Assignment 2

1. Set matrices A and B to:

$$A = \begin{bmatrix} 12 \\ 35 \end{bmatrix}, \quad B = \begin{bmatrix} 31 \\ 48 \end{bmatrix}$$

Calculate C=A*B as matrix multiplication using loops and matmul. Print. Do results differ?
Write the sum of A as a whole, along dimension 1, and along dimension 2.
Print the first column of A.
Count how many numbers in A+B are larger than 5 and compute their sum; do not use any loop.

2. In the following data (to be read from a file), a line containing the dimensions of a 2-dimensional matrix is followed by the data values of this matrix.

```
2
1.5 3.2
2.7 3.3
4
4 3 2 1
5 4 3 2
6 5 4 3
7 6 5 4
1
10
3
1 2 3
4 5 6
7 8 9
```

Create the file above. Write a program using the dynamic memory allocation that will:

a) read the dimension
b) allocate a real matrix with the given dimensions
c) read that matrix
d) print that matrix
e) deallocate the matrix
f) continue from 2 until the end of file

Optional

3. Write to file the following:

1 : printed 1 number(s)
1 2 : printed 2 number(s)
...
1 2 3 4 5: printed 10 number(s)

without using more than 2 write statements. Use clause ADVANCE='NO'.

4. Create a vector x of 100,000 reals and initialize x(i)=i+1.0/3.0. Store it in files in two formats:

a) formatted
b) unformatted

Then read the files and accumulate the sums. Compare timings of either reading using the CPU_TIME subroutine.
Close files with options to delete them.

5. Write a function that calculates a trace. Initialize matrix X(100,100) to

x_{ij}=100*i+j-1

and calculate

trace($X_{1\text{-}50,1,50}$ $X_{51\text{-}100,51\text{-}100}$)

Use matrix blocks (e.g., x(1:2,5:100), function SUM and possibly function MATMUL. Also use the * operator for matrices.

$$\texttt{trace(}\mathbf{X}\ \mathbf{Y}\texttt{)} = \sum_i (\mathbf{XY})_{ii}$$

$$\texttt{trace(}\mathbf{X}\ \mathbf{Y}\texttt{)} = \sum_{i,j} x_{ij} y_{ij}$$

Definition: for symmetric matrices