

$f(i, j) = |A[i] - A[j]| + |i - j|$  can be written in 4 ways (Since we are looking at max value, we don't even care if the value becomes negative as long as we are also covering the max value in some way).

$$\begin{aligned} & (A[i] + i) - (A[j] + j) \\ & -(A[i] - i) + (A[j] - j) \\ & (A[i] - i) - (A[j] - j) \\ & (-A[i] - i) + (A[j] + j) = -(A[i] + i) + (A[j] + j) \end{aligned}$$

Note that case 1 and 4 are equivalent and so are case 2 and 3.

We can construct two arrays with values:  $A[i] + i$  and  $A[i] - i$ . Then, for above 2 cases, we find the maximum value possible. For that, we just have to store minimum and maximum values of expressions  $A[i] + i$  and  $A[i] - i$  for all  $i$ .