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Project 3 CS 3305.502

Part 1:

Hallway of length n = hallways of length $n-5$ (start red) + hallways of length $n-2$ (start blue)

$a_n = a_{n-5} + a_{n-2}$

initial conditions $a_2 = 1$, $a_5 = 1$, $a_1 = 0$, $a_3 = 0$

when $n \le 0$ $a_n = 0$ (hallway needs to have positive length)

example use $n = 12$

$$a_{12} = a_7 + a_{10}$$
$$= (a_2 + a_5) + (a_5 + a_8)$$
$$= (a_2 + a_5) + (a_5 + (a_3 + a_6))$$
$$= (a_2 + a_5) + (a_5 + (a_3 + (a_1 + a_4)))$$
$$= (a_2 + a_5) + (a_5 + (a_3 + (a_1 + (a_{-1} + a_2))))$$
$$= 1 + 1 + 1 + 0 + 0 + 0 + 1$$
$$= 4$$

$n = 12$ using b = blue, r = red

rrb
brr
rbr
bbbbbb

4 options total

Part 2:

Part 2 = Part 1 − # hallways with touching reds

$a_n = a_{n-5} + a_{n-2} - (\underset{\text{start rr}}{a_{n-10}} + \underset{\text{end rr}}{a_{n-10}})$

$a_n = a_{n-5} + a_{n-2} - 2a_{n-10}$

Part 3:

using only greens and purples $a_n = n+1$ Because you can have $0-n$ greens, and the rest purples which results in $n+1$ options

$\therefore a_n =$ part 1 + greens/purples

$a_n = a_{n-5} + a_{n-2} + n + 1$

for $n = 12$ you can have $n+1 = 13$ green/purple only options
you can start red or blue and get a_{n-5} or a_{n-2} options as well

$\therefore a_n = a_{n-5} + a_{n-2} + n + 1$

covers only green/purple, only red/blue, and combinations of all 4