

- 2) (6 pt) A common operation that needs to be performed on vectors is the *dot product* or *scalar product*. This is defined as

$$\text{dot}(x, y) = \sum_{i=1}^n x_i y_i$$

where x and y are two vectors of length n .

Write a function that will compute the dot product of two vectors and a main program to test your function. Use the vectors in the datafile `hw31_1.in` to test your function.

Note that there is already an intrinsic F90 function that does this. Don't use the intrinsic function for this assignment.

- 2) (10 pts) Subroutines and functions can (and often do) call other subroutines and functions. Whenever you need to write a new function, it's a good idea to make use of any existing functions you have already written. Consider the binomial coefficient $C(n, k)$ defined by:

$$C(n, k) = \binom{n}{k} = \frac{n!}{k!(n-k)!}, \quad n \geq k.$$

This quantity is comprised of three factorial operations. If you have a function available to compute $n!$, you can use this routine to compute $n!$, $k!$ and $(n-k)!$. You can then combine these calculations to produce $C(n, k)$.

Write a function that will compute the binomial coefficient given the values of n and k . Your function should compute the factorials in the binomial coefficient formula by calling the factorial function we wrote in the previous class. The template for your function should be

```
FUNCTION getbinomial(n,k)
```

Use your function to compute the values of $C(3, 1)$, $C(5, 3)$, $C(14, 5)$, and $C(10, 0)$.