CH2120

Class 7

# Functions: Dummy Arguments

## Code

### mainProgram

**program** mainProgram

**implicit** **none**

**real** sumOf, diffBetween, prodOf, quotOf

**real** number1, number2

**real** sumOfNumbers, diffBetweenNumbers, prodOfNumbers, quotOfNumbers

**write**(\*,\*) "Arithmetic Operations"

**write**(\*,\*) "Enter the first number: "

**read**(\*,\*) number1

**write**(\*,\*) "Enter the second number: "

**read**(\*,\*) number2

**write**(\*,\*) "------------------------------------------------"

**write**(\*,\*) " ### Inside program mainProgram (Before calling functions...)"

**write**(\*,\*) " ### Number 1 = ", number1

**write**(\*,\*) " ### Number 2 = ", number2

**write**(\*,\*) "------------------------------------------------"

sumOfNumbers = sumOf(number1, number2)

diffBetweenNumbers = diffBetween(number1, number2)

prodOfNumbers = prodOf(number1, number2)

quotOfNumbers = quotOf(number1, number2)

**write**(\*,\*) "------------------------------------------------"

**write**(\*,\*) " ### Inside program mainProgram (After calling functions...)"

**write**(\*,\*) " ### Number 1 = ", number1

**write**(\*,\*) " ### Number 2 = ", number2

**write**(\*,\*) "------------------------------------------------"

**write**(\*,\*) "The input--"

**write**(\*,10) "Number 1 = ", number1

**write**(\*,10) "Number 2 = ", number2

10 **format**(a12, f8.2)

**write**(\*,\*)

**write**(\*,\*) "The output--"

**write**(\*,20) "The sum of ", number1, " and ", number2, " is ", sumOfNumbers

**write**(\*,20) "The difference of ", number1, " and ", number2, " is ", diffBetweenNumbers

**write**(\*,20) "The product of ", number1, " and ", number2, " is ", prodOfNumbers

**write**(\*,20) "The quotient of ", number1, " and ", number2, " is ", quotOfNumbers

20 **format**(a18, f8.2, a5, f8.2, a4, f8.2)

**end** **program** mainProgram

### sumOf

**real** **function** sumOf(inputNumber1, inputNumber2)

**implicit** **none**

**real** :: inputNumber1, inputNumber2

**write**(\*,\*) "------------------------------------------------"

**write**(\*,\*) " ### Inside function sumOf (Before changing arguments...)"

**write**(\*,\*) " ### Input Number 1 = ", inputNumber1

**write**(\*,\*) " ### Input Number 2 = ", inputNumber2

**write**(\*,\*) "------------------------------------------------"

inputNumber1 = 30

inputNumber2 = 40

**write**(\*,\*) "------------------------------------------------"

**write**(\*,\*) " ### Inside function sumOf (After changing arguments...)"

**write**(\*,\*) " ### Input Number 1 = ", inputNumber1

**write**(\*,\*) " ### Input Number 2 = ", inputNumber2

**write**(\*,\*) "------------------------------------------------"

sumOf = inputNumber1 + inputNumber2

**end** **function** sumOf

### diffBetween

**real** **function** diffBetween(inputNumber1, inputNumber2)

**implicit** **none**

**real** inputNumber1, inputNumber2

diffbetween = inputNumber1 - inputNumber2

**end** **function** diffBetween

### prodOf

**real** **function** prodOf(inputNumber1, inputNumber2)

**implicit** **none**

**real** inputNumber1, inputNumber2

prodOf = inputNumber1 \* inputNumber2

**end** **function** prodOf

### quotOf

**real** **function** quotOf(inputNumber1, inputNumber2)

**implicit** **none**

**real** inputNumber1, inputNumber2

quotOf = inputNumber1 / inputNumber2

**end** **function** quotOf

## Output

Arithmetic Operations

Enter the first number:

10

Enter the second number:

20

------------------------------------------------

### Inside program mainProgram (Before calling functions...)

### Number 1 = 10.0000000

### Number 2 = 20.0000000

------------------------------------------------

------------------------------------------------

### Inside function sumOf (Before changing arguments...)

### Input Number 1 = 10.0000000

### Input Number 2 = 20.0000000

------------------------------------------------

------------------------------------------------

### Inside function sumOf (After changing arguments...)

### Input Number 1 = 30.0000000

### Input Number 2 = 40.0000000

------------------------------------------------

------------------------------------------------

### Inside program mainProgram (After calling functions...)

### Number 1 = 30.0000000

### Number 2 = 40.0000000

------------------------------------------------

The input--

Number 1 = 30.00

Number 2 = 40.00

The output--

The sum of 30.00 and 40.00 is 70.00

The difference of 30.00 and 40.00 is -10.00

The product of 30.00 and 40.00 is 1200.00

The quotient of 30.00 and 40.00 is 0.75

## Ideas

* **write**: use to log intermediate values of variables (for tracking, debugging, etc.).
* Fortran routines pass arguments by reference (not by value).
* Dummy arguments: Arguments in a subprogram are not allocated storage space in the memory. Instead, they point to the memory location of actual variables.
* By default, subprograms can access and alter values stored in actual variables via dummy variables.
* **intent**(in): locks write access to the actual variables. It prevents the subprogram from unintentionally changing values of variables in the calling function.
* Modification—
  + Inside the functions, replace the declaration of dummy arguments with the following statement:

**real**, **intent**(in) :: inputNumber1, inputNumber2

* The compiler throws an error if the function attempts to alter the dummy variables.

# Subroutines: print

## Code

### mainProgram.f08

**program** mainProgram

**implicit** **none**

**real** sumOf, diffBetween, prodOf, quotOf

**real** number1, number2

**real** sumOfNumbers, diffBetweenNumbers, prodOfNumbers, quotOfNumbers

**write**(\*,\*) "Enter the first number: "

**read**(\*,\*) number1

**write**(\*,\*) "Enter the second number: "

**read**(\*,\*) number2

sumOfNumbers = sumOf(number1, number2)

diffBetweenNumbers = diffBetween(number1, number2)

prodOfNumbers = prodOf(number1, number2)

quotOfNumbers = quotOf(number1, number2)

**call** printArithmetic(number1, number2, sumOfNumbers, diffBetweenNumbers, prodOfNumbers, quotOfNumbers)

**end** **program** mainProgram

### printArithmetic.f08

**subroutine** printArithmetic(number1, number2, sumOfNumbers, diffBetweenNumbers, prodOfNumbers, quotOfNumbers)

**implicit** **none**

**real**, **intent**(in) :: number1, number2, sumOfNumbers, diffBetweenNumbers, prodOfNumbers, quotOfNumbers

**write**(\*,\*) "Arithmetic Operations"

**write**(\*,\*) "The input--"

**write**(\*,10) "Number 1 = ", number1

**write**(\*,10) "Number 2 = ", number2

**write**(\*,\*)

**write**(\*,\*) "The output--"

**write**(\*,20) "The sum of ", number1, " and ", number2, " is ", sumOfNumbers

**write**(\*,20) "The difference of ", number1, " and ", number2, " is ", diffBetweenNumbers

**write**(\*,20) "The product of ", number1, " and ", number2, " is ", prodOfNumbers

**write**(\*,20) "The quotient of ", number1, " and ", number2, " is ", quotOfNumbers

10 **format**(a12, f8.2)

20 **format**(a18, f8.2, a5, f8.2, a4, f8.2)

**end** **subroutine** printArithmetic

## Output

Enter the first number:

7.2

Enter the second number:

5.1

Arithmetic Operations

The input--

Number 1 = 7.20

Number 2 = 5.10

The output--

The sum of 7.20 and 5.10 is 12.30

The difference of 7.20 and 5.10 is 2.10

The product of 7.20 and 5.10 is 36.72

The quotient of 7.20 and 5.10 is 1.41