Question 2

(a) Row-major order

    for $i := 1$ to 4096 do

        for $j := 1$ to 4096 do {

            $\underset{2W}{A[i,j]} := \underset{2R}{A[i,j]} * \underset{2R}{B[i,j]};$ // After this assume $B[i,j]$ is in memory

            $\underset{2W}{B[i,j]} := \underset{2R}{C[n-i+1,j]} * \underset{In\ memory}{B[i,j]};$

        }

    2 fetchs of page A

    2 writes of dirty page A

    2 fetchs of page B

    2 writes of dirty page B

    2 fetchs of page C

    10 total pages of read and write from $i = 1, \ldots, 4096$

        $10 \cdot 4096 = $ 40960 total page transfers
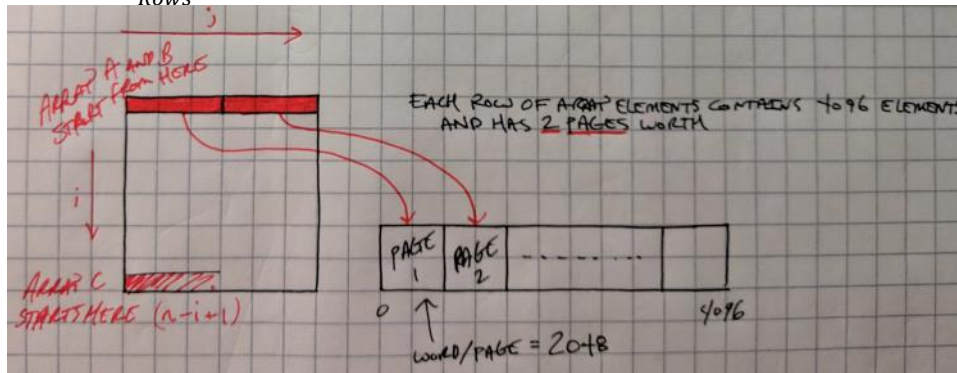
(b) Column-major order

    for $i := 1$ to 4096 do

        for $j := 1$ to 4096 do {

            $\underset{4096W}{A[j,i]} := \underset{4096R}{A[j,i]} * \underset{4096R}{B[j,i]};$ // After this assume $B[j,i]$ is in memory

            $\underset{4096W}{B[j,i]} := \underset{4096R}{C[j,n-i+1]} * \underset{In\ memory}{B[j,i]};$

        }

    4096 fetchs of page A

    4096 writes of dirty pages

    4096 fetchs of page B

    4096 writes of dirty page B

    4096 fetchs of page C

    20480 total page reads/writes from $j = 1$ and $i = 1, \ldots, 4096$

        $20480 \cdot \underset{columns}{4096} = $ 83,886,080 total page transfers