SWE 1301: Introduction to Problem Solving and Software Development

Lecture 04 : Functions, Operators and Expressions
At: CIT Theater
2-4pm
By: M. I. Mukhtar

Operators

▸ The computer has to be told how to process data.

▸ This task is accomplished through the use of operators.

▸ **Operators** are the data connectors within **expressions and equations.**
  ◦ They tell the computer how to process the data.
  ◦ They also tell the computer what type of processing needs to be done.
  ◦ Without these operators very little processing can be done.

Operators..

▸ The types of operators used in calculations and problem solving include:

> Mathematical Operators

> Relational Operators

> Logical Operators

Operators..

▸ **mathematical operators**: include addition, subtraction, multiplication, division, integer division, modulo division and power.

▸ **Relational operators**: include the equal to, less than, greater than, less than or equal to, greater than or equal to, and not equal to.
  ◦ A programmer uses relational operators to program decisions and loops

▸ **logical operators**: Logical operators are used to connect relational expressions (decision-making expressions) and to perform operations on logical data

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Mathematical Operators

Operator	Computer Symbol	Example	
Mathematical		Operation	Resultant
Addition	+	3.0 + 5.2	8.2
Subtraction	–	7.5 – 4.0	3.5
Multiplication	*	8.0 * 5.0	40.0
Division	/	9.0/4.0	2.25
Modulo division	%	9 % 4	1
Power	^ or pow()	3^2	9

Relational & Logical Operators

Operator	Computer Symbol	Example	Results
Relational			
Equals to	==	2==2	True
Not Equals to	!=	2!=2	False
Less than	<	5 < 3	False
Greater than	>	8 > 1	True
Less than or equal to	<=	6 < =6	True
Greater than or equal to	>=	9 >= 5	True
Logical			
And	and	True and True	True
Or	or	True or False	True

Table 2.8 Hierarchy of Operations

Order of Operations	Operand Data Type	Resultant Data Type
( ) Reorders the hierarchy; all operations are completed within the parentheses using the same hierarchy.		
1. Functions		
Mathematical Operators		
2. Power	Numeric	Numeric
3. \, MOD	Numeric	Numeric
4. *, /	Numeric	Numeric
5. +, –	Numeric	Numeric
Relational Operators		
6. =, <, >, <=, >=, <>	Numeric or string or character	Logical
Logical Operators		
7. NOT	Logical	Logical
8. AND	Logical	Logical
9. OR	Logical	Logical

Expression & Equation

▸ A knowledge of constants and variables, data types, and of operators is not very valuable until you can use these concepts to create expressions and equations.

▸ An **expression** processes the operands, through the use of operators.
  ◦ For example, to find the area of a rectangle you would multiply the length of the room by the width in the expression

Length * width

Expression & Equation..

▸ An **equation** stores the resultant of an expression in a memory location in the computer through the equal sign (=).

▸ The expression   Length * width   would be used as part of an instruction in the equation:

Area = Length * width

▸ The resultant of the expression Length * width would then be stored in a memory location called Area

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Function

▸ **Functions** are small sets of instructions that perform specific tasks and return values.

▸ Functions are used for basic tasks that are used repeatedly in the problem solving process.
  ◦ Each language has a set of functions within it.

▸ The format of a function is :
FunctionName (data)

  ◦ The data is listed as part of the function and are called **parameters**.

Type of Functions

▸ Mathematical functions: used in mathematical calculations such things as square root, absolute value, or a random

▸ String functions: used to manipulate string variables. For example, joining strings together, finding the length of strings.

▸ Conversion functions: used to convert data from one data type to another. For example, converting a string value to a numeric value.

▸ Statistical functions: used to calculate things such as maximum values, minimum values, and so forth.

Function Example

Function	Definition	Example	Result
Mathematical/ Statistical Functions			
abs(n)	Returns absolute value of (N)	abs(–4)	4
sqrt(n)	Returns square root of (n)	sqrt(4)	2
round(N,n1)	Returns the rounded value of N to the n1 place.	Round(3.7245, 2)	3.72
max(n1,n2,..)	Returns the maximum number in the list	Max(3,2,10)	10
Pow(N, n1)	Returns the value of N raise to the power of n1	Pow(4, 2)	16
ceil(n)	Return the largest integer greater than n	Ceil (3.22)	4

Function Example

Function	Definition	Example	Result
String Functions			
Length(s)	Returns the number of character in a string	Length(''Maryam'')	6
Capitalize()	Converts the first character of a string to upper case and lower case to all others	Capitalize("maryaM")	Maryam
Conversion Functions			
float(n)	Converts an integer (n) to real number	float(2)	2.0
int(n)	Converts a real number (n) to integer	int(3.55)	3

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Computer Expression

▸ Sometimes a programmer has to modify an expression into a format supported by computer. Examples:

Numeric Expression $\qquad X(3Y + 4) - \dfrac{4Y}{X + 6}$

Computer Expression $\qquad X * (3 * Y + 4) - 4 * Y/(X + 6)$

Relational expression $\qquad X$ is less than $Y + 5$

Computer Expression $\qquad X < (Y + 5)$

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Examples

▸ Convert the following expression into computer form

$$X = Y + 3Z - \dfrac{Z + Y}{Z - 3}$$

$$X = 5Y + \dfrac{3Z - 1}{4\,(3Z + 1) - Y}$$
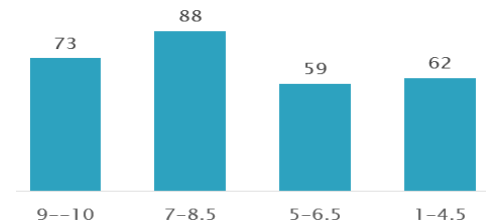
$$X = (X - Y)^2$$

▸ Evaluate with X = 2, Y= 3, z=1

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Quiz Statistics for 282 Students

Range	Count
9--10	73
7-8.5	88
5-6.5	59
1-4.5	62

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Students with 10/10

▸ CST/18/SWE/00114   CST/18/SWE/00119
▸ CST/18/SWE/00125   CST/18/SWE/00146
▸ CST/18/SWE/00148   CST/18/SWE/00151
▸ CST/18/SWE/00171

▸ CST/18/COM/00039   CST/18/COM/00041
▸ CST/18/COM/00045   CST/18/COM/00086
▸ CST/18/COM/00100

▸ CST/18/IFT/00133   CST/18/IFT/00136
▸ CST/18/IFT/00162

▸ CST/18/CBS/00128   CST/18/CBS/00138

▸ CMM/18/INF/00252

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Summary

▸ **Operators** are the data connectors within **expressions and equations.**

▸ Expressions and equations use operators to process the data.
  ◦ Expressions and equations use functions to process standard tasks.

▸ **Functions** are small sets of instructions that perform specific tasks and return values.

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Solving and Software Development   4/2/2019   18

Questions !!!