

Range Variable Iteration and Multidimensional Arrays

$$i := 0..5$$

$$j := 0..3$$

$$k := 0..6$$

$$x_i := i$$

$$y_j := j + 1$$

$$z_k := k - 1$$

$$x = \begin{pmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{pmatrix}$$

$$y = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$$

$$z = \begin{pmatrix} -1 \\ 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{pmatrix}$$

$$A_{i,j} := x_i + y_j$$

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \\ 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 9 \end{pmatrix}$$

$$B_{i,j,k} := x_i + y_j + z_k \quad \text{doesn't work}$$

Range variable iteration works only with 1 or two subscripts, not 3 or more

Can create multidimensional array (vector of matrices) instead:

$$M_{5,3} := 0$$

allocate matrix of zeroes (size: max i by max j)

$$B_k := M$$

$$B = \begin{pmatrix} \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \end{pmatrix}$$

$$B_0 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$B_1 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$(B_k)_{i,j} := x_i + y_j + z_k$$

this doesn't work either

Need to create it in a program instead:

```

B :=
  M5,3 ← 0
  for k ∈ 0..6
    for i ∈ 0..5
      for j ∈ 0..3
        x ← i
        y ← j + 1
        z ← k - 1
        Mi,j ← x + y + z
      Bk ← M
  B

```

$$B = \begin{pmatrix} \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \\ \{6,4\} \end{pmatrix}$$

$$B_0 = \begin{pmatrix} 0 & 1 & 2 & 3 \\ 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \\ 5 & 6 & 7 & 8 \end{pmatrix}$$

$$B_1 = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \\ 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 9 \end{pmatrix}$$

$$B_6 = \begin{pmatrix} 6 & 7 & 8 & 9 \\ 7 & 8 & 9 & 10 \\ 8 & 9 & 10 & 11 \\ 9 & 10 & 11 & 12 \\ 10 & 11 & 12 & 13 \\ 11 & 12 & 13 & 14 \end{pmatrix}$$