What is the least # of rungs needed to generate the permutation 5 3 2 4 1 8 7 6

To find cycles, compare to home position:

1 2 3 4 5 6 7 8

5 3 2 4 1 8 7 6

Cycle structure = (1, 5)(2, 3)(4)(6, 8)(7)

(2−1) + (2−1) + (1−1) + (2−1) + (1−1)

Least # rungs needed = $n - c = 8 - 5 = 3$

$= 2 + 2 + 1 + 2 + 1$

$-(1 + 1 + 1 + 1 + 1)$

(1, 2, 4, 6, 7)(3, 9, 5, 8)

need 9−2 = 7 rungs

Is this puzzle soluable:

4_1	2_2	8_3
7_4	3_5	5_6
6_7	1_8	

1 2 3 4 5 6 7 8

4 2 8 7 3 5 6 1

$3 + 1 + 5 + 4 + 1 + 1 + 1 + 0 = 16$ inversions

inversions = 16, even, so the puzzle is soluable.

Cycle structure $= (1,8,3,5,6,7,4)(2)$

cycles = 2

$n - c = 8 - 2 = 6$

This perm. can be achieved w/ 6 rungs.

Even. Soluable.

Even cycles (Eg 2 3 4 5 6 7 8 1) have odd parity. (8-cycle?)

7 cycles

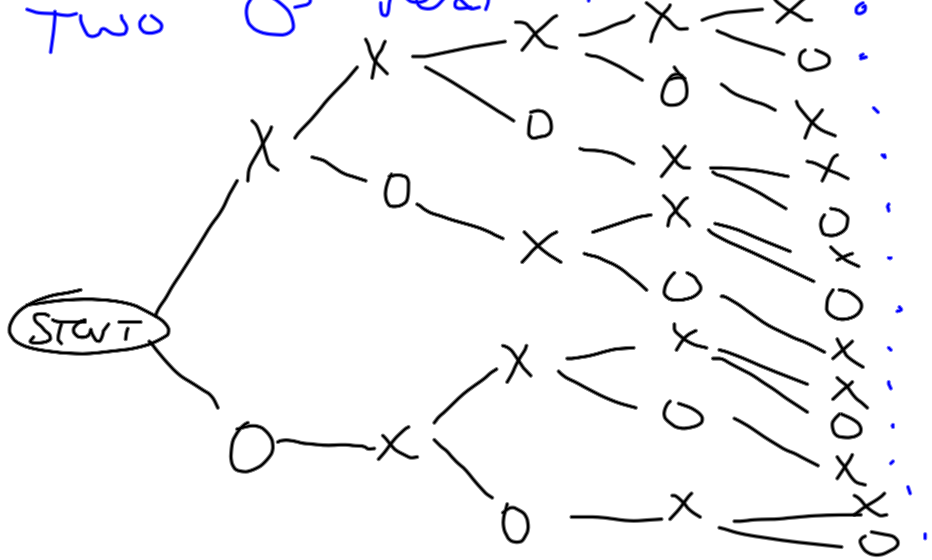
$n - c = n - 1$

$= 8 - 1 = 7.$

n = # elements

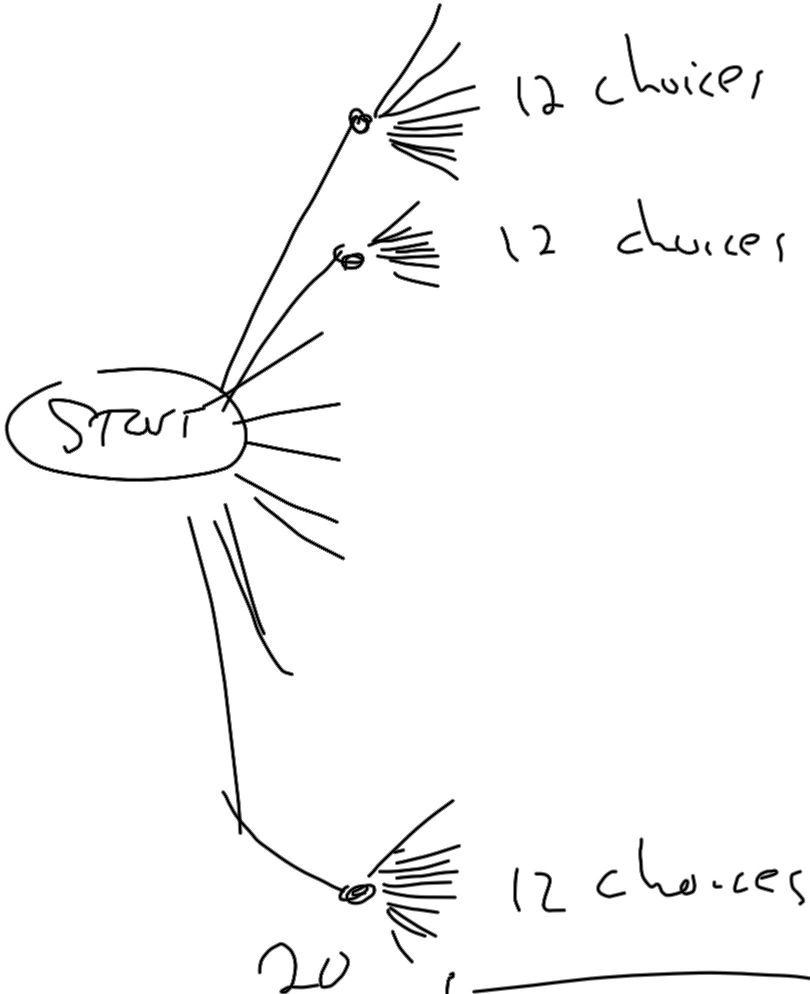
c = # cycles

X-O sequences of length 5 without two O's next to each other.

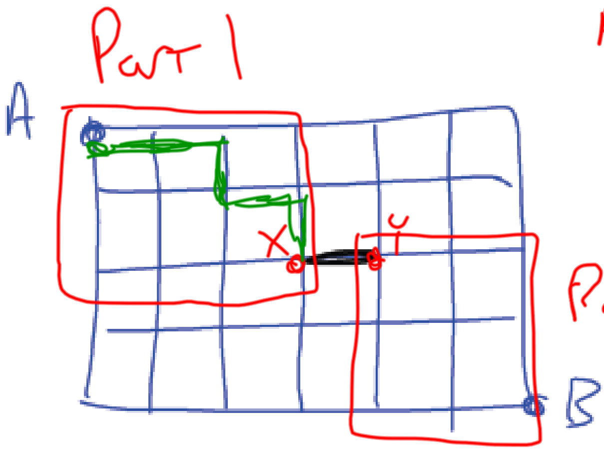


13 ways

20 boys
12 girls



120 branches



A → X can be done in $\frac{5!}{2!\,3!} = 10$ ways

SSEEE

Y → B $\frac{4!}{2!\,2!} = 6$ ways

SSEE

So, the total # of ways is 60

$= 10 \times 6$

$\frac{5!}{2!\cdot 3!} = \frac{5\cdot \cancel{4}^{2}\cdot \cancel{3\cdot 2\cdot 1}}{\cancel{2}\cdot 1\cdot \cancel{3\cdot 2\cdot 1}}$

$= 5\cdot 2 = 10$

Eric has 12 children, and wants to select ~~[illegible]~~ four to bring to the game.

\# ways to make his choice? Expres... integer.

$$\binom{12}{4} = \frac{12!}{4! \cdot 8!} = \frac{\cancel{12} \cdot 11 \cdot \cancel{10}^{5} \cdot 9 \cdot \cancel{8!}}{\cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot 1 \cdot \cancel{8!}} = \boxed{495}$$

YYYYNNNNNNNN