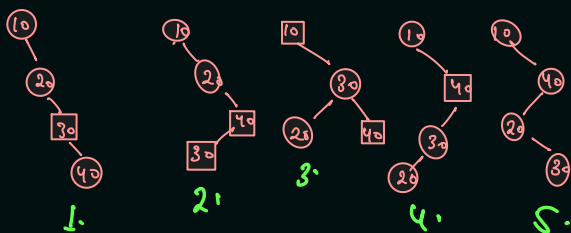
$$x^0 = 1$$



(10)



Catalan Numbers



# Count of valleys and Mountains:

$n=0$

Count of possible  
Arrangement

Arrangement:

$n=1$

1

$\wedge$  0

$\wedge$

$n=2$

2

$\swarrow \searrow$  0

$\swarrow \searrow$  1 pair

$\swarrow \searrow$

$\swarrow \searrow$

$n=3$

5

$\swarrow \searrow$  2 pair 0 pair

$\swarrow \searrow$  1 pair 1 pair

$\swarrow \searrow$  0 pair 2 pair

$\swarrow \searrow$  4

$n=4$

14

$C_4 \rightarrow$

$\swarrow \searrow$

$\swarrow \searrow$

$\swarrow \searrow$

$\swarrow \searrow$

$C_3 \neq C_0$   
 $\swarrow \searrow$  3 pair 0 pair  
 $5 \times 1$

$C_2 \neq C_1$   
 $\swarrow \searrow$  2 pair 1 pair  
 $2 \times 1$

$C_1 \neq C_2$   
 $\swarrow \searrow$  1 pair 2 pair  
 $1 \times 2$

$C_0 \neq C_3$   
 $\swarrow \searrow$  0 pair 3 pair  
 $1 \times 5$

$= 14$

$\swarrow \searrow$

$\swarrow \searrow$

$\swarrow \searrow$

$\swarrow \searrow$

$\swarrow \searrow$

# count Brackets :-

no. of brackets  
pair

Arrangement

0

-

1

-

1

()

→

1

()

2

(())

→

2

(1 pair) 0 pair

(0 pair) 1 pair

(())

()()

3

((()))

→

5

(2 pair) 0 pair

(1 pair) 1 pair

(0 pair) 2 pair

((()))

()()

()()

()()

()()

4

((((()))))

→

(14)

$C_4$

$C_3 + C_0$   
(3 pair) 0 pair

$C_2 + C_1$   
(2 pair) 1 pair

$C_1 + C_2$   
(1 pair) 2 pair

$C_0 + C_3$  ⇒  
(0 pair) 3 pair

((((()))))

((()()))

((())())

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Catalan Num

# Circle and chords:

Contr

Arrangement

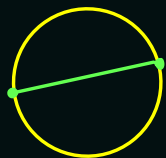
$n=0$

No. pts

0

①

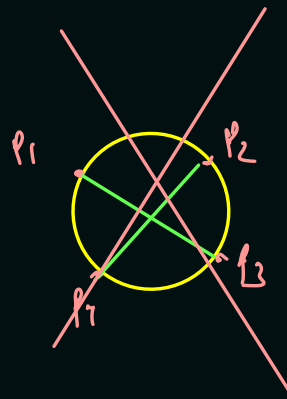
-



$n=1$

2

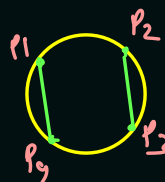
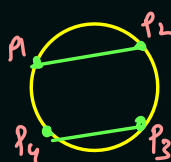
①



$n=2$

④

②



$n=3$

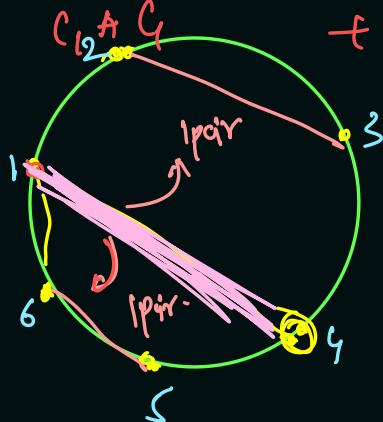
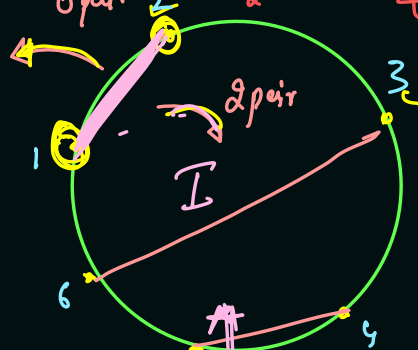
⑤

$C_3 \rightarrow$

6

$C_0$  0 pair

2 pair

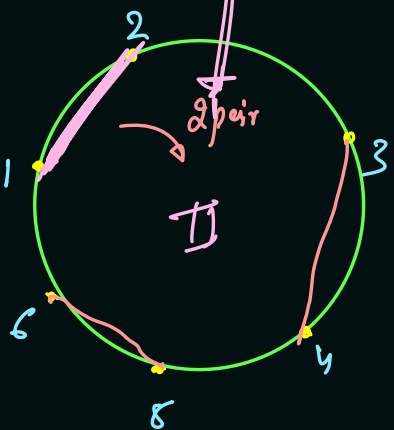


$C_2$  2 pair

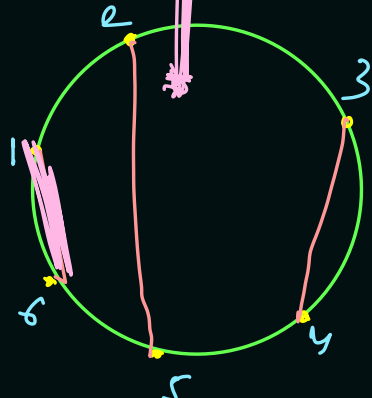
= Catalan Numbers

0 pair

2 pair

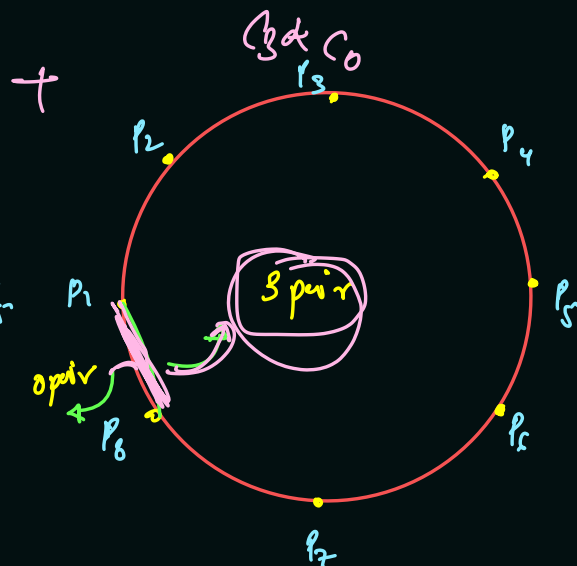
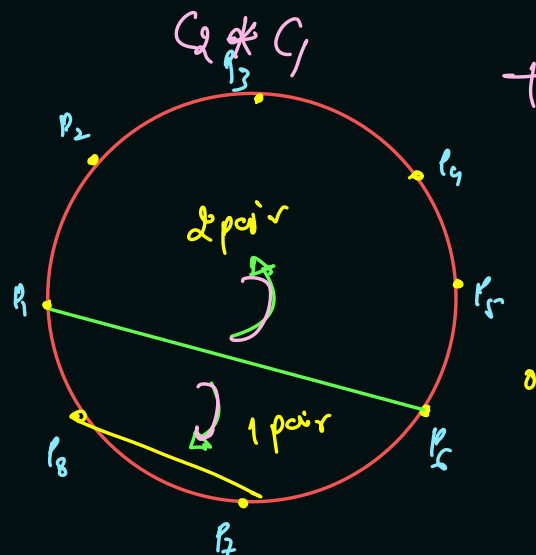
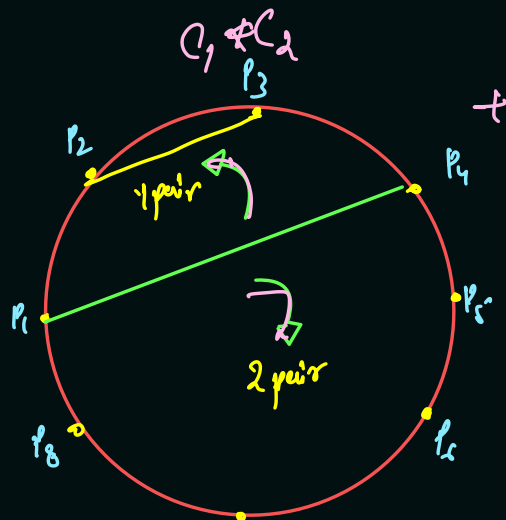
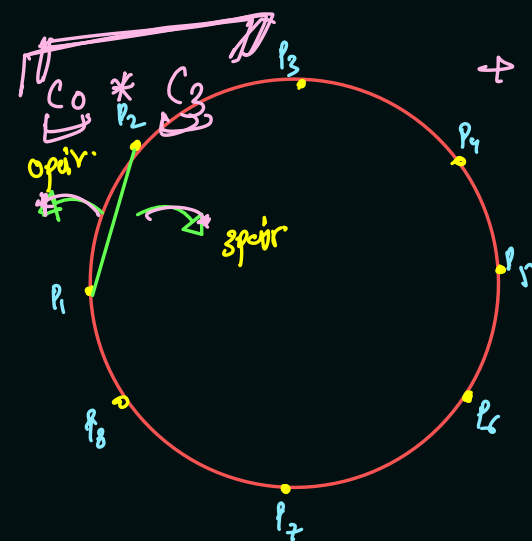


5 ways



$n=4$   
 $\underline{C_4}$        $\underline{pts=8}$

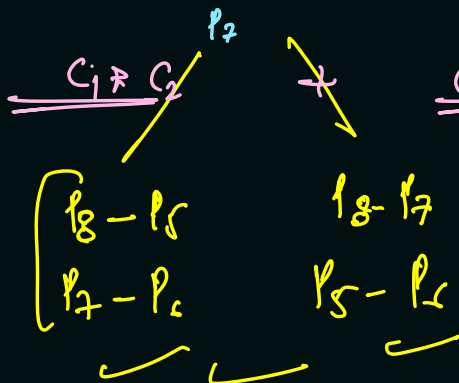
clockwise direction movement



$\underline{C_0 \rightarrow C_1 \rightarrow C_2 \rightarrow C_3}$

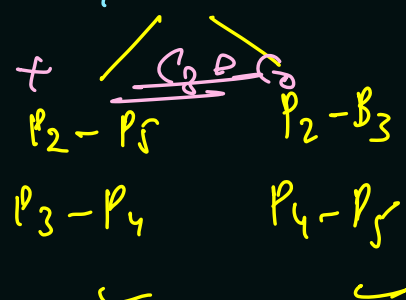
8 ways in

3 pair



(2)

$\underline{C_0 \rightarrow C_1}$



(2)

14

