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POPU

DS Tutorial - 3

1) Matrix → A[m][m]
Size → 4 bytes
Base address at A[1][1] = 1500
Address at A[4][5] = 1608 (Column major)

Address of A[i][j] = B + W* [M(j - Lc) + (i - Lr)]
(M = No. of rows)

1608 = 1500 + 4 × [m(5-1) + (4-1)]

$\frac{108}{4}$ = 4m + 3

27 - 3 = 4m

m = 6

2) Matrix → P[15][10]
Size → 8 bytes
Base address at P[0][0] = 1400
(Row major wise storage)
Address at P[10][7] = ?

Address of A[i][j] = B + W* [N* (i - Lr) + (j - Lc)]

A = 1400 + 8 [10 × (10-0) + (7-0)]

A = 1400 + 8 [100 + 7]

A = 1400 + 8 × 107

A = 1400 + 856

A = 2256

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3) Matrix → A[m][n]
Size → 4 bytes
Base address at A[1][1] → 1500
Address at A[4][5] → 1608
(Column major wise)

$1608 = 1500 + 4[m*(5-1) + (4-1)]$

$27 \cancel{108} = 4m + 3$

$m = 6$

No. of rows = 6

4) Array → D[-2 ... 10][3 ... 8] ⇒ D[13][6]
Size of double → 8 bytes
Base address → D[-2][3] ⇒ 4110
Address of D[4][5] = ?
(Column Major Wise)

$A = 4110 + 8*[13 \times (5-3) + (4-(-2))]$
$= 4110 + 8[13 \times 2 + 6]$
$= 4110 + 8[26 + 6]$
$= 4110 + 8 \times 32$
$= 4110 + 256$

A = 4366

5) ARray → AR[-4 ... 6, -2 ... 12] ⇒ AR[11, 15]
Address of AR[2][3] = 4142
Size → 2 bytes
Base address AR[-4, -2] = ?
(Row major wise)

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$4142 = B + 2[15 * (2 - (-4)) + (3 - (-2))]$

$4142 = B + 2[15 \times 6 + 5]$

$4142 = B + 2[90 + 5]$

$4142 = B + 2 \times 95$

$4142 = B + 190$

$\therefore \boxed{B = 3952}$

6) Matrix → M[10][10]

Size → 4 bytes

Base address at M[0][0] ⇒ 1840

Address at M[4][8] → ?

(Row Major Wise)

~~$A = 1840 + 4[10 \times (8-0) + (8-0)]$~~

$A = 1840 + 4[10 \times [4-0] + (8-0)]$

$A = 1840 + 4[48]$

$= 1840 + 192$

$\boxed{A = 2032}$

7) Matrix → B[10][7]

Size → 2 bytes

Base address B[x][1] → 1012

Address at B[7][3] → 1060

(Column major wise)

$1060 = 1012 + 2[10 \times (3-1) + (7-x)]$

$48 = 2[20 + 7 - x]$

$24 = 27 - x$

$x = 27 - 24$

$\boxed{x = 3}$

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8) Matrix → A[m×m]
Size → 2 bytes.
Base address at A[1][1] → 1098
Address at A[4][5] → ~~1068~~ 1144
(Column major wise)

$1144 = 1098 + 2[m \times (5-1) + (4-1)]$

$\frac{46}{2} = 4m + 3$

$23 = 4m + 3$

$20 = 4m$

$\boxed{m = 5}$

9) Array → A[8][5][7]
Base address at A[1][1][1] → 900
Address of A[5, 3, 6] = ?
Size → 4 bytes
Row wise:

$A[i,j,k] = BA + W[MN(k-1) + N(i-1) + (j-1)]$

$M = 8, N = 5, R = 7, i = 5, j = 3, k = 6$

$A = 900 + 4[8 \times 5(6-1) + 5(5-1) + (3-1)]$

$= 900 + 4[200 + 20 + 2]$

$= 900 + 888$

$\boxed{A = 1788}$

Column wise:

$A[i,j,k] = BA + [MN(k-1) + M(j-1) + (i-1)]W$

$= 900 + 4[8 \times 5 \times (6-1) + 8(3-1) + (5-1)]$

$= 900 + 4[200 + 16 + 4]$

$\boxed{A = 1780}$

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10) Matrix → A [90] [30] [40]

Size → 1 Byte

Base address → A [1] [1] [1] ⇒ 10

(Column major)

$$A[20][20][30] = 10 + 1[(30-1) \times 90 \times 30 + (20-1) \times 9 + (20-1)]$$

$$= 10 + [29 \times 90 \times 30 + 19 \times 9 + 19]$$

$$\boxed{A = 80039}$$

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