U1 (1/1 point)

With n balls and m boxes, 8 different problems could be constructed by changing constraints on the identity of boxes, balls and whether a box is allowed to be empty. Please fill in the blanks and answer the number of ways the scenario is possible.

1) n distinct balls, m distinct boxes, with empty box allowed _____

F

2) n distinct balls, m distinct boxes, with no empty box allowed _____

C

3) n distinct balls, m identical boxes, with empty box allowed _____

D

4) n distinct balls, m identical boxes, with no empty box allowed _____

A

5) n identical balls, m distinct boxes, with empty box allowed _____

B

6) n identical balls, m distinct boxes, with no empty box allowed _____

E

7) n identical balls, m identical boxes, with empty box allowed _____

H

8) n identical balls, m identical boxes, with no empty box allowed _____

G

A. $S(n,m)$

B. $C(n+m-1,n)$

C. $m!S(n,m)$

D. $\begin{cases} S(n,1)+S(n,2)+\cdots+S(n,m), & m \le n \\ S(n,1)+S(n,2)+\cdots+S(n,n), & m > n \end{cases}$

E. $C(n-1,m-1)$

F. m^n

G.the coefficient of x^n in $G(x) = \frac{x^m}{(1-x)(1-x^2)\cdots(1-x^m)}$

H.the coefficient of x^n in $G(x) = \frac{1}{(1-x)(1-x^2)\cdots(1-x^m)}$

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U2 (1/1 point)

On the circumference, 10 points are connected with 5 line segments among which there are no line crossing over and no point being used more than once. How many ways are there to connect these points?

42

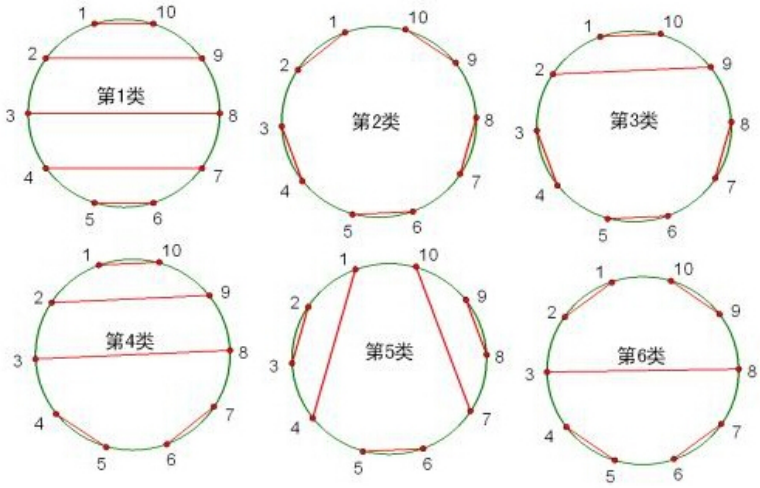
42

Answer: 42

EXPLANATION

Solution 1：Catalan numbers. C5=42

Solution 2: As the figure show, there are 6 different categories. In the first one, there are 5 ways to connect, in the second there are 2, in the third one there are 10 ways of connecting. There are 10 possibilities for the fourth category, 10 for the fifth and 5 for the sixth. Added together, you get 42 different ways of connecting.



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