Consider an array where the elements are with incremental natural numbers starting with 1 at the top right corner and following a diagonal pattern:

$$a = \begin{bmatrix} 1 & 2 & 4 & 7 & 11 & 16 & 22 & 29 \\ 3 & 5 & 8 & 12 & 17 & 23 & 30 & 38 \\ 6 & 9 & 13 & 18 & 24 & 31 & 39 & 48 \\ 10 & 14 & 19 & 25 & 32 & 40 & 49 & 59 \\ 15 & 20 & 26 & 33 & 41 & 50 & 60 & 71 \\ 21 & 27 & 34 & 42 & 51 & 61 & 72 & 84 \\ 28 & 35 & 43 & 52 & 62 & 73 & 85 & 98 \end{bmatrix}$$

What follows is the procedure to obtain a formula that gives the value for $a_(ij)$ without having to find it iteratively.

Let b be the first row of a:

$$b = \begin{bmatrix} 1 & 2 & 4 & 7 & 11 & 16 & \cdots \end{bmatrix}$$

Each number has a relationship with the previous one

$$\begin{aligned} b[0] &= 1 + 0 = 1 \\ b[1] &= 1 + 1 = 2 \\ b[2] &= 2 + 2 = 4 \\ b[3] &= 4 + 3 = 7 \\ b[4] &= 7 + 4 = 11 \\ b[5] &= 11 + 5 = 16 \\ \cdots \\ b[n] &= b[n-1] + n \end{aligned}$$

Extending $b[n-1]$ on each line shows a pattern:

$$
\begin{aligned}
b[0] &= 1 \\
b[1] &= b[0]+1 = 0(n-1)+1+n = 1n+1 \\
b[2] &= b[1]+2 = 1(n-1)+1+n = 2n+0 \\
b[3] &= b[2]+3 = 2(n-1)+0+n = 3n-2 \\
b[4] &= b[3]+4 = 3(n-1)-2+n = 4n-5 \\
b[5] &= b[4]+5 = 4(n-1)-5+n = 5n-9 \\
b[6] &= b[5]+6 = 5(n-1)-9+n = 6n-14 \\
\cdots & \\
b[n] &= n^2 - c[n] \qquad (1)
\end{aligned}
$$

where

$$
c = \begin{bmatrix} -1 & -1 & 0 & 2 & 5 & 9 & 14 & \cdots \end{bmatrix}
$$

$$
\begin{aligned}
c[0] &= -1 \\
c[1] &= -1 = 0-1 \\
c[2] &= 0 = 1-1 \\
c[3] &= 2 = 2+0 \\
c[4] &= 5 = 3+2 \\
c[5] &= 9 = 4+5 \\
c[6] &= 14 = 5+9 \\
\cdots & \\
c[n] &= (n-1) + c[n-1]
\end{aligned}
$$

Let's develop one, say $c[6]$, to unveil the pattern:

$$
\begin{aligned}
c[6] &= (6-1)+c[5] \\
&= (6-1)+(5-1)+c[4] \\
&= (6-1)+(5-1)+(4-1)+c[3] \\
&= (6-1)+(5-1)+(4-1)+(3-1)+c[2] \\
&= (6-1)+(5-1)+(4-1)+(3-1)+(2-1)+c[1] \\
&= (6-1)+(5-1)+(4-1)+(3-1)+(2-1)+(1-1)+c[0]
\end{aligned}
$$

that looks like:

$$
\begin{aligned}
c[n] &= \sum_{i=1}^{n}(i-1)+c[0] = \sum_{i=1}^{n} i - \sum_{i=1}^{n} 1 + c[0] \\
&= \frac{n(n+1)}{2} - n - 1 = \frac{n^2+n-2n-2}{2} \\
&= \frac{n^2-n-2}{2}
\end{aligned} \tag{2}
$$

And from (1) and (2) we have:

$$
\begin{aligned}
b[n] &= n^2 - \frac{n^2-n-2}{2} = \frac{2n^2-n^2+n+2}{2} \\
&= \frac{n^2+n+2}{2}
\end{aligned} \tag{3}
$$

That gives us the formula to find out the elements of the first row. To apply it to the rest of the rows, in (3) $n = ij$ and we offset the elements with the row i:

$$
a_{ij} = i + \frac{(ij)^2+(ij)+2}{2}
$$