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Practical work 3 explanation

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bc command in Linux OS

The Linux **bc** command (short for **b**asic **c**alculator) is a command-line utility that acts as a scientific calculator. The command interprets the **bc** language and performs arbitrary precision arithmetic with interactive statement execution.

Use the **bc** command as an interactive mathematical shell that takes standard input or as a mathematical scripting language.

bc command in Linux OS

The **bc** command has syntax similar to the **C** programming language.

The general command syntax is: `$ bc [options] [file]`

Using the manual of the bc command explain the roles of the options:

Option	Description
-h	Prints the command usage and exits
-l	Use bc advanced math libraries mathlib
-q	Starts the command without printing the GNU bc welcome.
-v	Prints the program version number, copyright, and quits.

bc command in Linux OS

The **bc** command can act as a **CLI-based** calculator for simple mathematical operations such as addition, subtraction, division, and multiplication.
It also supports various advanced mathematical functions like sine, cosine, tangent, and natural logarithms.
Enter the interactive mathematical shell by running the **bc** command without specifying files: **$ bc**

The command version and copyright information appear.
The command enters the interactive mode and waits for input. Example:

- **5+7**
- **8*2**
- **9/2**

To exit the interactive shell press **Ctrl+D** or run: **quit**

bc command in Linux OS

When working with decimals, the program defaults to zero digits after the decimal point. However, you can customize the behavior if you define the **scale** variable value

```
$ bc
    ➢ scale = 2
    ➢ 9/2
```

In order to use **bc** advanced math libraries **mathlib** you need to use the **-l** option, i.e.

```
$ bc -l
```

➔This will load the Math library and set the default value of scale to 20.

bc command in Linux OS

Below is the list of predefined functions that comes with the **bc** math library.

```
$ bc -l
```

- `9/2`
- `s (x)` The sine of x, x is in radians.
- `c (x)` The cosine of x, x is in radians.
- `a (x)` The arctangent of x, arctangent returns radians.
- `l (x)` The natural logarithm of x.
- `e (x)` The exponential function of raising e to the value x.
- `scale(expression)` show the number of digits after the decimal point in the expression.
- `sqrt(expression)`The square root of the expression. If the expression is negative, a run time error is generated.
- `last` Contains the value of the last printed number. It is a GNU bc extension.

bc command in Linux OS

Convert Decimal to Hexadecimal: Use **bc** to convert values from one number system to another. The command achieves that using two special variables - **ibase** (input base) and **obase** (output base).
For example, the following command converts 255 from base 10 to base 16:

- `obase=16;255`

Convert Decimal to Binary: Using - **ibase** and **obase**, **bc** allows users to convert decimals to binary numbers. For example, the following command converts the number 12 from base 10 to base 2:

- `obase=2;31`

The command allows users to convert values between other supported number systems - decimal, hexadecimal, binary, and octal. When converting from binary to decimal values, make sure to set the output **obase** value using hexadecimal values. For example, 10 in hexadecimal is 16.

bc command in Linux OS

Specify Input Files: Using **bc** with files allows users to repeat complex calculations multiple times. To provide the input from a file or multiple files, specify the file path when running the **bc** command. The file must be a text file readable by **bc**.

Example: `$ bc file.txt`

bc command in Linux OS

Create an Interactive Script: Create a shell script to reuse an existing calculation. For example, create a simple Fahrenheit to Celsius temperature conversion script by following the steps below:
Create a new text file using a text editor and paste the following lines:

```
scale=2
print "\nConvert Fahrenheit degrees to Celsius\n"
print "\nEnter temperature in Fahrenheit: "
fah = read()
print "\nThe equivalent Temperature in Celsius is: "
(fah-32.0)*5.0/9.0
quit
```

Execute the file using the following syntax: **`$ bc -q [filename]`**

bc command in Linux OS

Conditional Statements: Conditional Statements are used to take decisions and execute statements based on these decisions.

Syntax:

```
if(condition) {
        statements
} else {
        statements
}
```

bc command in Linux OS

Iterative statements

bc command supports the for loop and while loop for doing iterations.

Syntax:

```
for(assignment; condition; updation)
{
     statements…
}
OR
while(condition)
{
     statements…
}
```