



## Enigma 4

*Estimadas, estimados participantes:*

*Uno de nuestros ex-colaboradores cometió hace poco una imprudencia que no nos costó mucho corregir, y que ha terminado resultándonos muy útil. Después de recibir el mensaje que veréis debajo, nuestra organización se puso en contacto inmediatamente con Carmen y Nassim, que (bajo otros nombres) están al cargo de algunos de nuestros asuntos más delicados. Como imaginaréis, después de esto Ayman no forma ya parte de nuestra organización.*

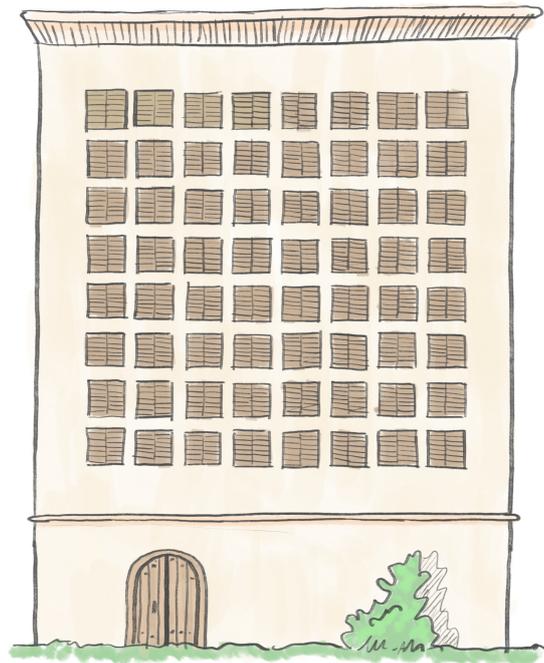
*Por favor, no penséis que el hecho de que el mensaje esté en inglés tiene algún tipo de relevancia para este enigma; no lo hemos traducido simplemente porque queremos que leáis sin intermediarios el mensaje que recibimos directamente de nuestro ex-colaborador.*

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Dear Enigma:

I have a problem I cannot solve and it's driving me crazy, so I beg for your help. Last month I was next to an empty and large building with these two people, Carmen and Nassim. As you will see, they seem to have incredible (that is: infinite) mental abilities (including perfect visual memory and instantaneous computation skills).

The building has 8 floors and 8 flats on each floor, each flat having one single window with nice wood shutters. These shutters can be open or closed, and these are the two only possible states for these boring shutters. For the moment, they are all closed.



You see, I thought I could have some fun with the following strange challenge, so I told them:

*“Carmen, I will go into the building and open a few of the shutters as I please. Then, Nassim will go far from here so that he cannot see the building anymore. After that I will point out to you one window of the building. I give you fifty euros if Nassim guesses which window I pointed out to you when he comes back. For this, you will not be allowed to speak to him or communicate with him in any way after I point out the window. The only thing you are allowed to do is toggle one single shutter (opening it if it’s closed, or closing it if it’s open) while he’s not here.”*

Carmen and Nassim started laughing. *“Why are you laughing?”* I say, a bit offended. Carmen answered

*“Well, that’s an easy way to earn money: I will just open (or close) the shutter of the window you pointed to me and when Nassim comes back he’ll notice the only window which has changed, and he’ll know that’s the one!”*

I felt dumb. Of course, they have perfect memory. It’s always the same with these two: for any challenge, they find the solution instantaneously. Annoyed, I wanted to increase the level of difficulty and I proudly proposed:

*“Well, I’ll tell you something. After Nassim has left I will first open and close some of the shutters (as many as I want!) and then I’ll point out to you one window. As before, you’ll be allowed to act on (only) one shutter. Same goal: Nassim should guess which window I pointed out to you. Aha! What do you say about this? Now it*

*doesn't matter that he can remember the previous state of the windows, because I will have toggled an unknown number of them."*

I was feeling confident because I had a strong feeling of impossibility for this new challenge. So I added:

*"And if you manage to do so, I'll tell you the secret codes to the Enigma organization!!"*

I laughed again. And then, amazingly, Nassim said: *"Well, you're basically offering us to betray your secret organization, for almost the same effort!"*

I was furious!

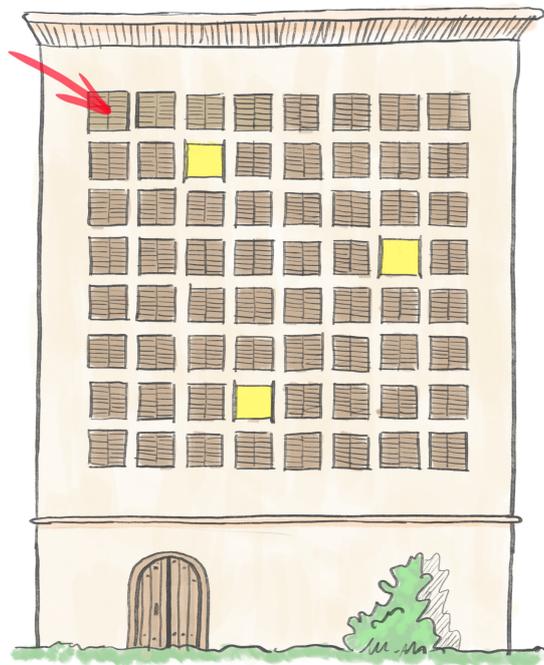
*"You must be bluffing! Come on, let's try this. There's no way you're going to guess the window I'll point out to Carmen. Get away from here and we'll see."*

Just before Nassim left, he had this cryptic exchange with Carmen that I did not quite understand:

*"Carmen, we need a language. For me, each window is an element of the space you may guess, since we need each element to be its own opposite."*

*"That's a good idea. The easiest is to order them lexicographically then."*

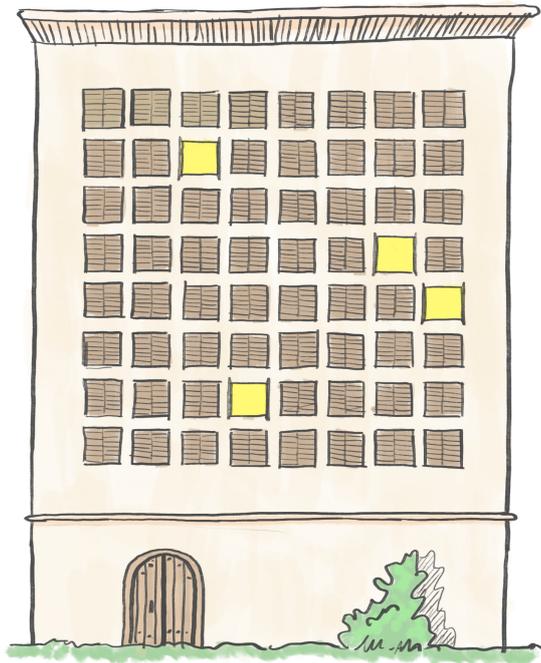
After this, Nassim gave her an affirmative wink and left the place. I run into the building and started randomly opening and closing shutters. After 10 minutes of intense activity the building looked like this:



I came back to the front of the building, out of breath and pointed to Carmen the window marked with an arrow in the picture. She nodded, slowly walked into the



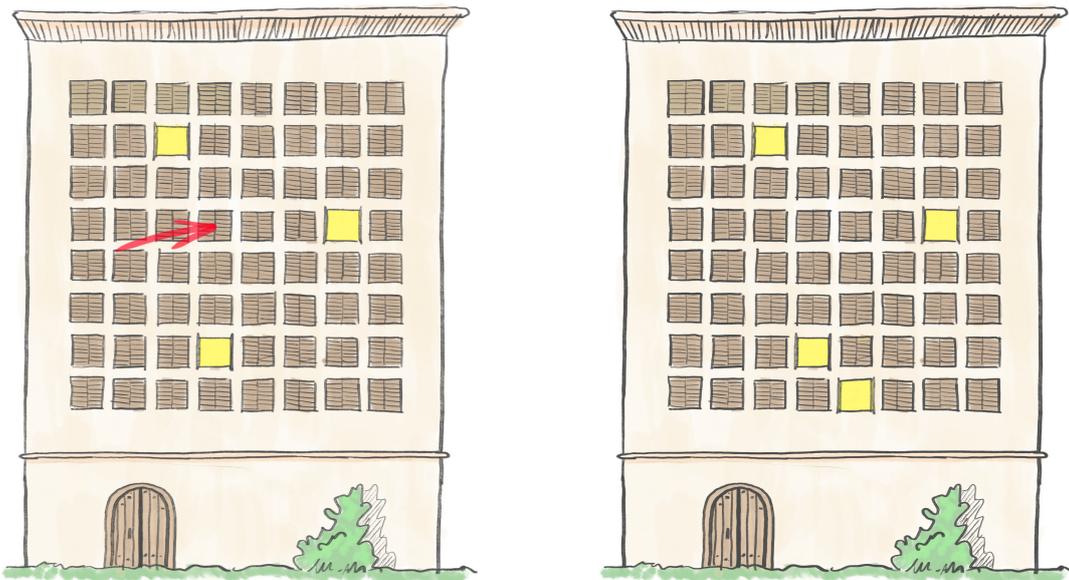
building, and opened one shutter. This was the building after this:



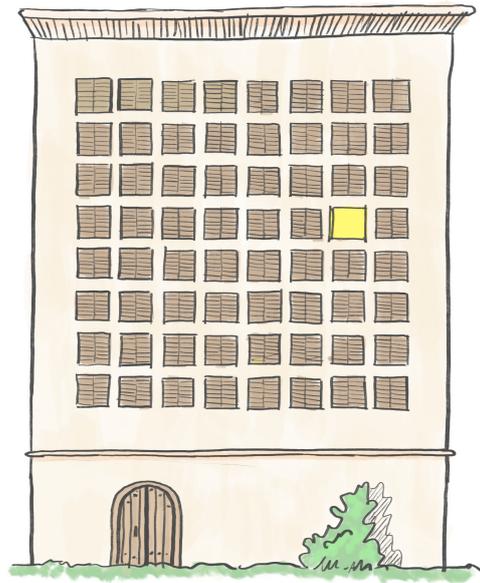
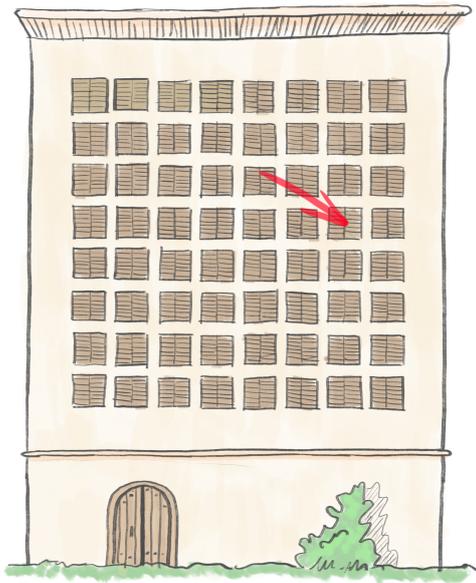
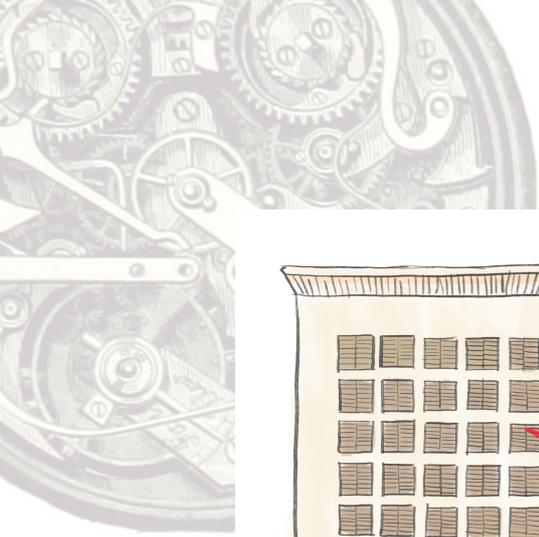
I called Nassim on the phone to get him back, and when he arrived he immediately pointed out the correct window!!

I just couldn't believe it!

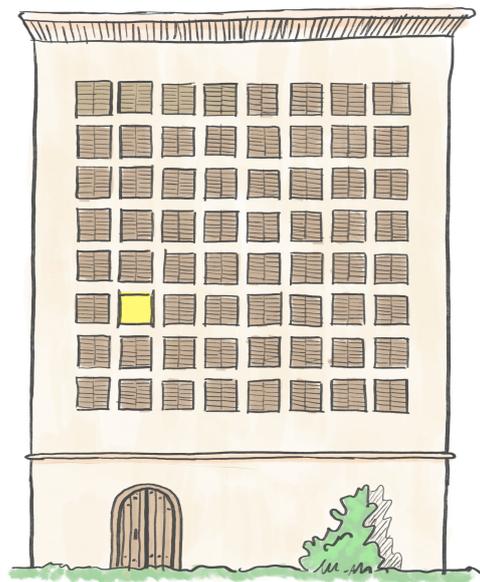
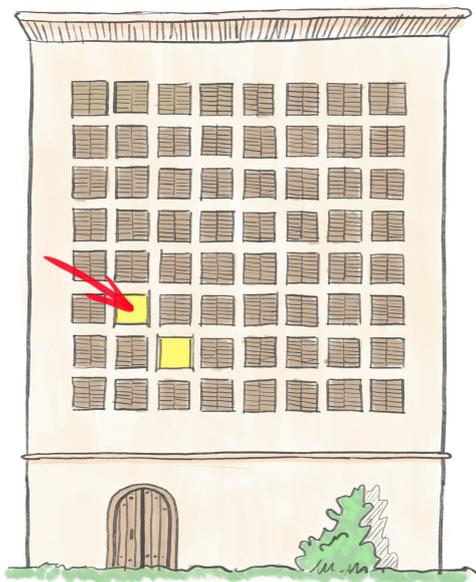
I thought it was luck, so we repeated the same game several times while I tried to guess how they were doing it. These are the results of my tests:



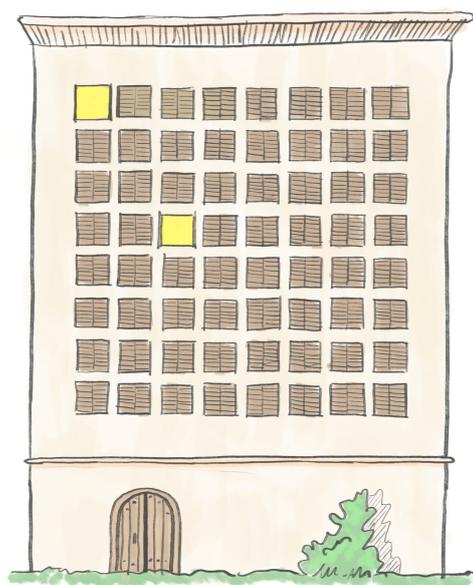
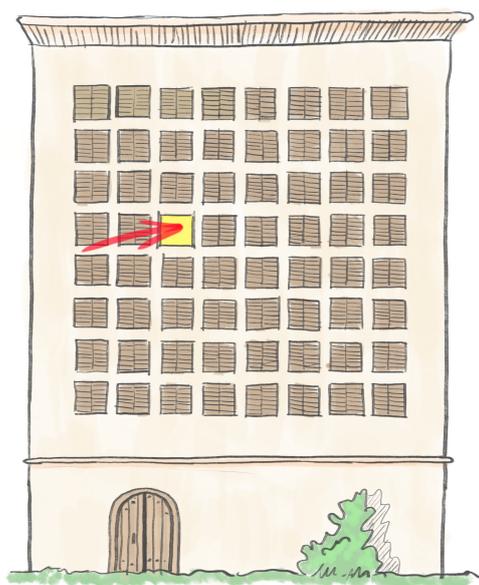
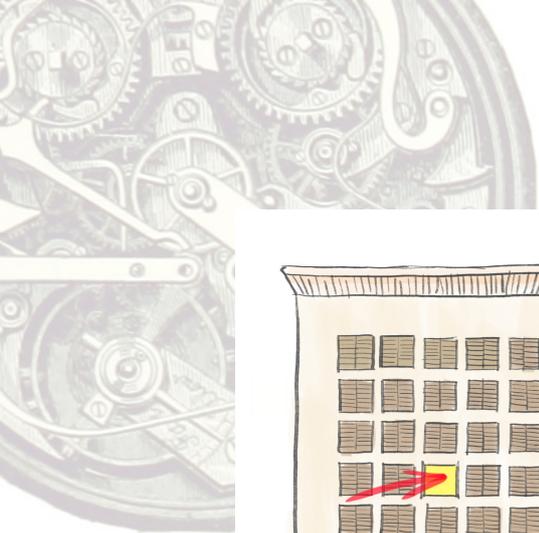
*With the same position, I pointed a different window to Carmen while Nassim was away. She opened the window indicated on the right, and Nassim guessed correctly!*



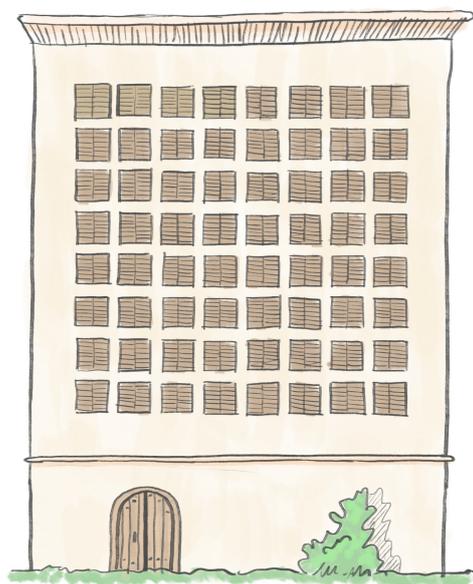
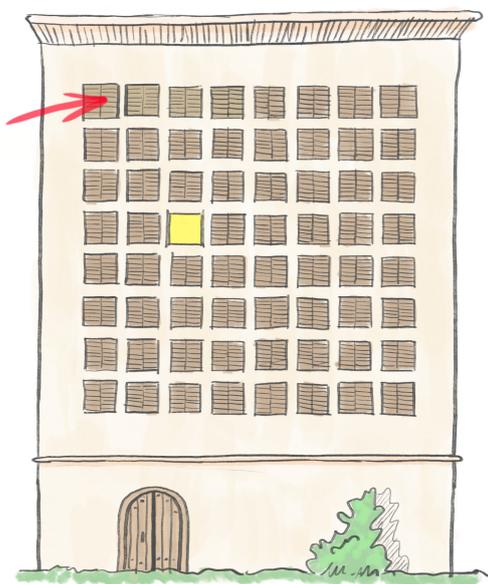
*I wanted to understand how they did it with simple positions. While Nassim was away, I set up the position on the left, and pointed out the indicated window to Carmen. She opened a window as you can see on the right, and Nassim guessed correctly!*



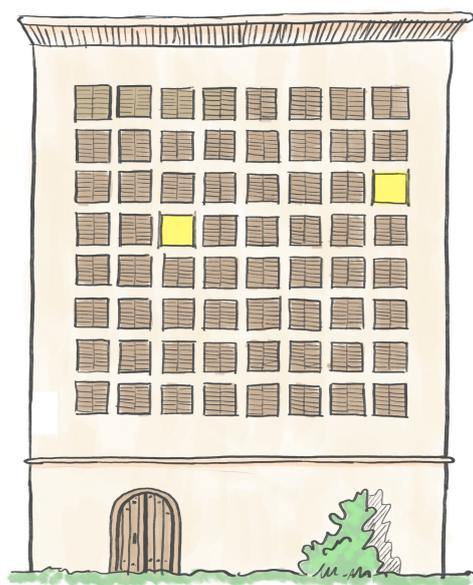
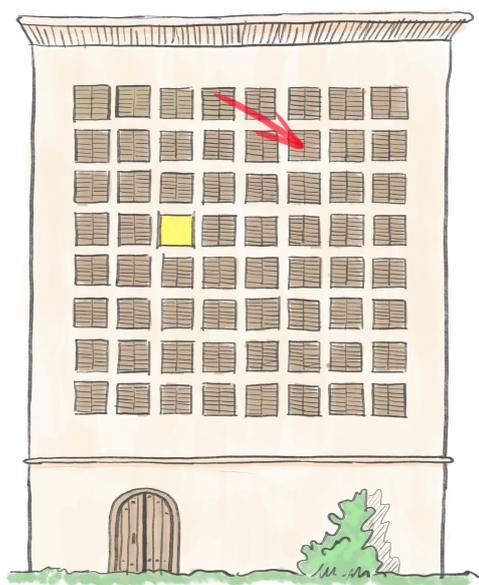
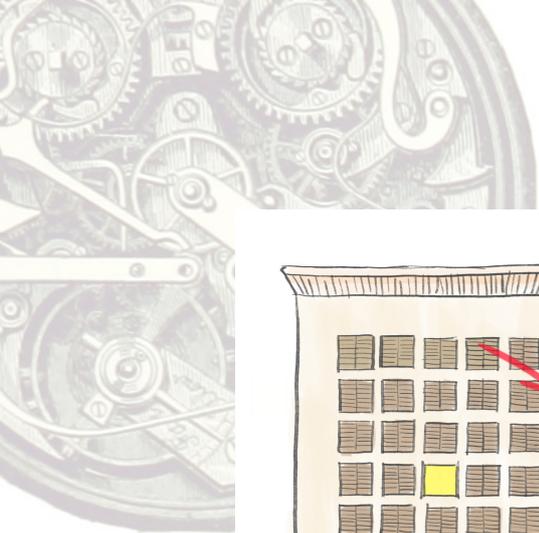
*While Nassim was away, I set up the position on the left, and pointed out the indicated window to Carmen. She closed a window as indicated on the right, and Nassim guessed correctly! Of course...*



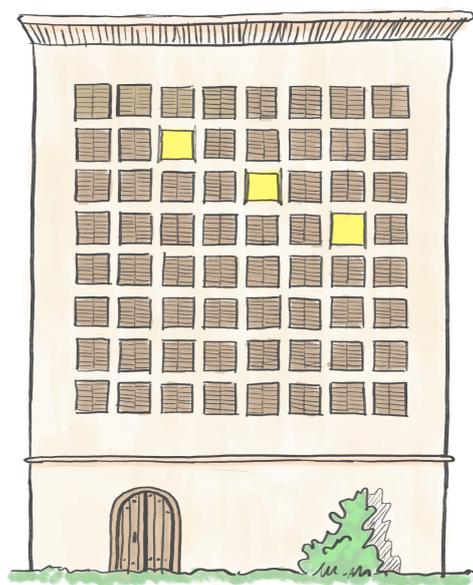
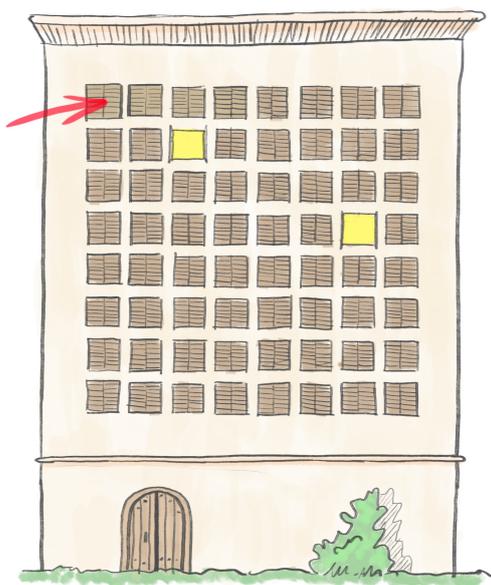
*I wanted to avoid what they just did, so while Nassim was away, I set up the position on the left, and pointed out the open window to Carmen. She opened the first window as indicated on the right, and Nassim guessed correctly! Carmen said “Of course, I could also have decided to not touch anything and Nassim would have guessed just as well.”*



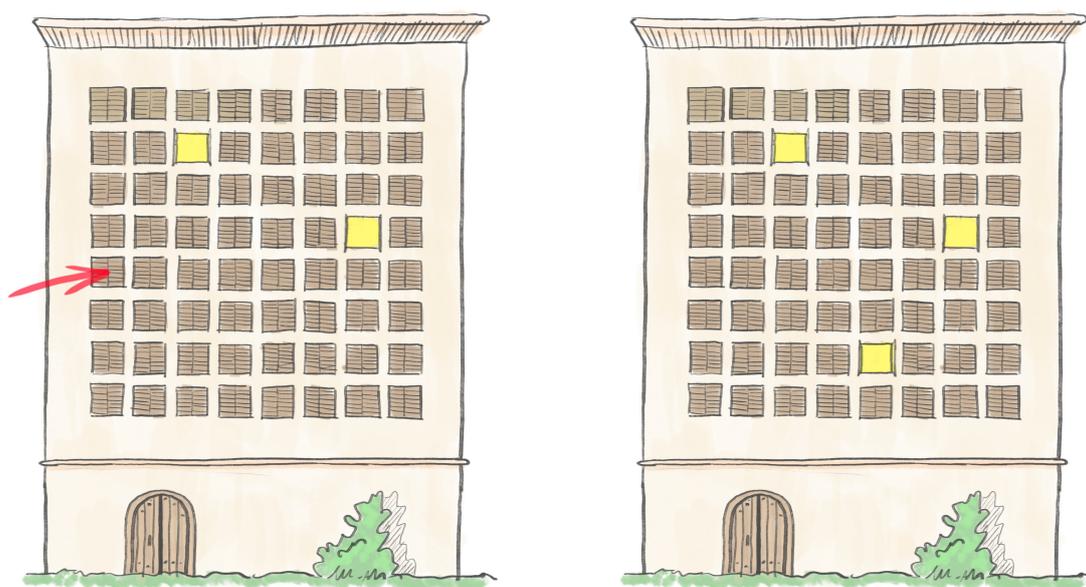
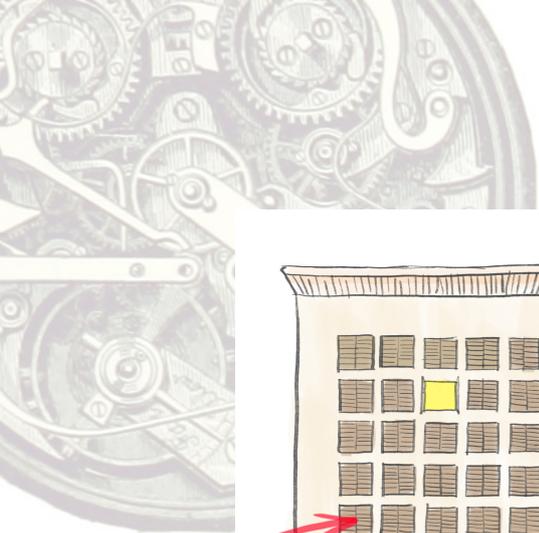
*Trying to understand, I set up the position on the left, and pointed out the indicated window to Carmen. She closed the only window which was open, and Nassim guessed correctly!*



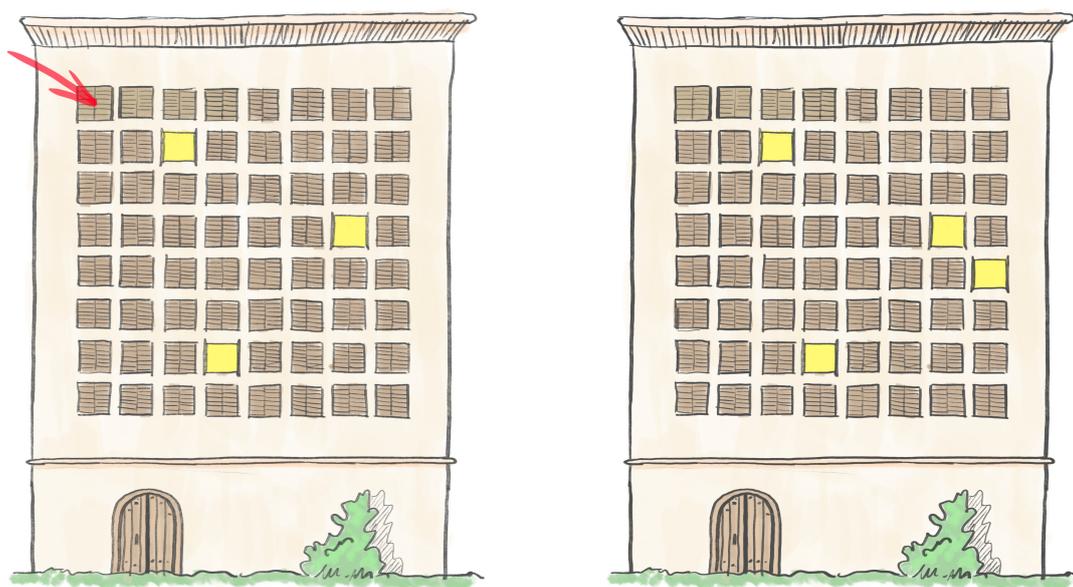
*While Nassim was away, I set up the position on the left, and pointed out the indicated window to Carmen. She opened the window indicated on the right, and Nassim guessed correctly!*



*While Nassim was away, I set up the position on the left, and pointed out the indicated window to Carmen. She opened the window indicated on the right, and Nassim guessed correctly!*

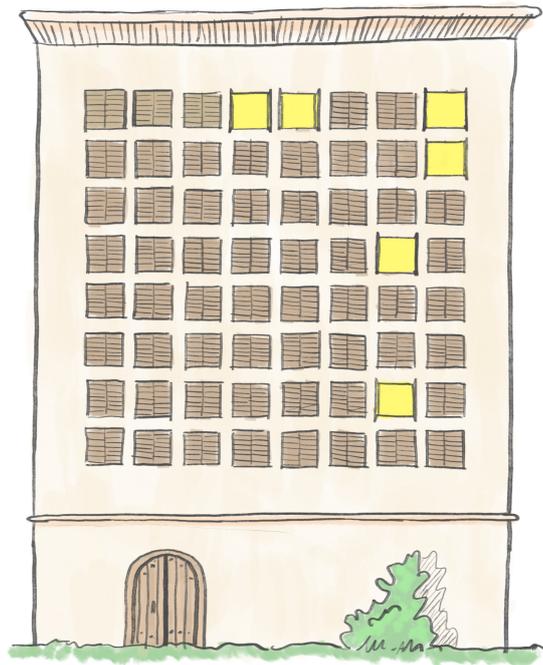


*While Nassim was away, I set up the position on the left, and pointed out the indicated window to Carmen. She opened the window indicated on the right, and Nassim guessed correctly!*



*While Nassim was away, I set up the position on the left, and pointed out the indicated window to Carmen. She opened the window indicated on the right, and Nassim guessed correctly again!*

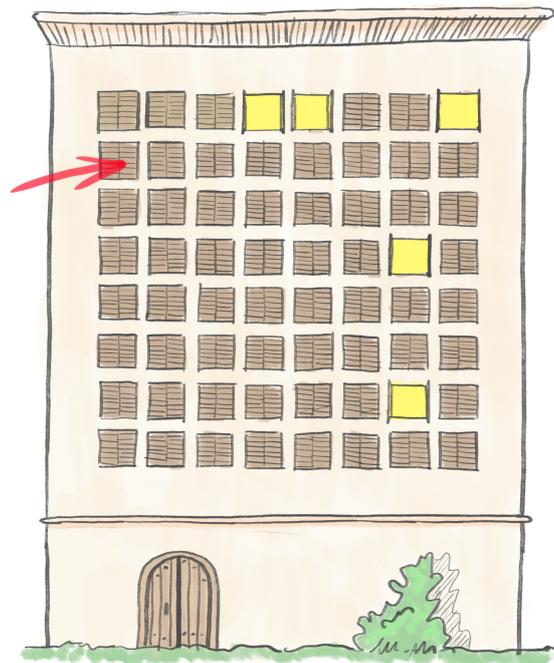
Finally I set up another position while Nassim was away, and pointed out one window to Carmen. Then, she opened one window. Here is the photo I took of the building after this:



Of course, Nassim guessed correctly after he returned.

**First question: which flat did I point out to Carmen?**

Just to see that you understand the way this works, I'll ask you something else. Next I set up the following position, and pointed out the window marked with the red arrow:





Carmen opened a window, and Nassim guessed correctly the window I pointed out, as always.

**Second question: which window did Carmen open?**

Please help. Best regards,

*Ayman*

*La respuesta debe contener la solución a las dos preguntas hechas en el texto anterior, indicando piso y ventana. Los pisos se cuentan desde el 1 (el más bajo) hasta el 8 (el más alto), y las ventanas se cuentan de izquierda (ventana 1) a derecha (ventana 8). Por ejemplo, la ventana indicada con la flecha roja en el dibujo justo antes de la segunda pregunta es la ventana 1, piso 7. El formato de la respuesta debe ser:*

*First question: ventana X, piso Y*

*Second question: ventana Z, piso W*

*donde X, Y, W, Z son números del 1 al 8.*