NAME

bc – arbitrary precision arithmetic language

SYNOPSIS

bc [**–c**] [**–l**] [*file*. . .]

AVAILABILITY

SUNWesu

DESCRIPTION

The **bc** utility implements an arbitrary precision calculator. It takes input from any files given, then reads from the standard input. If the standard input and standard output to **bc** are attached to a terminal, the invocation of **bc** is *interactive* , causing behavioural constraints described in the following sections. **bc** processes a language that resembles C and is a preprocessor for the desk calculator program **dc**, which it invokes automatically unless the **–c** option is specified. In this case the **dc** input is sent to the standard output instead.

USAGE

The syntax for **bc** programs is as follows:

L means a letter **a**–**z**,

E means an expression: a (mathematical or logical) value, an operand that takes a value, or a combination of operands and operators that evaluates to a value,

S means a statement.

Comments

Enclosed in **/**∗ and ∗**/**.

Names (Operands)

Simple variables: *L*.
Array elements: *L* **[** *E* **]** (up to **BC_DIM_MAX** dimensions).
The words **ibase**, **obase** (limited to **BC_BASE_MAX**), and **scale** (limited to **BC_SCALE_MAX**).

Other Operands

Arbitrarily long numbers with optional sign and decimal point.
Strings of fewer than **BC_STRING_MAX** characters, between double quotes (").
(*E* **)**

sqrt (*E* **)**	Square root
length (*E* **)**	Number of significant decimal digits.
scale (*E* **)**	Number of digits right of decimal point.
L **(** *E* , ... , *E* **)**	

Operators

+ – ∗ / % ^	(% is remainder; ^ is power)
++ ––	(prefix and postfix; apply to names)
== <= >= != < >	
= =+ =– =∗ =/ =% =^	

Statements

E
{ *S* ;. . . ; *S* }
if (*E* **)** *S*
while (*E* **)** *S*
for (*E* **;** *E* **;** *E* **)** *S*
null statement
break
quit

Function Definitions

```
define L ( L ,. . .  L ) {
        auto L ,. . .  L
        S ;. . .  S
        return ( E )
}
```

Functions in –l Math Library

s(*x***)**	sine
c(*x***)**	cosine
e(*x***)**	exponential
l(*x***)**	log
a(*x***)**	arctangent
j(*n*,*x*)	Bessel function

All function arguments are passed by value.

The value of a statement that is an expression is printed unless the main operator is an assignment. Either semicolons or new-lines may separate statements. Assignment to **scale** influences the number of digits to be retained on arithmetic operations in the manner of **dc**. Assignments to **ibase** or **obase** set the input and output number radix respectively.

The same letter may be used as an array, a function, and a simple variable simultaneously. All variables are global to the program. **auto** variables are stacked during function calls. When using arrays as function arguments or defining them as automatic variables, empty square brackets must follow the array name.

OPTIONS

–c Compile only. The output is **dc** commands that are sent to the standard output.

–l Define the math functions and initialize **scale** to 20, instead of the default zero.

OPERANDS

The following operands are supported:

file A pathname of a text file containing **bc** program statements. After all cases of *file* have been read, **bc** will read the standard input.

EXAMPLES

In the shell, the following assigns an approximation of the first ten digits of π to the variable *x :*

```
x=$(printf "%s\n" 'scale = 10; 104348/33215' | bc)
```

Defines a function to compute an approximate value of the exponential function:

```
scale = 20
define e(x){
        auto a, b, c, i, s
        a = 1
        b = 1
        s = 1
        for(i=1; 1==1; i++){
                a = a*x
                b = b*i
                c = a/b
                if(c == 0) return(s)
                s = s+c
        }
}
```

Prints approximate values of the exponential function of the first ten integers:

```
for(i=1; i<=10; i++) e(i)
```

or

```
for (i = 1; i <= 10; ++i) {
    e(i) }
```

ENVIRONMENT

See **environ**(5) for descriptions of the following environment variables that affect the execution of **bc**: **LC_CTYPE**, **LC_MESSAGES**, and **NLSPATH**.

EXIT STATUS

The following exit values are returned:

0 All input files were processed successfully.
unspecified An error occurred.

FILES

/usr/lib/lib.b mathematical library
/usr/include/limits.h to define BC_ parameters

SEE ALSO

dc(1), **awk**(1)

NOTES

The **bc** command does not recognize the logical operators **&&** and | | .

The **for** statement must have all three expressions (*E*'s).