QBasic/Full Book View

< QBasic

Basic Input

The **INPUT** command is used to gather input from the user. This section will attempt to teach you how to gather input upon request from the user. For real-time input, see QBasic/Advanced Input.

Here is the syntax of the input command:

```
INPUT "[text to user]"; [variable] ' Question mark added
```

or

```
INPUT "[text to user]", [variable] ' No question mark added
```

Example:

```
INPUT "What is your name"; name$
```

or

```
INPUT "What is your age", age
```

When a semicolon (;) is used after the text output to the user, a question mark (?) and space ( ) are added to the output. When a comma (,) is used, no question mark is added.

If a string is specified (e.g., 'name$'), anything the user enters before pressing the 'return' key will be accepted.

If a numeric variable (e.g., 'age') is specified, the user must enter a number. If any non-numeric key is entered, the error message "Redo from start" will be output and the INPUT command rerun.

6INPUT.BAS

```
CLS
INPUT "What is your name"; name$
PRINT "Hello, "; name$;
INPUT "How old are you"; age
INPUT "What is your best computer game?", game$
PRINT "     name:"; name$
PRINT "      age:"; age; " years old"
PRINT "best game:"; game$
```

Please note: In the PRINT command, the (;) function *concatenates* (joins) the contents of the string variables with the text between the quotes (" "). Note the use of spaces so that the final printed text reads properly.

If a numerical variable is specified within the PRINT command, additional space is automatically added both before and after the number.

See also: `LINE INPUT` command to read a line of text from a file (and place the result in a string variable) or to input a series of variables (in which case any comma found will be treated as a delimiter between fields).

INPUT # and LINE INPUT

INPUT # uses an open file stream to collect data from the file itself. The file may be a data file, a bitmap, or a text file. The syntax is:

```
INPUT #file_stream, variable1 ; variable2$ ' more variables can be taken.
```

LINE INPUT is used to collect an entire line of a text file. Syntax:

```
LINE INPUT 1,file_line '1 is the file stream number. Can be any other number too.
```

WARNING: If input is taken beyond the file end, the error : "Input past end of file " is issued. You can use `LOF` and `EOF` functions to prevent errors. (LOF stands for LENGTH OF FILE while EOF stands for END OF FILE)

Text Output

Text Output

Your first QBasic program: 1HELLO.BAS

The following paragraph requires a computer with QBasic installed

To begin, write down everything from the program below ("PRINT "Hello World") into a text editor or into the QBasic **IDE** (Integrated Development Interface) itself and save it as "1HELLO.BAS". Next open the file in QBasic (unless you used QBasic IDE in which case it is already open) and press F5. *Optionally you can use the "RUN" menu located on the menu bar at the top of the IDE window.* This will execute (run) the program. The words "Hello World" should appear on the upper left hand side of the screen. You have just executed your first QBasic program. If you press F5 again, another line of text saying "Hello World" will appear on the upper left hand side of the screen pushing the first one down to the second row of the screen. You can follow the same procedure for the rest of the example programs in this wikibook.

1HELLO.BAS

```
PRINT "Hello World"
```

PRINT

PRINT is QBasic's text output function. It is the command that we will be exploring through this section. PRINT is a QBasic function that requires arguments. The argument in the "Hello, World!" program we just ran were the words "Hello, World!". So, PRINT is the function and "Hello, World!" is the argument we *pass* to the function.

PRINT [Text to screen]

Note: For a short cut, just use a question mark "?" in place of the command "PRINT". Likewise you can use a single quote "'" in place of the key word REM to insert comments in your code

2HELLO.BAS

```
PRINT "This line will be erased"
CLS
PRINT "Hello";
PRINT " World",
PRINT "Hello Jupiter"
PRINT "Good Bye",,"For";" Now"
PRINT 1,2,3,4,5
```

PRINT, Commas, Semicolons, tab (n) and CLS

This is what the program output should look like:

```
Hello World   Hello Jupiter
Good Bye                    For Now
 1             2             3              4              5
```

The first line of 2HELLO.BAS outputs "This line will be erased." to the screen. However, in the second line, the CLS command clears the screen immediately after. So, it will only flash momentarily. The text "Hello Jupiter" should line up with '2' under it. More than one comma can be used consecutively. In this example, after "Good Bye" two commas are used to move "For Now" over two tab columns. "For Now" should line up with '3'.

My final statement on this topic is to play around with it. Try using commas and semicolons in a program.

3HELLO.BAS

```
CLS
hello$ = "Hello World"
number = 12
PRINT hello$, number
```

Variables

Variables are used to store information. They are like containers. You can put information in them and later change the information to something else. In this first example they may not seem very useful but in the next section (Input) they will become very useful.

In this example we use two types of variables: string variables and numeric variables. A string variable holds a string of characters, such as words. (A character is a letter, digit or symbol.) In this case, the characters are letters. A string variable is denoted by ending the name of the variable with a dollar sign. The string variable in this program is **hello$**. Whatever value you assign to **hello$** will be displayed in the **PRINT** statement. The numeric variable is **number**. Numeric variables do not have a special ending like string variables.

4FACE.BAS

```
CLS
LOCATE 14, 34      'position the left eye
PRINT "<=>"        'draw the left eye
LOCATE 14, 43      'position the right eye
PRINT "<=>"        'draw the right eye
LOCATE 16, 39      'position the nose
PRINT "o|o"        'draw the nose
LOCATE 18, 36      'position the mouth
PRINT "\_______/"  'draw the mouth
```

```
LOCATE 19, 42      'the bottom
PRINT "The Face by QBasic"
```

LOCATE statement

LOCATE allows you to position the cursor for the next piece of text output. Contrary to Cartesian coordinates which read (X,Y), the locate statement is LOCATE Y,X. In this case Y is the distance down from the top of the screen and X is the distance from the left side of the screen. The reason that LOCATE does not follow the standard coordinate system is that it is not necessary to include the X portion; you can use the format LOCATE Y which just specifies the line to start on.

LOCATE[row, column]
LOCATE[row]

5FACE.BAS

```
CLS

LOCATE 14, 34
COLOR 9
PRINT "<=>"

LOCATE 14, 43
PRINT "<=>"

COLOR 11
LOCATE 16, 39
PRINT "o|o"

COLOR 4
LOCATE 18, 36
PRINT "\_______/"

COLOR 20
LOCATE 19, 42
```

```
PRINT "U"

LOCATE 1, 1
COLOR 16, 1
PRINT "Hello World"
```

COLOR statement

The program 5FACE.BAS is broken into many sections to make it easier to read. This is an example of a good programming habit. Each three-line piece of code specifies what the color, location and form of its part of the face. The order of the position and the color is unimportant. The new statement COLOR allows you to change the color of the text. Once changed, all output will be in the new color until COLOR or CLS is used.

COLOR [foreground]
COLOR [foreground], [background]

The colors are designated by numbers which will be discussed in the next section.

Color by Number

There are 16 colors (in screen mode 0), numbered from 0 to 15.

0	Black	8	Gray
1	Blue	9	Light Blue
2	Green	10	Light Green
3	Cyan	11	Light Cyan
4	Red	12	Light Red
5	Purple	13	Light Purple
6	Brown/Orange	14	Yellow (Light Orange)
7	Light Grey (White)	15	White (Light White)

If you look carefully at this chart you can see that there are 8 main colors (0 through 7) and then those colors repeat, each in a lighter shade. You may also notice that the colors act as a combination of binary values (where blue=1, green=2, red=4, etc.) This makes it much easier to memorize the color scheme. Blinking colors are also available: at 16, the colors start over again with blinking black and extend through 31 (blinking white). However, the blinking option is not available for the background, only for the text (foreground). Add 16 to the color you wish to blink. e.g.: 2+16=18 - Blinking Green, 4+16=20 - Blinking Red.

It is possible to switch the blinking foreground text with an intense background, but this task is beyond the scope of this QBasic textbook, and may not work when MS Windows displays the console in a windowed mode.

Font

On a VGA compatible video card, you can inspect and change the font used in screen mode 0.

```
OUT &H3CE, 5: OUT &H3CF, 0 'Clear even/odd mode
OUT &H3CE, 6: OUT &H3CF, 4 'Map VGA mem A0000-BFFFF
OUT &H3C4, 2: OUT &H3C5, 4 'Set bit plane 2
OUT &H3C4, 4: OUT &H3C5, 6 'Clear even/odd mode again
```

You can now use PEEK and POKE to access the character data. It starts at absolute address &HA0000 and every character is 32 bytes, each of which is a row of eight bits. The highest bit of each byte corresponds to the leftmost pixel of each row. Usually only the first 16 or 8 rows are used, depending on the WIDTH setting.

When you're done, it's important to put the memory mapping back to what QBasic expects:

```
OUT &H3CE, 6: OUT &H3CF, 14 'Map VGA mem B8000-BFFFF
```

Summary

In this section we looked at several methods to manipulate text output. All centered around the PRINT statement. LOCATE and COLOR modified where the text was displayed and how it looked. We used CLS to clear the screen and gave a brief introduction to variables which will be expanded upon in later sections.

Basic Math

There are six numerical variables within QBasic:

Type	Minimum	Maximum
Integer	-32,768	32,767
Long Integer	-2,147,483,648	2,147,483,647
Float	-3.37x10^38	3.37x10^38
Double	-1.67x10^308	1.67x10^308
64-bit Integer	-9,223,372,036,854,775,808	9,223,372,036,854,775,807
64-bit Float	±1.18E−4932	±1.18E+4932

Please note that Integer and Float type variables for 64-bit are available only in QB64.

A lot of programming is math. Don't let this scare you: a lot of the math is simple, but it's still math. In this section, we will look at doing some basic math (the same stuff you learned in the 3rd grade) and manipulating numbers.

Equation Setup

In QBasic an equation has a basic setup a right side and a left side. For instance X=5, as you can probably figure out, this sets the variable X to 5. But we can use variables on the right side too. Y=X*10 would set Y equal to 10 times X, in this situation, 50. In this next program I will show several equations to give you a feel for math.

7MATH.BAS

```
CLS

'Set a-d to initial values
a = 10
b = 6
c = 3.1415
d = 3.333333

e = a + b
PRINT a; "+"; b; "="; e
```

```
f = c * d
PRINT c; "x"; d; "="; f

g = b - c
PRINT b; "-"; c; "="; g

h = b / d
PRINT b; "/"; d; "="; h

i = INT(d)
PRINT "Remove the decimal from "; d; "="; i
```

Understanding 7MATH.BAS

The most important thing you can take away from this is the setup for math equations. I think you can figure out what all the symbols are and what they do, but QBasic is picky about equations. For 'e=a+b', if you try 'a+b=e' it will not work. The final thing I would like to address in 7MATH.BAS is the INT() function. As far as vocabulary, a function is something that takes in a piece of information and gives you another piece of information back. So PRINT, was a statement, and INT() is a function. The INT() function takes a number and truncates its decimal, it does not round. So INT(5.1) is 5 and INT(5.999) is still 5. If you want to round a number use CINT().

8MATH.BAS

```
CLS
INPUT "Enter a number: ", x
PRINT

x = x + 5
PRINT "X is now: "; x

x = x * x
PRINT "X is now: "; x
```

```
x = x / 5
PRINT "X is now: "; x

x = x - 4
PRINT "X is now: "; x

x = x / x
PRINT "X should be 1: "; x
```

Understanding 8MATH.BAS

8MATH.BAS shows one simple concept that is very important in programming, but impossible in math. The way that the computer calculates the equation is it does all the math on the right side of the equation and then sticks it in the variable on the left side. So the equation x=x+5 makes perfect sense, unlike math where it is a contradiction. Reassigning a value to a variable based on its current value is common and a good way to keep the number of variables down.

9TIP.BAS

```
CLS
INPUT "How much is your bill: ", bill
INPUT "What percent tip do you want to give: ", tip

tip = tip / 100    'change percent to decimal
tip = tip * bill   'change decimal to money

PRINT
PRINT "The tip is"; tip; "$."
PRINT "Pay"; tip + bill; "$ total."
```

Tip Calculator

9TIP.BAS calculates your tip and total bill from the bill and percent tip you wish to give. The first three lines clear the screen and get the information from the user. The fifth line changes the tip from a percent to the correct decimal by dividing by 100 (ex. 20%=.2 because 20/100=.2) the

next line takes that percent and turns it into a dollar value by multiplying the decimal value by the bill. So if your bill is $20.00 and you leave a 20% tip, it multiplies 20*.2 which is 4 or $4.00. The last three lines format the output.
This is a good example of a complete program. It collects information from the user, it processes the information and it gives the user feedback. Also, the middle section of the program is a good example of variable conservation. This is subject that will take some practice to get used to. In writing a program, if you use too many variables, it will become difficult to keep track of all of them. If you try and conserve too much, you code may become difficult to understand.

You may notice that the program may print more than two decimal places if you enter a bill that is not an exact dollar value. As an exercise, try modifying the program so that it only displays two decimal places - you can use the `CINT()` function or any other rounding method you intend to use.

10OROP.BAS

```
'ORder of OPerations
CLS
a = 15
b = 10
c = 12.2
d = 1.618

PRINT a * b + c    'these two are different
PRINT a * (b + c)

PRINT

PRINT b - c / d    'these two are different
PRINT (b - c) / d

PRINT

PRINT a * b - c * d / a + d    'these two are the same
PRINT (a * b) - ((c * d) / a) + d
```

Parentheses and Order of Operations

10OROP.BAS is an example of order of operations and how parentheses can be used to manipulate it. I do not want to go into an indepth explanation of the order of operations here. The best advice I can give is unless you are sure of the order of operations, use parentheses to make sure the equation works how you want. All you need to know about parentheses is that the deepest nested parentheses calculate first. If you wish to know more, there are plenty of algebra resources available. On that note, you may wish to brush up on algebra. While it is not necessary for programming, it can help make programming easier and it can allow you to create more advanced programs.

Random Numbers

Though we will not go into their use until the next section, I would like to discuss the generation of random numbers. QBasic has a random number statement, RND, that generates a random decimal between 0 and 1. You can think of it as a random percent. At first, this may seem like an odd way to generate random numbers. However, with a little math it is very easy to manipulate this to provide numbers in whatever range you want.
The first step is to multiply RND by a number (the range you want). For instance 'RND*10'. This will return random numbers (decimal numbers) between 0 and 10(both included). So, to pick a random number between zero and ten we would say '(RND*10)'

11RND.BAS

```
CLS
RANDOMIZE TIMER

PRINT "Random number from 0-9:"; RND * 10
PRINT

PRINT "Random number from 1-10:"; (RND * 10) + 1
PRINT

PRINT "Random integer from 1-10:"; INT(RND * 10) + 1
PRINT
```

```
PRINT "Random even integer from 50-100:"; INT(RND * 25) * 2 + 50
```

More on RND

A few notes on 11RND.BAS, the second line, RANDOMIZE TIMER, sets it so that the computer uses the current time to pick random number. If you don't do this, it picks the same random number every time (try it, write a one line program, PRINT RND, and run it over and over, your screen will fill up with the same number) this can prove useful for some applications, but not most. Stick RANDOMIZE TIMER in at the top of all your programs that use the RND statement and they will be far less predictable. This program just show some ways to choose what you want from your random number generator. The last line shows that you can be very specific in what you get. Make sure to run this program several times to see the different results.

Flow Control

Conditional execution

To choose between two or more sections of the program to execute, the IF statement can be used. It is also possible to use the WHILE, DO UNTIL and CASE statements. All of these control conditional execution by using a Boolean logic 'test', the result of which is either TRUE or FALSE. To repeat a section of code for a set number of times, the FOR statement is used.

The IF test can be executed in a single line, however it can also be used like the others to control a block of code.

True or False

Boolean logic is a test that yields one of only two possible results, true or false. The tests are always mathematical in nature .. when two characters (or strings) are 'compared' it is their ASCII codes that are used (thus a < b and b < A).

The comparison operators used in qbasic are: = true if two variables are equal < true if the first is less than the second =< true if the first is less than or equal to the second > true if the first is greater than the second >= true if the first is greater than or equal to the second <> true if the two are unequal

Multiple tests can be linked together in the comparison, using the 'AND', 'OR' and 'NOT' operators. We will cover exactly what these mean later on, but you probably understand the first two already.

IF

One of the most useful statements in QBasic is the IF statement. It allows you to choose what your program will do depending on the conditions you give it. The next few programs will be taking a look at ways to use the IF statement.

```
IF [conditional] THEN [do this]
```

The single line IF is the simplest example. To execute a block of code, the END IF is used

```
 IF [conditional] THEN
   [do this]
   [and do this]
     ...
   [and also do this]
 END IF
```

IF...THEN...ELSE

```
IF [conditional] THEN [do this] ELSE [do that]
```

To choose between two different code blocks, the ELSE statement is used.

```
IF [conditional] THEN
  [do this]
  ..
  [and do this]
ELSE
  [do that]
  ..
  [and also that]
END IF
```

13 ELSEIF

As an alternative to starting an entirely new IF THEN ELSE statement sequence. You can follow the THEN statement(s) with ELSEIF [conditional] THEN. This does not create a new level of nesting.

IF [conditional] THEN

```
[do this]
..
[and do this]
```

ELSEIF [conditional] THEN

```
[do that]
..
[and also that]
```

ELSEIF [conditional] THEN

```
[do the other]
..
[and also ...]
```

ELSE

```
[do this final thing]
```

END IF

FOR...NEXT

```
FOR <variable name> = <start value> TO <end value> [STEP
<increment>]
 [do this]
 ...
 [and do this]
NEXT
```

<increment> may be + or - and is optional. If omitted the default is +1. The code contained within the FOR loop will always be executed at least once because it is only at the 'NEXT' statement that the value of the variable is checked against the end value.

When the NEXT statement executes, the variable is modified by STEP value and compared against the end value. If the variable has not yet exceeded the end value, control is returned to the line following the FOR.

You can exit a FOR loop early with the **EXIT FOR** command.

14FOR.BAS

```
CLS
RANDOMIZE TIMER

num = INT(RND * 20) + 1

FOR count = 1 TO 5
 INPUT "Pick a number between 1 and 20: ", answer
 IF answer = num THEN PRINT "You win after";count;"guesses!": END
NEXT
PRINT "You lose"
```

WHILE...WEND

```
WHILE <condition is true>
  [do this]
  ..
  [and this]
WEND
```

If the condition is true, the code following the WHILE is executed. When the WEND command is executed, it returns control to the WHILE statement (where the condition is tested again). When the condition evaluates to FALSE, control is passed to the statement following the WEND.

15WHILE.BAS

```
PRINT "Press any key to continue"
WHILE INKEY$=""
WEND
```

In the example above, you see a press any key prompt that waits until the user presses a key. (The INKEY$ feature will be described under Advanced Input.)

DO...LOOP

```
DO
  [this]
  ..
  [and this]
LOOP WHILE <condition is true> / LOOP UNTIL <condition is true>
```

The **DO...LOOP** construct is a more advanced of the WHILE loop - as with other flow control blocks, it is marked by **DO** and **LOOP** to denote the boundaries.

It relies on a conditional statement placed after either DO or LOOP:

```
DO
  a$ = inkey$
LOOP WHILE a$=""
```

As an alternative, you can instead replace **WHILE** with **UNTIL** have the loop continue until a specific condition is met:

```
DO
  x=x+1
LOOP UNTIL x >= 10
```

In some versions of BASIC the UNTIL or WHILE condition can follow the DO statement rather than the LOOP statement (pre-test) as apposed to the above shown (post-test).

12IF.BAS

```
 CLS
 RANDOMIZE TIMER

 num = INT(RND * 100) + 1
 DO
      INPUT "Pick a number between 1 and 100: ", answer

      IF num = answer THEN PRINT "You Got It!"
      IF num > answer THEN PRINT "Too Small"
      IF num < answer THEN PRINT "Too big"
LOOP UNTIL num = answer
PRINT "Game Over."
```

SELECT CASE

```
 SELECT CASE <variable expression>
   CASE <value>
     [do this]
   CASE <value 2>
     [do instead]
   ...
   CASE ELSE
   ...
END SELECT
```

The select statement is a substitute for repeated use of IF statements. The <variable expression> is evaluated and compared against each CASE <value> in turn. When a CASE <value> is found to match, the [do this] code following is executed. If an EXIT CASE is executed, control passes to the line following the END SELECT, otherwise the next CASE <value> is checked. If no matches are found, the CASE ELSE is executed. Note that <value> may be a number, character or string or logical expression (eg '>0', '<>1'). Note also that multiple CASE matches may be found and executed (so, for example, if two CASE <values> are 'CASE >1' and 'CASE >10', a <variable expression> that evaluates to 11 (or more) will result in both CASE >1 and CASE >10 being executed)

```
CLS
PRINT "WELCOME"
PRINT "I HAVE AN ANSWER FOR ANY OF YOUR QUESTIONS"
10 INPUT "WRITE YOUR QUESTION AND I'LL GIVE YOU AN ANSWER ",
question$
RANDOMIZE TIMER
PRINT
answer = INT(RND * 4 + 1)
SELECT CASE answer
    CASE 1
        PRINT "PLEASE REPHRASE YOUR QUESTION."
    CASE 2
        PRINT "YOUR QUESTION IS MEANINGLESS."
    CASE 3
        PRINT "DO YOU THINK I CAN ANSWER THIS?"
    CASE 4
        PRINT "THIS QUESTION LOOKS FUNNY."
END SELECT
PRINT
PRINT "ENTER ANOTHER QUESTION", K$
GOTO 10
```

If a parameter would be covered by more than one case statement, the first option will take priority.

Advanced Input

INKEY$

Getting real time information from the user is a little more difficult. To do so, we will use the INKEY$ command, which checks to see whether a user typed a key and provides the keypress to the program.

Look at this code and then we will look at it in depth:

```
DO
    LET k$ = INKEY$
LOOP UNTIL k$ <> ""
SELECT CASE k$
    CASE "q"
        QuitProgram
    CASE "c"
        MakeCircle
    CASE "s"
        MakeSquare
END SELECT
```

The first part is the DO-LOOP which constantly polls INKEY$ for a return value. In the basic use, INKEY$ returns an empty string if no keys are being pressed and continues with the program. Once a key is pressed, INKEY$ will return that key immediately.

The keyboard buffer

What is INKEY$ doing and how does it work?

While the INKEY$ command looks like it returns the key currently being pressed, this is not the case. It is used by the program to answer the question, "What is IN the KEYboard buffer?" To understand this you will need to understand what a basic buffer is and why it is used.

In older systems (not necessarily the IBM PC) a single chip processed keyboard input, and controlled the LED lights for caps lock and number lock. Because a computer does many things at once (e.g., take input from the mouse, crunch numbers, call subroutines, display new information on the screen), it needs to be able to remember what was pressed on the keyboard while it is busy. This chip contained some memory (called a buffer) that allow keeping track of a limited number of keypresses.

Within the Dos platform under IBM PCs, the hardware has changed slightly. Instead of a hardware buffer, pressing or releasing a key will interrupt the running program to add a keystroke to a software buffer located in the BIOS. This procedure is usually unnoticed by the user and has minimal impact on system performance. However, this buffer allows for 15 characters: attempting to overflow it when the computer is busy will cause a short beep and drop any further characters.

The INKEY$ command uses this buffer as a FIFO (First In First Out) buffer. As an example let's say you have a game that has a bouncing ball on the screen and a paddle at the bottom. The computer program constantly has to update the screen to show the movement of the ball. While it does this the program passes by an INKEY$ command to see what value is returned. If the user has pressed a key since the last time the command was invoked it will return that key. Let's say the ball is moving over to the right and the user needs to press the "R" key to tell the program to move the paddle right. Since the program is busy moving the ball and updating the screen, it does not instantaneously notice that the user has pressed the key. Instead, the key press is stored in the keyboard buffer, and retrieved a few milliseconds (or microseconds) later when the INKEY$ command is used.

In many programs (as above), INKEY$ will appear nested in a loop. It is requested over and over again. This allows the program to get user input one character at a time. Using our example above, the user may need to press R over and over again until the paddle is under the ball. On the other hand, the user may press R too many times and need to press L to move it left. Because the INKEY$ command is using a FIFO buffer it will always retrieve the keys pressed in the same order as they were typed.

In summary, the INKEY$ command will always return and remove the first character in the keyboard buffer. Generally speaking, it is used over and over to retrieve every key that has been pressed, and to allow a user to interact with a program in a close approximation to "real time." If there is no key in the keyboard buffer, INKEY$ returns an empty string (no character).

Scancodes

Some keypresses are not associated with an ASCII character. When one of these keys is pressed, INKEY$ returns a string with two characters: the first character is a null (ASCII code 0), and the second is the raw scan code for the keyboard. A full listing of the scancodes can be found within the QBASIC help file. You can also determine the scan codes by examining the results of INKEY$ as you press those keys in question.

Note:
Some keys cannot be directly detected by INKEY$.

```
  Ctrl+            Extended; prefixed with CHR$(0)
 1  A               3   Ctrl+2
 2  B              15   Shift+Tab
 3  C
 4  D                Alt+    Alt+    Alt+     Alt+
 5  E              16  Q   30  A   44  Z   120  1
 6  F              17  W   31  S   45  X   121  2
 7  G              18  E   32  D   46  C   122  3
 8  H  Backspace   19  R   33  F   47  V   123  4
 9  I  Tab         20  T   34  G   48  B   124  5
10  J  Ctrl+Enter  21  Y   35  H   49  N   125  6
11  K              22  U   36  J   50  M   126  7
12  L              23  I   37  K           127  8
13  M  Enter       24  O   38  L           128  9
14  N              25  P                   129  0
15  O                                      130  -
16  P                 Shift Ctrl Alt       131  =
17  Q              59   84   94  104  F1
18  R              60   85   95  105  F2
19  S              61   86   96  106  F3
20  T              62   87   97  107  F4
21  U              63   88   98  108  F5
22  V              64   89   99  109  F6
23  W              65   90  100  110  F7
```

```
24  X              66   91  101  111  F8
25  Y              67   92  102  112  F9
26  Z              68   93  103  113  F10
27  [  Escape     133  135  137  139  F11
28  \             134  136  138  140  F12
29  ]
30  6              71  Home   72  Up    73  PgUp
31  -              75  Left             77  Right
                   79  End    80  Down  81  PgDn
   Ctrl+           82  Insert           83  Del
127 Backspace
                  119  Ctrl+Home   132  Ctrl+PgUp
                  115  Ctrl+Left   116  Ctrl+Right
                  117  Ctrl+End    118  Ctrl+PgDn
```

Subroutines and Functions

Purpose

Subroutines and functions are ways to break up your code into reusable 'lumps'. They allow the programmer reuse a large set of common instructions just by calling the appropriate procedure or function.

For example, lets say you need to PRINT multiple Tables of values. One way to do this is to just enter all the Table PRINT commands directly into where you need them. However this not only makes the program very large but also makes it harder to debug or change the 'style' of the table. A simpler way is to create a single 'Print Table' procedure and enter all of the PRINT commands there. Then, each time you need to print a Table, you would simply 'call' the 'Print Table' procedure with a list of the values to be printed.

Procedure vs. Function

A procedure does something and does not return anything for the programmer. For example, a procedure might be used to set the screen mode and palette.

A function does something and RETURNS a value. For example, if you need to find the average of two values, you might write a function that takes in two numbers and returns the average.

GOTO and GOSUB

The GOTO and GOSUB statements were the original methods by which functions were created. They were the most common on older basic implementations and are kept around for compatibility reasons; however, their use is not recommended in other programming languages or in large scale projects, both because GOTO's make it harder to 'follow' the program flow and because GOSUB's do not 'isolate' the changes made to any variables.

These two commands depend on Labels, which come in one of two forms. The first and older form involves writing line numbers at the beginning of each line (usually in increments of 10). The newer method looks similar to other programming languages, which is a single word followed by a colon.

The GOTO statement is simple; it just moves the execution point to a given Label:

The GOSUB statement transfers control to a given Label, however whan a RETURN statement is encountered, execution returns to the line following the GOSUB statement. Any changes made within the GOSUB will be to actual variables used within the 'main' code.

ON ERROR

The ON ERROR allows you to define an error handler for your program; when an error occurs, it immediately jumps to the given label. The control returns once the program reaches a RESUME statement, which can either return control to the same point, the next statement, or any other desired label.

Within Qbasic, the error handler cannot be located within any subroutines. As such, any error checking or flags will have to be handled through the use of variables that are shared with the main module.

Note:
While the QBasic documentation states ON ERROR RESUME NEXT is a valid statement, this is incorrect.

NOTE: If your error handling routine does not have a "resume" statement in it (IOW you try to do it all with gotos) error handling will only work once - the next "on error" will be ignored and the program ends as if you had no "on error" statement at all. This problem does not seem to be mentioned in any of the documentation. It took me three hours to figure out why two nearly identical program portions acted so differently.

Declaring a subroutine

A superior method of declaring a subroutine is using the SUB statement block, because (by default) any new variables used within the subroutine are discarded on exit.

Under the QBasic IDE, doing so moves the SUB block to its own section in the window to prevent accidental deletion of the module, and allows the easier organization of the program code.

Calling a subroutine is as simple as writing the name of the subroutine (passing any required parameters). If you want, you can use the CALL statement to indicate to other programmers that it is a subroutine.

```
SUB name (params)
{SHARED variables 'if any}
'{code to execute}
'   ...
'   ...
{STATIC variables 'if any, to be saved for use next time}
END SUB
```

Whilst the Parameters passed into subroutines are passed by 'reference' (i.e. they take on a new name within the SUB), any changes that are made to the values are 'reflected back' into the originals. By default, all other variables used within the SUB are discarded when the END SUB is reached (or an EXIT SUB is executed), except as below :-

To 'preserve' the values of variables used within the SUB for re-use on the next CALL, use the STATIC keyword at the end.

If you need access to a variable (that has not been passed as a parameter), use the SHARED keyword to define each at the start of the subroutine (a SHARED variable retains its name).

Declaring a function

A function is a form of subroutine that returns a value. Everything that applies in defining a subroutine also applies to a function. Within the function, the return value is created by using the function name as a variable - the return value is then passed to the calling expression when a valid exit or end call is reached. There are two ways to return from a function, one way is to reach the END FUNCTION statement, the other is to make a call to EXIT FUNCTION. The difference between END FUNCTION and EXIT FUNCTION is that there can only be a single END FUNCTION and it must appear after all other code for the function as it denotes the end of a code block. EXIT FUNCTION can occur multiple times and can be placed anywhere deemed appropriate.

```
FUNCTION name (params)
   ' Shared variable declarations
  name = result
   ' ...
END FUNCTION
```

Functions are declared in the same way as variables - it returns the variable type it's defined to return, in the same way variables are defined to contain their specified type. By default, it is a number, but appending a dollar sign indicates that it is returning a string.

Functions can only be called within an expression; unlike subroutines, they are not a standalone statement.

Arrays and Types

Q basic is an IDE(integrated development environment) developed by Microsoft to create, edit, debug and execute basic program.

Built-in Types

QBasic has five built-in types: INTEGER (%), LONG(&) integer, SINGLE(!) float, DOUBLE(#) float and STRING($). QB64 has two more built-in types: _INTEGER64 (&&) and _FLOAT (##)

Implicit declaration is by adding the type character to the end of the variable name (%, &, !, #, $, &&, ##). See **QBasic/Basic math** for more.

Explict declaration is by using the DIM statement before first use:

```
DIM a AS STRING
DIM b AS INTEGER
DIM c AS LONG
DIM d AS SINGLE
DIM e AS DOUBLE
DIM f AS _INTEGER64 'QB64 only
DIM g AS _FLOAT 'QB64 only
```

If you do not use either implicit or explicit declaration, QBASIC interpreter assumes SINGLE type.

User-defined type

A user defined type allows you to create your own data structures. Please note that custom types are similar to arrays.

```
 TYPE playertype
  name AS STRING
  score AS INTEGER
 END TYPE
```

You can then declare variables under this type, and access them:

```
DIM playername AS playertype
playername.name = "Bob"
playername.score = 92
```

This above example shows how a custom type can be used for maintaining data, say on a player who plays a game.

Array

An array is a collection of values stored in a single variable. A STRING is an array of characters (so, for example, char$(1) means 1st character in string char$). Arrays of numbers should be defined using the DIM instruction (unless you DIM them, they are limited to 10 elements on each dimension).

By default, arrays in QBasic are static in size and cannot be changed later in the program. Code that will set up this type of array is as follows:

```
DIM myArray(10) as TYPE 'this is explaining the datatype to be used
during program execution in array'
```

TYPE can be any of the built in QBasic (INTEGER, LONG, SINGLE, DOUBLE, STRING) or user-defined type. If this is not specified, the array takes the Type defined by the variable name suffix - INTEGER (%), LONG(&) integer, SINGLE(!) float, DOUBLE(#), STRING($) - or INTEGER if none.

WARNING: If your data Type is string, DIM string(10) defines a SINGLE string of 10 characters, NOT 10 strings of arbitary length ! (10 strings of up to 128 chars each would be defined as DIM string(10,128)

By issuing the Meta Command '$DYNAMIC at the beginning of your program you can cause your arrays to be dynamic:

```
 ' $DYNAMIC
 DIM myDynamicArray(5) as INTEGER
 REDIM myDynamicArray(10) as INTEGER
```

This is now perfectly legal code.

To free up space occupied by an array, use the ERASE statement.

Multidimensional array

An array isn't restricted to one dimension - it's possible to declare an array to accept two parameters in order to represent a grid of values.

```
 DIM housenames(25,25) as STRING
```

You cannot use the REDIM statement to change the number of dimensions on the array, even with dynamic allocation.

Non-zero base

In most languages, arrays start at the value 0, and count up. In basic, it's possible to index arrays so that they start at any value, and finish at any other value.

```
DIM deltas(-5 TO 5)
```

You can change the default lower bound with the OPTION BASE statement.

Files

In this lesson, we will learn how to create and modify files. In doing so, we will create a portion of a text editor to handle reading and writing files to and from disk - the program won't be complete by the end of this chapter, but will be finished within Advanced Text Output.

Let's start by setting up out main procedure:

```
'$DYNAMIC
ON ERROR GOTO handler ' Prepares the error handler
DIM text(50) AS STRING ' Used to contain the text file.
maxlines = 50 ' Contains the current size of the buffer.

DO
  CLS 'clears the screen
  INPUT "Would you like to create a (N)ew file, (L)oad an existing
one, or (E)xit the program"; choice$

  SELECT CASE UCASE$(choice$) 'UCASE$ converts strings to UPPER
CASE
    CASE "N" 'New file
    CASE "L" 'Load a file
    CASE "E" 'Exit
      CLS
      END
  END SELECT
LOOP 'returns to the top of the program.

handler:
```

```
errorflag = ERR   ' Keep track of the error that occurred.
RESUME NEXT ' Proceeds with the next statement.
```

As you can see, we are using CASE rather than IF. IF statements can sometimes work better than case statements, but for now, we want to avoid *spaghetti code* (where there are too many GOTO's).

So far, we don't really have much, but it's a start. We've asked the user what they want to do, and finished 1/3 options. Not so shabby when you put it that way!

The OPEN statement

The open statement allows either reading or writing information from the disk. In general, the open statement follows this pattern:

```
OPEN file$ FOR INPUT AS 1
OPEN file$ FOR OUTPUT AS 2
```

The file$ determines the filename to use. The FOR portion indicates how the file will be accessed or operated - it may be APPEND, BINARY, INPUT, OUTPUT, and RANDOM. The AS # is the identifier used for the file handle in question - this may be a variable if desired.

Note:
If you allow the user to enter a filename that does not exist on disk, you need to implement error handling using ON ERROR to react to this situation.

Input and output

When you need to access or write content to a file handle, the PRINT and INPUT statements expect a file handle to appear as the first parameter:

```
 INPUT #1, a$
 PRINT #2, a$
```

In some cases, you need to detect if you are going to reach the end of file - this is performed by the EOF function, which accepts a filehandle that takes input.

Reading the file from disk

We will now add a subroutine to read the complete file from disk, as lines of text, into an string array called text(). It is also possible to read a data file full of numerical values (and input these into a number array), however that is a different topic.

Note the code that finds the file 'size', by reading lines one at a time until the End Of File is reached, and the use of 'SEEK' to 'rewind' to the beginning again.

```
SUB LoadFile
  SHARED filename$
  SHARED lines, maxlines
  SHARED text() AS STRING
  SHARED errorflag

  INPUT "Enter filename: "; filename$

  OPEN filename$ FOR INPUT AS 1
  IF errorflag <> 0 THEN
    errorflag = 0
    CLOSE
    PRINT "File not found - press return to continue."
    INPUT "", a$
    EXIT SUB
  END IF

  ' Count the number of lines.
  lines = 0
  DO WHILE NOT EOF(1)
    LINE INPUT #1, l$
    lines = lines + 1
  LOOP
```

```
    'Allocate enough space for input.
    IF maxlines > lines THEN
      REDIM text(lines + 25) AS STRING
      maxlines = lines + 25
    END IF
    SEEK #1, 1 ' Rewind to the beginning of the file.

    ' Read the lines into the buffer
    FOR cline = 1 TO lines
      LINE INPUT #1, text(cline)
    NEXT
    CLOSE 1
    errorflag = 0

  END SUB
```

The example above treats the file as type=text. If the file contains numbers (for example, a data array of N integers per line x M lines) these can be read (input #) one at a time, directly into a numeric array. Input will read the numbers one at a time, 'stopping' after each is input. Numbers can be separated by 'anything' (so lines of text will be skipped).

Writing a file to the disk

The function for writing a file to disk is easier:

```
  SUB SaveFile (outfile$)
    SHARED filename$
    SHARED lines, maxlines
    SHARED text() AS STRING
    SHARED errorflag

    IF outfile$ = "" THEN
      LOCATE 1, 1
      INPUT "Enter filename: "; outfile$
    END IF
    OPEN outfile$ FOR OUTPUT AS 1
    IF errorflag <> 0 THEN
      errorflag = 0
      CLOSE
      PRINT "Couldn't save file - press return to continue."
      INPUT "", a$
      EXIT SUB
    END IF

    ' Write each line to the file
    FOR cline = 1 TO lines
      PRINT #1, text(cline)
    NEXT

    CLOSE 1
    errorflag = 0
    filename$ = outfile$

  END SUB
```

Part 2: New file

In order to create a new file, you have to open it for OUTPUT, then close it. Example:

```
OPEN NEWFILE FOR OUTPUT AS #1
CLOSE #1
```

NOTE: If you accidently open an existing file, all of its contents will be overwritten!

Advanced Text Output

Cursor manipulation

As you try to write your text editor, you may realize that you will need to place the cursor in a given location on the screen. This is performed using the LOCATE statement.

Note:

Printing any character in the bottom-right corner of the screen will cause the display to scroll.

Color

To change the current printing color, use the COLOR statement.

```
    COLOR 7,0  'Uses the default white on black.
    COLOR 15,0 'Bright white on black.
    COLOR 0,1  'Black on blue
    COLOR 14,0 'Bright yellow.
```

This can be used for title or status bars at the bottom.

Formatted printing

The PRINT USING statement allows you to output strings or numbers in a specified format. With this statement, you can write numbers out to specified decimal places or perform advanced output.

The most common format specifiers would be # and ., which reserve space for digits and decimal points respectively. You may also use the underscore to ensure that a given character is printed literally.

Note: **PRINT USING** is unable to add *leading zeros* to a number. E.g., if you specify 3 digits (###), a two digit number will be output with leading spaces.

Text animation

You require some time before doing a certain procedure. It is generally better to make an animation during the process which shows that the program has not hanged, but is going on. Why make that out of very complicated graphics? Use this: <syntaxhighlight lang = QBasic> SUB TEXT_ANIM

```
    X = 15 ' CAN BE ANY OTHER VALUE TOO
    Y = 15 ' CAN BE ANY OTHER VALUE
    LOCATE Y,X
    DO
        PRINT ">     "
        SLEEP 1
        CLS
        PRINT " >    "
        SLEEP 1
        CLS
        PRINT "  >   "
        SLEEP 1
        CLS
        PRINT "   >  "
        SLEEP 1
        CLS
        PRINT "    > "
        SLEEP 1
        CLS
        PRINT "     >"
        SLEEP 1
        CLS
     LOOP UNTIL INKEY$ <> ""
```

END SUB </SOURCE> The program uses **INKEY$**, which you have not learnt yet, and **SLEEP** and **DO...LOOP**, which also you have not learnt. For more information, refer to Flow Control and Appendix.

Sound

QBasic has three ways of making sounds.

- BEEP command
- SOUND command
- PLAY command

BEEP

Earlier used as PRINT CHR$(07) the now available BEEP command makes a beep noise. It is commonly used to attract attention, when some important message is being displayed.

```
'Syntax example
BEEP
PRINT CHR$(07)
```

The two commands , as can be seen by running this program on a computer, are exactly the same.

SOUND

The SOUND command produces sound of a specific frequency for a specific duration from the PC Speaker. Only one sound can be played at a time. If multiple SOUND statements are issued sequentially, every statement after the first will not execute until after the previous one finishes.

Syntax

```
SOUND f, d
```

- f - Frequency in Hertz, ranges from 37 to 32767
- d - Duration in ticks, ranges from 0 to 65535, there are 18.2 ticks per second

Example

```
SOUND 550,30
```

Plays a 100 hertz wave for 20 ticks, about 1.1 seconds.

The lowest frequency allowed by QBasic is 37 Hz, which is roughly a D in the 2nd octave. The highest frequency is 32 767 Hz, but this tone can not be heard, because the normal human hearing range ends at 20 000 Hz.

A secondary function of the SOUND command is to use it to control time in a program.

```
    For x% = 1 TO 10
     Print x%
     Sound 32000,18.2
    NEXT
```

This program will print the numbers 1 to 10, with a 1 second delay between each number.

PLAY

The PLAY command is for playing musical notes,octave. It can only play one note at a time.

More than that the play command can play a complex stored "song" This is accomplished through the use of a song string. For string command detail, see QBasic/Appendix#PLAY.

Simple Musical Keyboard In Qbasic

```
rem Music keyboard
do
note$ = inkey$
select case ucase$(note$)
case "A"
Play "A"

case "B"
Play "B"

case "C"
Play "C"

case "D"
Play "D"

case "E"
Play "E"
```

```
case "F"
Play "F"

case "G"
Play "G"

end select

loop until ucase$(note$) = "Q"

end
```

This code uses a select case command to check values of note$. Ucase$ is used to maintain that there be no difference if Caps Lock is applied. The play command is used to play different notes. The other features of play have not been used here.

Graphics

What QBasic can do with Graphics

QBasic is not graphically very capable but many good programs can be created with it. Commands like PSET, CIRCLE, LINE, etc., are used to draw graphics in QBasic. Good examples of graphical programs created using QBasic are **SYMMETRIC ICON** and **SYMMETRIC FRACTALS**.

Functions

Screen will let you set how it will be used. Text Graphics, both, and the Size of the surface you are working with. Screen 0 .. means Text Only. Screen 12 .. means 64 X 480 X 16 Colors & Text.

PSET

The PSET command lets the programmer display pixels on the screen. Before you type the command in, you must make sure that a SCREEN command is in. Look at this example:

```
SCREEN 13
PSET (1,1), 43
```

This command will display one yellow pixel at the coordinates 1, 1. The coordinates are X and Y coordinates, like any other mathematical situation. So the PSET command has to have this layout to function properly:

```
PSET ([X coordinate], [Y coordinate]), [Colour of Pixel]
```

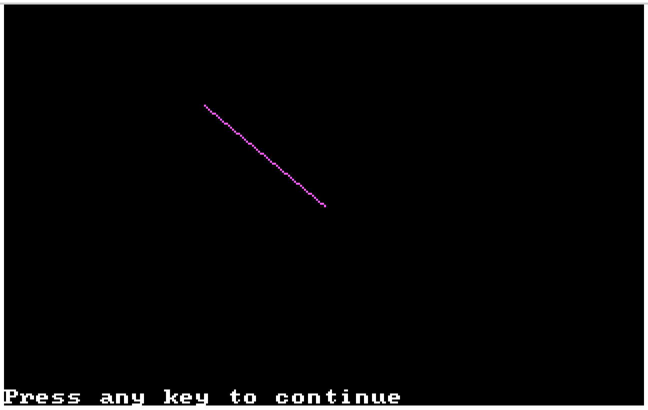
Remember that X coordinates are those that go left to right on the screen and Y coordinates are those that go Up to Down on the screen.

LINE

```
   LINE [[STEP](x1!,y1!)]-[STEP](x2!,y2!) [,[color%] [,[B | BF]
[,style%]]]
   STEP           Specifies that coordinates are relative to the
current
                    graphics cursor position.
   (x1!,y1!),     The screen coordinates of the start of the line
and of
   (x2!,y2!)      the end of the line.
   color%         A color attribute that sets the color of the line
or
                    rectangle. The available color attributes depend
on your
                    graphics adapter and the screen mode set by the
most
                    recent SCREEN statement.
   B              Draws a rectangle instead of a line.
   BF             Draws a filled box.
   style%         A 16-bit value whose bits set whether or not
pixels are
                    drawn. Use to draw dashed or dotted lines.
```

This simple program displays a line:

```
  Screen 13
  LINE (160,10)-(100,50),13
```



```
Press any key to continue
```

CIRCLE

```
CIRCLE (100, 100), 25, 4,0,3.14
```

This displays a circle at the coordinates. The layout of the function is as follows:

```
CIRCLE ([X Coordinate], [Y Coordinate]), [Radius], [Colour Number],
[Start Angle],[Finish Angle]
```

Remember to put a SCREEN command at the front.

PAINT

To use PAINT, there must be a SCREEN command declared. The command has coordinates that tells QBasic where to start. The color number specifies the color to paint with, and the bordercolor tells the PAINT command that it should not paint further when it encounters a pixel of that color. In almost all cases, you will need to use the bordercolor parameter, simply because without it, PAINT will cover the entire screen.

```
PAINT ([X Coordinate],[Y Coordinate]), [Color Number], [Border
Color]1,2,3,4,5,5
```

DRAW

ToDo

Making An Image Using the DATA command

Graphics using this command can either be made by using a Graphics Editor or by using the DATA command Manually. The DATA command is a way of inputting information into QBasic and being read by the READ command. Remember that the DATA command cannot be used in subroutines or functions. Look at this example:

```
SCREEN 7
FOR y = 1 TO 10
FOR x = 1 TO 10
READ z
PSET (x, y), z
NEXT
NEXT
DATA 04, 04, 04, 04, 04, 04, 04, 04, 04, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 00, 00, 00, 00, 00, 00, 00, 00, 04
DATA 04, 04, 04, 04, 04, 04, 04, 04, 04, 04
```

The FOR commands declare the amount of pixels there are to be read. On this particular program, there are pixels of 10 by 10 (100) so we put:

```
FOR x = 1 TO 10
FOR y = 1 TO 10
```

We have now declared the x and y planes. You can change these values if you want a smaller or bigger picture Bitmap. The READ command reads the DATA commands and declares the information gathered as z.

```
READ z
```

The PSET reads the planes and the DATA read and a bitmap.

```
PSET (x, y), z
```

It works like the first example on this page, except it is reading more than one pixels

Advanced Graphics

Animation

Basic Movement

Animation is basically graphics that changes over a fixed period of time. In this we will be using a do-loop .

```
SCREEN 7  ' we need to use a graphics enabled screen mode
animation   'calling the sub



SUB animation
    SCREEN 7
    x = 10 'set first x- coordinate
    y = 10 'set first y-coordinate
    DO
        CLS ' going back to a blank screen so that the previous
rectangle is erased
        x = x + 3  ' setting increment of coordinate x
        y = y + 3   ' setting increment of coordinate y

        LINE (x, y)-(x + 5, y) 'drawing lines
        LINE (x, y + 5)-(x + 5, y + 5)
        LINE (x, y)-(x, y + 5)
        LINE (x + 5, y)-(x + 5, y + 5)
        SLEEP 2

    LOOP UNTIL INKEY$ <> ""



END SUB
```

Explanation:

1. We have switched from the default qbasic text-only screen to one which enables graphics.
2. We have called the sub which creates the animation.
3. We have begun the do-loop until. This enables the animation to run until the user ends it by pressing a key.
4. We have set an increment of the coordinates. This allows the box to be drawn on a new position rather than the same one. If it movement in only one direction was wished, we had to set the increment only in one variable.
5. We have drawn lines from each coordinate to another. Note that each time one coordinate remains fixed while the others change.(In this I refer to the two coordinate sets, the first starting and the ending one)
6. We have issued a sleep command . This stops execution for 2 seconds . Without this the do-loop will execute more quickly than we want , and the animation will be very short-lived.
7. By using RND for the variables, you can create a randomized ,unpredictable animation.

Mouse-Control

In this step, we will use the QB64 inbuilt _mousehide,_mousex,_mousey,_mouseinput and _mousebutton commands to control the mouse input.

WARNING

```
These Functions only work in QB64!
```

```
_mousehide
screen 7

mousetrack

sub mousetrack
do while _mouseinput
cls

X = _mousex
Y = _mousey

LINE (X - 10, Y)-(X + 10, Y), 15
LINE (X, Y - 10)-(X, Y + 10), 15

        IF _MOUSEBUTTON(1) THEN
            IF X > A AND X < A + 25 AND Y > B AND Y < B + 25 THEN
                message$ = "yes"
                goto action
            END IF
        END IF

loop until inkey$ <> ""
```

1. Here the first function "_mousehide" prevents the default pointer mouse format to be displayed on the screen
2. Mouseinput function retrieves mouse information.
3. The next functions "_mousex" and "_mousey" hold the current x and y coordinates of the mouse.
4. The lines draw a basic trigger .
5. The "_mousebutton" function returns the value of the mouse button pressed, "1" signifies the left button being pressed.

6. If the mouse button event has taken place within a certain enclosed area, a message in the form of "message$" is issued. This can be used later on.
7. The procedure, if the previous condition has been fulfilled , goes to line label "action" where any commands to be executed may lie.
8. Else , the process loops , until a "loop until" condition has been met. It can also be something other than the one given above.

Usage

These graphics and animations can be used to create a complete game. Instead of the "Mouse" functions, you could use the "Inkey$" command to issue various scenarios and cases, each with a complete code to decide what happens next.

Tip

Instead of making games which do not contain any user information, you could use ".txt" files to store information. This information can be later retrieved to make a game with a complete "Career" option.

3d Graphics

Simple 3D Box

3 Dimension or 3D graphics in Qbasic is nothing , but including an additional 'z' axis and to extend the 2 dimensional structure along that axis. This can be achieved by drawing a box, or the structure you want , each time at a new x and y position. It is quite like animation, except, we do not erase the structure after it being drawn , and there is no need of any intermediate pause. You can better understand by looking at the 3d box program given below.

```
Redo:
cls
screen 1
Input "Enter the X-position?";k  'entering coordinates of the
screen from where to start.
Input "Enter the Y-position?";l   ' this also determines the size
of the box.
color 1
```

```
for i = 1 to 50 step 2    rem box ' step to ensure space between the
boxes, make it one to eliminate the space. The 50 number sets the
extension of the box along the z axis
    a = k+i:b = l+i            ' this "for-next" loop draws the box
over and over again, each with incremented values of k and l.
    line (a,a)-(b,a)
    line (a,b)-(b,b)
    line (a,a)-(a,b)
    line (b,a)-(b,b)
next                                rem diagonals
line (k,k)-(a,a)                     ' the four diagonals to the structure
, which make it more realistic
line (l,l)-(b,b)
line (l,k)-(b,a)
line (k,l)-(a,b)
Input"Do you want to redo? (Y/N)";ans$
if ucase$(ans$)="Y" then goto Redo
end
```

Images

WARNING

NONE of these functions work in IDEs other than QB64.

Simple image

```
rem image_display
cls
Dim Image as long
x = 1000   'resolution
y = 1000
Image = _loadimage("TEST.jpg") 'loading the image
```

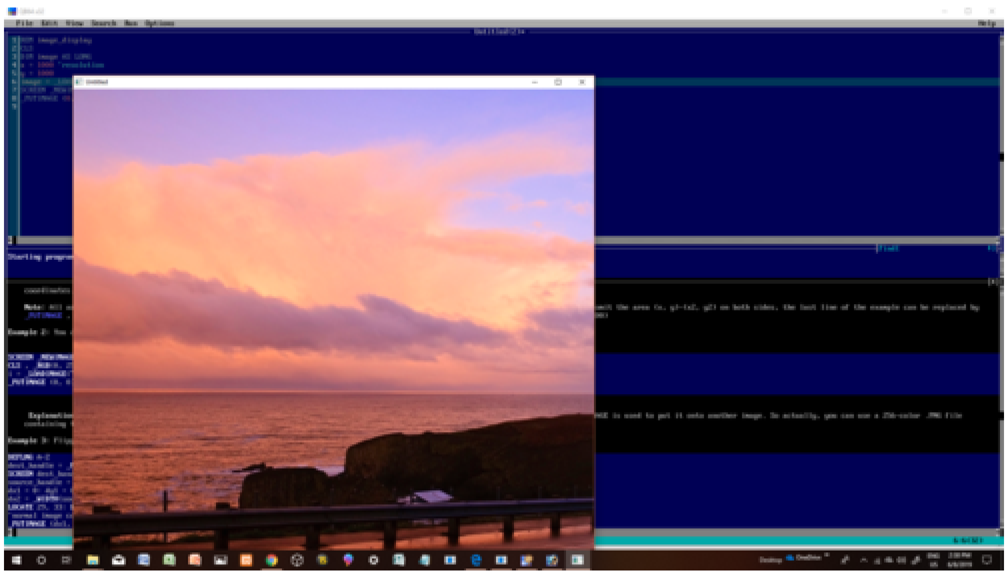
```
screen _newimage(x,y,32) 'putting screen sizes
_putimage (0,0),Image 'putting image
```

So, you were most probably expecting miles of code. And there you have it, all you need to display an image in QB64!

So, what does this astoundingly simple piece of code even do?

A step by step explanation:

1. We have DIMed our variable Image as a long value. This is because the image handle returned by the _loadimage function is a long value.
2. x and y are our variables. They hold the values we need to put as the resolution. Thus , for a 800 x 900 image, x = 800 , y = 900.
3. The image variable Image is next being put the handle values of the image "TEST.jpg". A healthy warning: Keep the image in the folder of the QB64 IDE. Or else , the function wont work!
4. Next, we have resized the screen to fit the image. The newimage function requires three parameters, the resolution parameters and the color mode parameters. Here we have used 32 bit color modes, you can also use 256 bit pallete color modes.
5. Lastly, we put the image using _putimage, which takes the Image variable(our image handle) as its parameter.

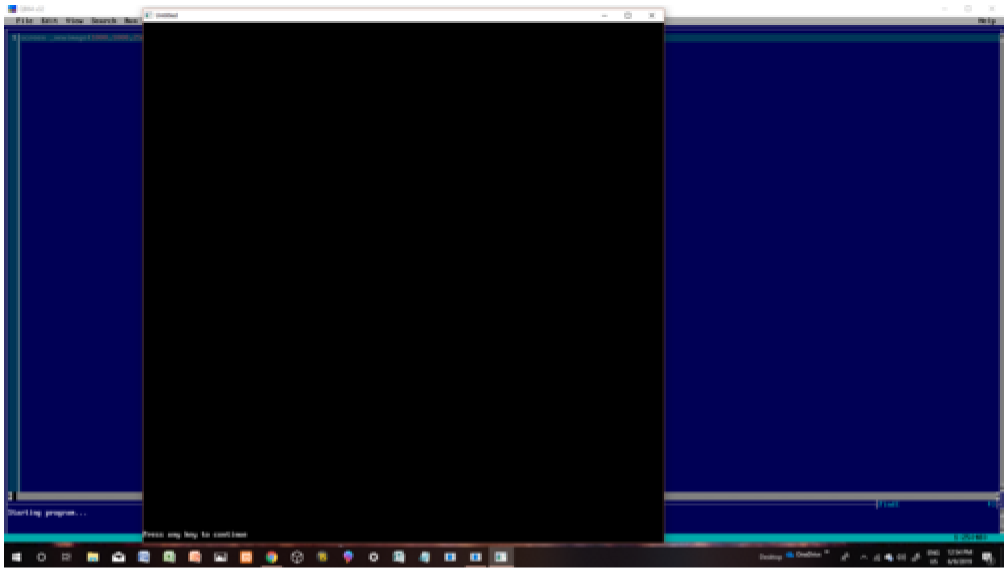


Secondary use of _newimage for setting screen details

Well, you must be thinking , all these commands must be used in this exact same order. Nah, that isnt the case. You can use _newimage solo, to set the screen details, like shown below:

```
screen _Newimage(1000,1000,256)
```

This code sets the screen to a massive 1000 x 1000 resolution , with 256 bit palette color modes!



What Next

Websites

There are many good websites out there on the topic of QBasic. This is a list of the best sites:

Petes QBasic Site (http://www.petesqbsite.com/) : This site is mostly aimed at people thinking about programming video games in QBasic.

The QBasic Page (http://www.qbasic.com/) : This is a good site for getting source codes and programs for QBasic.

QBasic News (http://www.qbasicnews.com/) : The most recent and up to date news on the QBasic community.

QBasic Programming for Kids (http://www.tedfelix.com/qbasic/) : A good site for young people to start programming.

Qb64 (http://www.QB64.org/) : All you need to know about QB64.

Also, the QB64 IDE has an inbuilt help page, giving essential help when you don't know how to use a command. The only drawback is , it does not show any help unless you select the command and right click on it, and click on "HELP ON ...." which means, you atleast have to know the name of the command before you seek help on it.

Further in programming

If you are learning QBasic, chances are that you are still new to programming. It is a diverse world, explore it!

A list of extremely good programming languages to continue further:

- *C++*
- *HTML*
- *Java*
- *Javascript*
- *CSS*

Sample Programs

Calculator

This program can be used to make a simple, functioning calculator, very simply.

```
Rem calculator
cls
10
print "input first operand"
input a
print "select operation"
print "addition(a)"
print "subtraction(s)"
print "multiplication(m)"
print "division(d)"
print "exponentification(e)"
print "rooting(r)"
print "Quit(q)"
do
next$ = inkey$
loop until next$ <> ""
gosub input_var2

select case next$
case "a"
c = a + b
print "sum is:";c
case "s"
c = a - b
print "Difference is:";c
case "m"
c= a*b
print "Product is :";c
case "d"
c = a/b
print "Quotient is:";c
case "e"
c = a^b
print "Exponentification is:"c
case "r"
c = a^ 1/b
print "Root is:";c
case "q"
end

end select
sleep 3
goto 10
```

```
sub input_var
input "enter second operand";b
end sub
```

For reference goto Basic Math

Basic Game

Uses animation to make a simple game.

```
SCREEN 7
COLOR 15, 1


_MOUSEHIDE
CLS
LOCATE 5, 1
PRINT "GUNSHOTS"

DO
    NEXT$ = INKEY$
LOOP UNTIL NEXT$ <> ""

CLS
LOCATE 5, 1
PRINT "In this game, you require to bring"
PRINT ""
PRINT "the crosshairs to the box"
PRINT ""
PRINT " , which is the target ,"
PRINT ""
PRINT " and click to shoot it."
PRINT ""
PRINT " In this game , you control"
PRINT ""
PRINT "the crosshairs with your mouse."
PRINT ""
PRINT " You will be given a"
PRINT ""
PRINT " fixed number of tries."
PRINT ""
PRINT " The number of times you hit the target,"
PRINT ""
PRINT " you will be given a point "

DO
    NEXT$ = INKEY$
LOOP UNTIL NEXT$ <> ""









CLS
LOCATE 5, 1
PRINT "Get Ready!"

DO
    NEXT$ = INKEY$
LOOP UNTIL NEXT$ <> ""
```

```
10
A = INT(RND * 100)
B = INT(RND * 100)

DO: K$ = INKEY$
    20

    DO WHILE _MOUSEINPUT
        CLS

        IF TRY_COUNT > 30 THEN
            CLS
            LOCATE 10, 1
            PRINT "Remarks:"
            IF POINT_COUNT < 10 THEN PRINT "OH NO! NICE TRY!"
            IF POINT_COUNT > 10 AND POINT_COUNT < 16 THEN PRINT
"GOOD WORK!"
            IF POINT_COUNT > 15 AND POINT_COUNT < 21 THEN PRINT
"GREAT!"
            IF POINT_COUNT > 20 AND POINT_COUNT < 26 THEN PRINT
"AMAZING!"
            END
        END IF



        SECOND = VAL(RIGHT$(TIME$, 2))
        IF PREVSEC <> SECOND THEN
            COUNT = COUNT + 1
        END IF

        LOCATE 25, 25
        PRINT POINT_COUNT
```

```
X = _MOUSEX: Y = _MOUSEY
LINE (X - 10, Y)-(X + 10, Y), 15
LINE (X, Y - 10)-(X, Y + 10), 15

LINE (A, B)-(A + 25, B), 15
LINE (A, B + 25)-(A + 25, B + 25), 15
LINE (A, B)-(A, B + 25), 15
LINE (A + 25, B)-(A + 25, B + 25), 15
PAINT (A, B), (1), 15

IF _MOUSEBUTTON(1) THEN
    IF X > A AND X < A + 25 AND Y > B AND Y < B + 25 THEN
        POINT_COUNT = POINT_COUNT + 1
        TRY_COUNT = TRY_COUNT + 1
        GOTO 10
    END IF



END IF

IF COUNT > 1 THEN
    COUNT = 0
    TRY_COUNT = TRY_COUNT + 1
    GOTO 10

END IF




PREVSEC = SECOND
```

```
        GOTO 20




    LOOP
LOOP
```

For reference , goto Advanced Graphics

Clock

A clock which is quite like a digital clock,with no hands.Use draw to make them if you want.

```
REM  Clock
SCREEN 7

CLS
start:
SCREEN 7
_FONT 16
LOCATE 1, 5
PRINT "CLOCK"
PRINT "________________________________________"

LINE (50, 50)-(100, 100), 1, BF
LOCATE 9, 5
PRINT "TIME"
LOCATE 10, 5
PRINT "CONTROL"
LINE (150, 50)-(200, 100), 2, BF
LOCATE 9, 18.5
PRINT "STOP WATCH"




DO
```

```
exit$ = INKEY$
IF exit$ = "e" OR exit$ = "E" THEN
    CLS
    SCREEN 7
    COLOR 2, 1
    LOCATE 5, 5
    PRINT "YOU HAVE ABORTED THE CLOCK"





    WHILE close_count <> 10
        close_count = close_count + 1
        LOCATE 7, 5
        PRINT "APPLICATION  ";
        IF close_count MOD 2 = 1 THEN
            PRINT "CLOSING >>>   "
        ELSE
            PRINT "CLOSING   >>> "
        END IF





        SLEEP 1
    WEND

    CLS
    SCREEN 7
    COLOR 10, 0
    END
END IF
```

```
    Mouser mx, my, mb
    IF mb THEN
        IF mx >= 50 AND my >= 50 AND mx <= 100 AND my <= 100 THEN
'button down
            DO WHILE mb 'wait for button release
                Mouser mx, my, mb
            LOOP
            'verify mouse still in box area
            IF mx >= 50 AND my >= 50 AND mx <= 100 AND my <= 100
THEN
                GOTO proccess
            END IF
        END IF
    END IF



    Mouser mx, my, mb
    IF mb THEN
        IF mx >= 150 AND my >= 50 AND mx <= 200 AND my <= 100 THEN
'button down
            DO WHILE mb 'wait for button release
                Mouser mx, my, mb
            LOOP
            'verify mouse still in box area
            IF mx >= 150 AND my >= 50 AND mx <= 200 AND my <= 100
THEN
                time_control = 1
                GOTO proccess
            END IF
        END IF
    END IF
LOOP
```

```
proccess:

IF time_control = 0 THEN
    time_enter:
    LOCATE 12, 6
    INPUT "enter time"; t
    IF t > 1800 THEN
        mistake = mistake + 1
        IF mistake > 3 THEN
            PRINT "BLOCKED"
            END
        END IF

        GOTO time_enter
    END IF
END IF

Mouser mx, my, mb
IF mb THEN
    IF mx >= 150 AND my >= 50 AND mx <= 200 AND my <= 100 THEN
'button down
        DO WHILE mb 'wait for button release
            Mouser mx, my, mb
        LOOP
        'verify mouse still in box area
        IF mx >= 150 AND my >= 50 AND mx <= 200 AND my <= 100 THEN
            time_control = 1
            GOTO proccess
        END IF
    END IF
END IF
```

```
WHILE INKEY$ <> " "
    SLEEP 1
    count = count + 1
    tc = tc + 1
    BEEP
    CLS
    LOCATE 1, 5
    PRINT "CLOCK"
    PRINT "________________________________________"

    IF time_control = 1 THEN
        LINE (150, 50)-(200, 100), 2, BF
    END IF
    LOCATE 3, 5
    PRINT "CURRENT TIME:"; TIME$
    LOCATE 5, 5
    PRINT "MINUTES:"; minute
    LOCATE 6, 5
    PRINT "SECONDS:"; count
    IF count = 60 THEN
        count = 0
        minute = minute + 1
    END IF

    IF time_control = 0 THEN
        LOCATE 8, 5
        PRINT "TIME LEFT:"; (t - tc) \ 60; ":"; (t - tc) MOD 60
        IF tc = t THEN
            BEEP
            BEEP
            BEEP
            BEEP
            END
        END IF
    END IF
    IF time_control = 1 THEN
        Mouser mx, my, mb
        IF mb THEN
            IF mx >= 150 AND my >= 50 AND mx <= 200 AND my <= 100
THEN 'button down
                DO WHILE mb 'wait for button release
                    Mouser mx, my, mb
                LOOP
                'verify mouse still in box area
                IF mx >= 150 AND my >= 50 AND mx <= 200 AND my <=
100 THEN
                    END
                END IF
            END IF
        END IF
        LOCATE 10, 10
        PRINT "PRESS BUTTON TO END"
    END IF

WEND
GOTO start




SUB Mouser (x, y, b)
    mi = _MOUSEINPUT
    b = _MOUSEBUTTON(1)
    x = _MOUSEX
    y = _MOUSEY
END SUB
```

This is a little logical combination of all the chapters you have read so far.

Binary Coder

No, this is NOT a binary decoder, but a binary Coder. This takes any decimal system number and converts it to binary. Run this program to see for yourself.

```
REM binary
SCREEN 7
COLOR 1, 2

_FONT 16
LOCATE 7, 10
PRINT "Binary Coder"

SLEEP 5

start:

CLS
LOCATE 1, 1
PRINT "Binary coder"
PRINT "_____________"
PRINT ""
PRINT ""
PRINT ""
PRINT ""




INPUT "Enter Decimal number"; a
CLS
LOCATE 1, 1
PRINT "Binary coder"
PRINT "_____________"
PRINT ""
PRINT ""
WHILE a <> 0
    PRINT a MOD 2;
    IF a MOD 2 = 1 THEN
        a = a \ 2
    ELSE a = a / 2
    END IF

WEND
PRINT ""
PRINT ""
PRINT "Binary code is reversed"
WHILE INKEY$ <> " "
WEND
GOTO start
```

Just the trouble is: the binary code is reversed. You might have guessed it by looking at the last PRINT statement. I still haven't figured out how to reverse it, so I guess you have to do it yourself. And , the WHILE loop has a print statement with the semicolon at the end. That is used to ensure that the next number comes after it, not on the next line.

Projectile Game

Remember Gorillas? Well, take out the graphics and what you get is this:

```
10
RANDOMIZE TIMER
cor = RND * 150
cor2 = CINT(cor)
IF cor2 < 30 AND cor2 > -30 THEN GOTO 10

PRINT "The object to hit is at coordinates"; cor2

INPUT "enter velocity"; v
INPUT "enter angle"; a
d = ((v ^ 2) * SIN(2 * a)) / 10
PRINT "Hit on:"
PRINT CINT(-d)
```

```
IF CINT(-d) < cor2 + 30 AND CINT(-d) > cor2 - 30 THEN
    PRINT "Well Done!"
ELSEIF CINT(-d) < 30 AND CINT(-d) > -30 THEN PRINT "Hey , you hit
us!"
ELSE PRINT "Ugh, not on target"
END IF
```

Huh? Ok, now the maths is complicated , but the formula is basically the same. Here, the projectile has to land between 30 coordinates out of the hit object, or else you lose. See Wikipedia:Projectile motion for more information on the maths part. Tip: Add graphics. It will be a big , fat piece of code, but the final product will be AMAZING!

Check hearing

Ok, now , how high a frequency sound can you hear? Test your hearing with this program:

```
REM ultrasonic_test
CLS
freq = 20000
DO
    PRINT "Frequency is:"; freq

    SOUND freq, 18.2
    INPUT "Can you hear?"; ans$
    IF ans$ = "no" THEN
        freqrange = freq
        GOTO 10
    END IF
    freq = freq + 100
LOOP
10
freq = freqrange
DO
    PRINT "frequency is:"; freq

    SOUND freq, 18.2
    INPUT "can you hear?"; ans$
    IF ans$ = "no" THEN
        PRINT "your max frequency is:"; freq
        END
    END IF
    freq = freq + 2
LOOP
```

Check this out!

Appendix

Commands

ABS()

```
N = ABS(expression returning a numerical value)
```

Returns the 'absolute' value of the expression, turning a negative to a positive (e.g. -4 to 4)

```
PRINT ABS(54.345) 'This will print the value ABS now as it is
(54.345)
```

```
PRINT ABS(-43)    'This will print the value as (43)
```

.

ACCESS

```
OPEN "file.txt" FOR APPEND ACCESS WRITE
```

This sets the access of a file that has been declared into the program. There are three settings that the programmer can set. These are:

```
READ - Sets up the file to be read only, no writing.
WRITE - Writes only to the file. Cannot be read.
READ WRITE - Sets the file to both of the settings above.
```

FOR APPEND opens the file as a text file and sets the file pointer to the end of the file, thereby appending new output to the file. If omitted, FOR RANDOM is the default, which would open the file as a sequence of fixed-length records and set the file pointer to the start of the file. New data would overwrite existing data in the file without warning.

ASC("C")

```
PRINT ASC("t")  'Will print 116
```

Prints the ASCII code number of the character found within the brackets. If the programmer put in a string into brackets, only the first character of the string will be shown.

ATN()

```
ATN(expression)
```

Part of the inbuilt trigonometry functions. An expression that evaluates to a numeric vale is converted to it's Arc-Tangent.

```
angle = ATN( B )
angle2 = ATN( 23 / 34 )
```

BEEP

```
BEEP
```

The BIOS on the motherboard is instructed to emit a "Beep" sound from the PC 'speaker'. See also SOUND and PLAY.

An older, outdated alternative is to use : PRINT CHR$(07)

This was replaced later by the BEEP command.

BLOAD

```
BLOAD file_path$, memory_offset%
```

Loads a file saved with BSAVE into memory.

- file_path$ is the file location
- memory_offset is an integer specifying the offset in memory to load the file to

The starting memory address is determined by the offset and the most recent call to the DEF SEG statement

BSAVE

```
BSAVE file_path$, memory_offset%, length&
```

Saves the contents of an area in memory to a file that can be loaded with BLOAD

- file_path$ is the file location
- memory_offset is an integer specifying the offset in memory to save
- length the number of bytes to copy

The starting memory address is determined by the offset and the most recent call to the DEF SEG statement

CALL ABSOLUTE

```
CALL ABSOLUTE([argument%, ...,] address%)
```

Pushes the provided arguments, which must be INTEGER, from left to right on the stack and then does a far call to the assembly language routine located at address. The code segment to use is set using DEF SEG. Normally QBasic will push the address of arguments, but if an argument is preceded by BYVAL the value of the argument will be pushed.

Note that because QBasic pushes the arguments from left to right, if you provide three arguments for example the stack will look like this:

```
SS:SP Return IP
+0002 Return CS
+0004 Argument 3
+0006 Argument 2
+0008 Argument 1
```

Example:

```
'POP CX
'POP DX
'POP BX
'POP AX
'MOV [BX], AX
'PUSH DX
'PUSH CX
'RETF
A$ = "YZ[Xë•RQ╦" 'Codepage: 437
I% = 42: J% = 0
IF VARSEG(A$) <> VARSEG(J%) THEN STOP 'Both A$ and J% are stored in
DGROUP.
DEF SEG = VARSEG(A$)
CALL ABSOLUTE(BYVAL I%, J%, PEEK(VARPTR(A$) + 3) * 256& OR
PEEK(VARPTR(A$) + 2))
PRINT J%
```

QBasic doesn't set BP to the stack frame of your machine language routine, but leaves it pointing to the stack frame of the calling QBasic procedure, which looks like this:

```
-???? Variable 3
-???? Variable 2
-???? Variable 1
-???? Return value (only if the procedure is a FUNCTION, absent if
a SUB)
-0002 BP of calling procedure
SS:BP BP of calling procedure (yes, again)
```

```
+0002 Six bytes referring back to the calling procedure to use when
executing END/EXIT SUB/FUNCTION
+0008 Argument 3
+000A Argument 2
+000C Argument 1
```

The offsets indicated with -/+???? will depend on the sizes and presence of variables, return value and arguments. For example, an INTEGER variable will take two bytes, but a LONG variable four. As one might expect considering how QBasic passes arguments, variables are stored in reverse order of declaration. Contrary to when calling a machine language routine, the arguments here will always be addresses. For arguments passed by value, space is allocated on the stack and the address of that space is passed to the procedure.

CASE

```
SELECT CASE expression
CASE test1[, test2, ...]: statements
[CASE test4[, test5, ...]: statements]
[CASE ELSE: statements]
END SELECT
```

Executes the statements after the first CASE statement where a test matches expression. The tests can be of the following forms:

```
expression
expression1 TO expression2
IS {<|<=|=|<>|>=|>} expression
```

This is an example of a program with no CASE commands that assigns different paths to values:

```
PRINT "1. Print 'path'"
PRINT "2. Print 'hello'"
PRINT "3. Quit"
INPUT "Enter a choice: "; a$
IF a$ = "1" THEN PRINT "path": RUN
IF a$ = "2" THEN PRINT "hello": RUN
IF a$ <> "3" THEN PRINT "That is not a valid choice.": RUN
```

This is what a program looks like with the CASE command:

```
PRINT "1. Print 'path'"
PRINT "2. Print 'hello'"
PRINT "3. Quit"
INPUT "Enter a choice: "; a$
SELECT CASE a$
CASE "1": PRINT "path": RUN
CASE "2": PRINT "hello": RUN
CASE IS <> "3": PRINT "That is not a valid choice.": RUN
END SELECT
```

CHAIN

```
CHAIN filename
```

This chains execution to another QBasic program. Values may be passed to the other program by using the COMMON statement before the CHAIN statement. Note that execution doesn't return to the first program unless the second program uses CHAIN to transfer execution back to the first.

CHDIR

```
CHDIR directoryname
```

This is used for setting the working directory, also known as the current directory. The directory name is declared exactly like in DOS and long file names aren't supported. For example:

```
CHDIR "C:\DOS"
```

Note that this doesn't change the current drive and every drive has its own working directory. You can set the current drive like this:

```
SHELL "C:"
```

CHR$()

This returns the string character symbol of an ASCII code value.

```
name$ = CHR$([ascii character code])
```

Often used to 'load' characters into string variables when that character cannot be typed (e.g. the Esc key or the F{n} (Function Keys) or characters that would be 'recognised' and acted upon by the QBASIC interpreter. The following four characters cannot occur in a QBasic string literal:

- 0 Null: all characters up to the end of the line will get deleted, including this one.
- 10 Line Feed: signals the end of the line.
- 13 Carriage Return: this character will get deleted.
- 34 Quotation Mark: signals the end of the string literal.

Here is a list of some character codes :-

```
07 Beep (same as BEEP)
08 Backspace
09 Tab
27 Esc
72 Up Arrow
75 Left Arrow
77 Right Arrow
80 Down Arrow
```

CINT()

This rounds the contents of the brackets to the nearest integer.

```
PRINT CINT(4573.73994596)
```

4574

CIRCLE

```
CIRCLE ([X Coordinate], [Y Coordinate]), [Radius], [Colour],
[Start],[End],[Aspect]
```

Lets the programmer display a circle. Like all graphics commands, it must be used with the SCREEN command.

CLEAR

```
CLEAR
```

Resets all variables, strings, arrays and closes all files. The reset command on QBasic.

CLOSE

```
CLOSE
```

Closes all open files

```
CLOSE #2
```

Closes only the file opened as data stream 2. Other files remain open

CLS

```
CLS
```

Clears the active screen. Erases all text, graphics, resets the cursor to the upper left (1,1), and also applies the current background color (this has to be set using the COLOR command) to the whole screen.

COLOR

```
COLOR [Text Colour], [Background Colour]
```

This lets you change the colour of the text and background used when next 'printing' to the current output window. It can be done like this:

```
COLOR 14, 01
PRINT "Yellow on Blue"
```

You have a choice of sixteen colours:

```
00: Black           08: Dark Grey
01: Dark Blue       09: Light Blue
02: Dark Green      10: Light Green
03: Dark Cyan       11: Light Cyan
04: Dark Red        12: Light Red
05: Dark Purple     13: Magenta
06: Orange Brown    14: Yellow
07: Grey            15: White
```

These values are the numbers that you put in the COLOR command.

Note Only screen modes 0, 7, 8, 9, 10 support a background color. To 're-paint' the whole screen in a background colour, use the CLS command.

COMMON

Declares a variable as 'global', which allows its value to be accessed across multiple QBasic programs / scripts (see also the CHAIN command)

```
COMMON SHARED [variablename]
```

Each program that declares 'variablename' as COMMON will share the same value.

NOTE. All COMMON statements must appear at the start of the program (i.e. before any executable statements).

CONST

Fixes a variable so it can not be changed within the program.

```
CONST (name) {AS (type = INTEGER / STRING)} = (expression or value)
```

For example :-

```
CONST PI = 3.14159265
```

Assigns the value 3.14159265 to PI.

```
CONST PI2 = 2 * PI
```

PI must be assigned a value before it is used to calculate PI2. Typically all CONST are declared at the beginning of a program.

DATA

```
DATA [constant]
```

Use in conjunction with the READ and RESTORE command. Mostly used in programs dealing with graphics, this command lets QBasic read a large number of constants. The READ command accesses the data while the RESTORE command "refreshes" the data, allowing it to be used again.

DATE$

A system variable that always contains the current date as a string in mm-dd-yyyy format. Use it like this:

```
a$ = DATE$
```

DEF SEG

Sets the current segment address.

```
DEG SEG [=address]
```

- address is a segment address that can contain a value of 0 through 65535.

If address is omitted, DEF SEG resets the current segment address to the default data segment. DEF SEG is used by BLOAD, BSAVE, CALL ABSOLUTE, PEEK, and POKE

DEST(Only QB64!)

_DEST sets the current write-to page or image. _DEST image_handle sends the destination image to an image of handle stored in long variable image_handle. _DESt 0 sends the destination image to the current screen being used.

DIM

This is used to declare an array (early versions of QBasic required all variables to be defined, not just arrays greater than 10)

```
DIM [Array Name] ([count],[count], ..)
```

The Array name can be of any type (Integer, Double, String etc). If not declared, single precision floating point is assumed. Strings can be 'declared' using $ sign (Integers with the '%' sign). The QBASIC interpreter tolerates numeric arrays of up to 10 count without these needing to be declared.

NOTE Early versions of QBasic did not explicitly set the contents of an array to zero (see CLEAR command)

```
DIM table%(100,2)
```

Create an integer array called table% containing 100x2 = 200 entries

```
DIM form$(5)
```

Create a string array called form$ containing 5 strings

```
DIM quotient(20) AS DOUBLE
```

Create an array called quotient that contains 20 double precision numbers

DO .. LOOP

```
DO
[program]
LOOP UNTIL [test condition becomes TRUE]
```

Used to create a loop in the program. The [condition] is tested only after the [program] code is executed for the first time (see also WHILE). For example:

```
num$ = 1
sum$ = 0
DO
sum$ = 2 * num$
PRINT sum$
num$ = num$ + 1
LOOP UNTIL num$ = 13
```

This does not work But the following does

```
num = 1
sum = 0
DO
sum = 2 * num
PRINT sum
num = num + 1
LOOP UNTIL num = 13
```

DRAW

```
DRAW "[string expression]"
```

Used to draw a straight line from the current 'cursor' position in the current colour. DRAW defines the direction (up, down etc.) and the length of the line (in pixels). For example:-

```
SCREEN 7
PSET (50, 50), 4
DRAW "u50 r50 d50 l50"
```

The letter in front of each number is the direction:

```
U = Up    E = Upper-right
D = Down  F = Lower-right
L = Left  G = Lower-left
R = Right H = Upper-left
```

The drawing 'cursor' is left at the position where the line ends. u50 draws from 50,50 upwards ending at 50,0 r50 draws from 50,0 to the right, ending at 100,0 d50 draws from 100,0 downwards, ending at 100,50 l50 draws from 100,50 to the left, ending at 50,50

The example shown will thus draw a red 'wire frame' square.

See also LINE and CIRCLE commands.

Note: The diagonal from 0,0 to 100,100 will be 100 * root(2) pixels long (i.e. 141)

END

```
END
```

Signifies the end of the program. When QBasic sees this command it usually comes up with a statement saying: "Press Any Key to Continue".

END TYPE / END DEF / END SUB / END FUNCTION / END IF / END SELECT

- `END TYPE` ends a TYPE definition.
- `END DEF` ends a DEF FN function definition.
- `END SUB` ends a SUB procedure definition.
- `END FUNCTION` ends a FUNCTION procedure definition.
- `END IF` ends a multiline IF block.

- `END SELECT` ends a SELECT CASE block.

ENVIRON

```
ENVIRON [string expression]
```

NOTE: If you are running QBasic on a Windows system, you will not be able to use this command.

This command helps you set an environment variable for the duration of the session. On exit from the QBasic.exe interpreter, the variables revert to their original values.

EOF()

This checks if there are still more data values to be read from the file specified in (). EOF() returns a boolean / binary value, a one or zero. 0 if the end of file has not been reached, 1 if the last value in the file has been read (see also LINE INPUT)

```
OPEN File.txt FOR INPUT AS #1
DO
INPUT #1, text$
PRINT text$
LOOP UNTIL EOF(1)
END
```

Note that, since the INPUT is executed before UNTIL is reached, File.txt must contain at least one line of text - if the file is empty, you will receive an 'ERROR (62) Input past end of file'.

ERASE

```
ERASE [arrayname] [,]
```

Used to erase all dimensioned arrays.

ERROR

System variable holding a numeric value relating to the processing of the previous line of code. If the line completed without error, ERROR is set to 0. If the line failed, ERROR is set to one of the values shown below. Most commonly used to redirect program flow to error handling code as in :-

```
ON ERROR GOTO [line number / label]
```

If ERROR is non=zero, program flow jumps to the line number or label specified. If ERROR is zero, program flow continues with the next line below.

To manually test your program and check to see if the error handling routine runs OK, ERROR can be set manually :-

```
ERROR [number]
```

Set ERROR = number

The error numbers are as follows:

```
1 NEXT without FOR                  39 CASE ELSE expected
2 Syntax Error                      40 Variable required
3 RETURN without GOSUB              50 FIELD overflow
4 Out of DATA                       51 Internal error
5 Illegal function call             52 Bad file name or number
6 Overflow                          53 File not found
7 Out of memory                     54 Bad file mode
8 Label not defined                 55 File already open
9 Subscript out of range            56 FIELD statement active
10 Duplicate definition             57 Device I/O error
11 Division by zero                 58 File already exists
12 Illegal in direct mode           59 Bad record length
13 Type mismatch                    61 Disk full
14 Out of string space              62 Input past end of file
16 String formula too complex       63 Bad record number
17 Cannot continue                  64 Bad file name
18 Function not defined             67 Too many files
19 Yes RESUME                        68 Device unavailable
20 RESUME without error             69 Communication-buffer overflow
```

```
24 Device timeout                  70 Permission denied
25 Device Fault                    71 Disk not ready
26 FOR without NEXT                72 Disk-media error
27 Out of paper                    73 Advanced feature unavailable
29 WHILE without WEND              74 Rename across disks
30 WEND without WHILE              75 Path/File access error
33 Duplicate label                 76 Path not found
35 Subprogram not defined
37 Argument-count mismatch
38 Array not defined
```

Note that ERROR is set when execution fails, not when the code is 'read' - so, for example, a 'divide by 0' will be found before the result is assigned to a non-existent array variable or written to a non-existent file.

EXIT

Allows the immediate exit from a subroutine or a loop, without processing the rest of that subroutine or loop code

```
EXIT DEF
```

Exits from a DEF FN function.

```
EXIT DO
```

Exits from a DO loop, execution continues with the command directly after the LOOP command

```
EXIT FOR
```

Exits from a FOR loop, execution continues with the command directly after the NEXT command

```
EXIT FUNCTION
```

Exits a FUNCTION procedure, execution continues with the command directly after the function call

```
EXIT SUB
```

Exits a SUB procedure.

FOR .. NEXT

```
FOR [variable name] = [start value] TO [end value] {STEP n}
[program  code]
NEXT [variable name]
```

The variable is set to the [start value], then program code is executed and at the Next statement the variable is incremented by 1 (or by the STEP value, if any is specified). The resulting value is compared to the [end value] and **if not equal** program flow returns to the line following the FOR statement.

For example:

```
FOR a = 200 TO 197 STEP-1
PRINT a
NEXT a
```

200 199 198

Care must be taken when using STEP, since it is quite possible to step past the (end value) with the result that the FOR loop will run 'for ever' (i.e. until the user aborts the interpreter or an error occurs), for example :-

```
FOR a = 200 TO 197 STEP-2
PRINT a
NEXT a
```

200 198 196 194 192 ... 0 -2 -4 ... -32768 ERROR overflow

GOSUB

```
GOSUB [subroutine line number / label]
```

Command processing jumps to the subroutine specified. When the RETURN command is encountered, processing returns to this point and continues with the line below the GOSUB.

IF

```
IF [variable or string] [operator] [variable or string] THEN
[command] {ELSE [command]}
```

Compares variables or strings. For example, if you wanted to examine whether or not a user-entered password was the correct password, you might enter:
IF a$ = "password" THEN PRINT "Password Correct"
Where a$ is the user entered password. Some operators include:
"="- equal to
"<"- less than (only used when variable or string is a number value)
">"- greater than (only used when variable or string is a number value)
"<>"- does not equal
"<="- less than or equal to (only used when variable or string is a number value)
">="- greater than or equal to (only used when variable or string is a number value)
One can also preform actions to number values then compare them to other strings or variables using the if command, such as in the below examples:
IF a+5 = 15 THEN PRINT "Correct"
IF a*6 = b*8 THEN PRINT "Correct"

INCLUDE (QUICKbasic Only)

QUICKBasic supports the use of include files via the $INCLUDE directive:

```
(Note that the Qbasic interpreter does NOT support this command.)
```

```
'$INCLUDE: 'foobar.bi'
```

Note that the include directive is prefixed with an apostrophe, dollar, and that the name of the file for inclusion is enclosed in single quotation mark symbols.

INKEY$

```
[variable] = INKEY$
```

This is used when you want a program to function with key input from the keyboard. Look at this example on how this works:

```
a$ = INKEY$
PRINT "Press Esc to Exit"
END IF a$ = CHR$(27)
```

You can use this in conjunction with the CHR$ command or type the letter (e.g. A).

INPUT

```
INPUT [String Literal] [,or;] [Variable]
```

Displays the String Literal, if a semi colon follows the string literal, a question mark is displayed, and the users input until they hit return is entered into the variable. The variable can be a string or numeric. If a user attempts to enter a string for a numeric variable, the program will ask for the input again. The String Literal is option. If the string literal is used, a comma (,) or semicolon (;) is necessary.

INPUT #

```
INPUT #n [String Literal] [,or;] [Variable]
```

Reads a string / value from the specified file stream (see also LINE INPUT #)

```
INPUT #1, a$, b$, n, m
```

Reads 4 values from the file that is OPEN as #1. a$ is assigned all text until a ',' (comma) or end of line is reached, b$ the next segment of text, then two numeric values are interpreted and assigned to n and m.

Note that, within the file, numbers can be separated by 'anything' - so, if a number is not found (for 'n' or 'm') on the current 'line' of the file, the rest of the file will be searched until a number is found. Input is then left 'pointing' at the position in the file after the last number required to satisfy the input statement (see also 'seek #' command)

INSTR

```
INSTR (start%, Search$, Find$)
```

Returns the character position of the start of the first occurrance of Find$ within Search$, starting at character position 'start%' in Search$. If Find$ is not found, 0 is returned. start% is optional (default = 1, the first character of Search$)

```
Pos = INSTR ("abcdefghi", "de")
```

returns 4

LEFT$()

```
A$ = LEFT$(B$,N)
```

A$ is set to the N left most characters of B$.

```
A$ =  LEFT$("Get the start only",6)
```

returns "Get th"

See also RIGHT$(), MID$().

LET

```
LET [variable] = [value]
```

Early versions of the QBasic.exe command interpreter required use of the 'LET' command to assign values to variables. Later versions did not.

```
LET N = 227 / 99
LET A$="a line of simple text"
```

is equliavent to :-

```
N = 227 / 99
A$="a line of simple text"
```

LINE

```
LINE ([X], [Y]) - ([X], [Y]), [Colour Number]
```

Used for drawing lines in QBasic. The first X and Y are used as coordinates for the beginning of the line and the second set are used for coordinating were the end of the line is. You must put a SCREEN command at the beginning of the program to make it work.

Note. When in SCREEN 13, the Colour Number == the Palette number

LINE INPUT #

```
LINE INPUT #1, a$
```

Reads a complete line as text characters from the file OPEN as stream #1 and places it in a$.

To find the 'end of line', the QBasic interpreter seaches for the 'Carriage Return' + 'Line Feed' (0x0D, 0x0A) characters. When reading text files created on UNIX/LINUX systems (where the 'Line feed' 0x0A is used on it's own to signify 'end of line'), LINE INPUT will not recognise the 'end of line' and will continue to input until the end of file is reached. For files exceeding 2k characters, the result is an "Out of String Space" Error as a$ 'overflows'. One solution is to use a text editor able to handle UNIX files to open and 'save as' before attempting to process the file using QBasic.

LOADIMAGE (QB64 Only)

(NOTE! The commands in this section refer to a third-party program called "QB64". Neither QUICKbasic nor Qbasic support _LOADIMAGE, _NEWIMAGE, OR _PUTIMAGE commands. Both QUICKbasic and Qbasic have a "SCREEN" command, but it works diffently in those languages than in QB64.)

_LOADIMAGE("image.jpg")

Shows an image. Must be used with the commands SCREEN, _NEWIMAGE and _PUTIMAGE.

Example:

DIM rabbit AS LONG SCREEN _NEWIMAGE(800, 600, 32) rabbit = _LOADIMAGE("rabbit.jpg") _PUTIMAGE (100,100), rabbit

LOOP

```
DO
[Program]
LOOP UNTIL [condition]
```

Used to create a loop in the program. This command checks the condition after the loop has started. This is used in conjunction with the DO command.

LPRINT

```
LPRINT [statement or variable]
```

Prints out text to a printer. The LPRINT command expects a printer to be connected to the LPT1(PRN) port. If a printer is not connected to LPT1, QBasic displays a "Device fault" error message.

If your printer is connected to a COM port instead, use the MS-DOS MODE command to redirect printing from LPT1 to COMx (for example, to redirect to COM1, use the following command:

```
   MODE LPT1=COM1
```

If you need to cancel the redirection when finished, use the following command:

```
   MODE LPT1
```

MID$

```
 a$=MID$(string$,start%[,length%])
 MID$(string$,start%[,length%])=b$
```

In the first use, a$ is set to the substring taken from string$ strating with character start% taking Length% characters. If length% is omitted, the rest of the line (i.e. start% and all the characters to the right) are taken.

In the second use, length% characters of string$ are replaced by b$ starting at start%. If length% is omitted, the rest of the line is replaced (i.e. start% and all the characters to the right)

See also LEFT$ RIGHT$ LEN

MOD

```
  a MOD b
```

Returns the remainder of an integer divide of a by b

For example, 10 MOD 3 returns 1

NEWIMAGE(Only QB64!)

_NEWIMAGE is used to set a long variable as the screen dimensions, or can be used with the SCREEN command (See later in Appendix) to directly set the screen details. It is very useful as you can enlarge the SCREEN mode '13' which has RGB color settings, if you find the default size too small.

Syntax: _NEWIMAGE(width,length,screen_mode)

- width and length are long variables, while screen_mode is the screen mode format you wish to change.

It is also used to prepare the window screen surface for the image you want to put (first load it using LOADIMAGE).

OPEN

```
OPEN "[(path)\8.3 file name.ext]" (FOR {INPUT/OUTPUT} AS #{n})
```

This opens a file. You have to give the DOS file name, for example:

```
OPEN "data.txt" FOR INPUT AS #1
```

Opens the existing file data.txt for reading as data stream #1. Since no path is specified, the file must be in the same folder as the QBasic.exe - if not, processing halts with a 'file not found' error

```
OPEN "C:\TEMP\RUN.LOG" FOR OUTPUT AS #2
```

Opens an empty file named RUN.LOG in the C:\TEMP folder for writing data stream #2. Any existing file of the same name is replaced.

PALETTE

```
PALETTE[palette number, required colour]
```

For VGA (SCREEN mode 13) only, sets the Palette entry to a new RGB color. The palette number must be in the range 1-256. The required colour is a LONG integer created from the sum of (required Blue * 65536) + (required Green * 256) + required Red.

RANDOMIZE

```
RANDOMIZE TIMER
A = INT((RND * 100)) + 1
```

RANDOMIZE will set the seed for QBasic's random number generator. With QBasic, it's standard to simply use RANDOMIZE TIMER to ensure that the sequence remains the same for each run.

The example is a mathematical operation to get a random number from 1 to 100.

INT stands for Integer, RND for Random and "*" stands for the limit upto which the random number is to be chosen. The "+ 1" is just there to ensure that the number chose is from 1 to 100 and not 0 to 99.

Note: Subsequent calls of this function do not guarantee the same sequence of random numbers.

READ

```
READ AIM(I)
```

Used in conjunction with the DATA command, this command lets QBasic read data. This is mostly used when dealing with large quantities of data like bitmaps.

REM or '

```
REM {comments}
' {comments}
```

When the interpreter encounters REM or " ' " (a single quote) at the start of a line, the rest of the line is ignored

RETURN

```
RETURN
```

Signifies that it is the end of a subroutines

RND

```
RANDOMIZE TIMER
A = INT((RND * 100)) + 1
```

RND will provide a random number between 0 and 1.

The example is a mathematical operation to get a random number from 1 to 100. RANDOMIZE TIMER will set the initial seed to a unique sequence. INT stands for Integer, RND for Random and "*" stands for the limit upto which the random number is to be chosen. The "+ 1" is just there to ensure that the number chose is from 1 to 100 and not 0 to 99.

Internally, the seed a 24-bit number, iterated in the following method: rnd_seed = (rnd_seed*16598013+12820163) MOD 2^24

PLAY

```
PLAY "[string expression]"
```

Used to play notes and a score in QBasic on the PC speaker. The tones are indicated by letters A through G. Accidentals are indicated with a "+" or "#" (for sharp) or "-" (for flat) immediately after the note letter. See this example:

```
PLAY "C C# C C#"
```

Whitespaces are ignored inside the string expression. There are also codes that set the duration, octave and tempo. They are all case-insensitive. PLAY executes the commands or notes the order in which they appear in the string. Any indicators that change the properties are effective for the notes following that indicator.

```
Ln      Sets the duration (length) of the notes. The variable n does
not indicate an actual duration
        amount but rather a note type; L1 - whole note, L2 - half
note, L4 - quarter note, etc.
        (L8, L16, L32, L64, ...). By default, n = 4.
        For triplets and quintets, use L3, L6, L12, ... and L5, L10,
L20, ... series respectively.
        The shorthand notation of length is also provided for a
note. For example, "L4 CDE L8 FG L4 AB"
        can be shortened to "L4 CDE F8G8 AB". F and G play as eighth
notes while others play as quarter notes.
On      Sets the current octave. Valid values for n are 0 through 6.
An octave begins with C and ends with B.
        Remember that C- is equivalent to B.
< >     Changes the current octave respectively down or up one
level.
Nn      Plays a specified note in the seven-octave range. Valid
values are from 0 to 84. (0 is a pause.)
        Cannot use with sharp and flat. Cannot use with the
shorthand notation neither.
MN      Stand for Music Normal. Note duration is 7/8ths of the
length indicated by Ln. It is the default mode.
ML      Stand for Music Legato. Note duration is full length of that
indicated by Ln.
MS      Stand for Music Staccato. Note duration is 3/4ths of the
length indicated by Ln.
```

```
Pn     Causes a silence (pause) for the length of note indicated
(same as Ln).
Tn     Sets the number of "L4"s per minute (tempo). Valid values
are from 32 to 255. The default value is T120.
.      When placed after a note, it causes the duration of the note
to be 3/2 of the set duration.
       This is how to get "dotted" notes. "L4 C#." would play C
sharp as a dotted quarter note.
       It can be used for a pause as well.
MB MF  Stand for Music Background and Music Foreground. MB places a
maximum of 32 notes in the music buffer
       and plays them while executing other statements. Works very
well for games.
       MF switches the PLAY mode back to normal. Default is MF.
```

PRINT

```
PRINT [Argument] [,or;] [Argument]...
```

Displays text to the screen. The Argument can be a string literal, a string variable, a numeric literal or a numeric variable. All arguments are optional.

```
PRINT #[n] [,or;] [Argument]...
```

Saves data to the file that is 'OPEN FOR OUTPUT AS #[n]' or we can use ? symbol for print command

PSET

```
PSET ([X coordinate],[Y coordinate]), [Pixel Colour]
```

This command displays pixels, either one at a time or a group of them at once. For the command to work, the program must have a SCREEN command in it.

SCREEN

```
SCREEN [Screen Mode Number]
```

This command is used for displaying graphics on the screen. There are ten main types of screen modes that can be used in QBasic depending on the resolution that you want. Here is a list of what screen modes you can choose from:

SCREEN 0: Textmode, cannot be used for graphics. This the screen mode that text based programs run on.

SCREEN 1: 320 x 200 Resolution. Four Colours

SCREEN 2: 640 x 200 Resolution. Two Colours (Black and White)

SCREEN 7: 320 x 200 Resolution. Sixteen Colours

SCREEN 8: 640 x 200 Resolution. Sixteen Colours

SCREEN 9: 640 x 350 Resolution. Sixteen Colours

SCREEN 10: 640 x 350 Resolution. Two Colours (Black and White)

SCREEN 11: 640 x 480 Resolution. Two Colours

SCREEN 12: 640 x 480 Resolution. Sixteen Colours

SCREEN 13: 320 x 200 Resolution. 256 Colours. (Recommended)

Note. In SCREEN 13 you have a colour Palette of 256 colours. The PALETTE is pre-set by Windows however you can change the RGB values using the PALETTE command.

SEEK

```
SEEK #[file number], 1
```

Repositions the 'input #' pointer to the beginning of the file.

SGN

```
SGN(expression yielding a numeric value)
```

Yields the 'sign' of a value, -1 if < 0, 0 if 0, 1 if > 0

SHELL

The 'SHELL' command is used in Qbasic to issue a command to Command Prompt/Windows Shell . The 'Shell' command is used along with a string that contains commands that would be understood by any of the above software. The string enclosed commands are much like that of MS-DOS

Example: SHELL can be used with a 'DIR' command to make a directory of files in a certain folder or path.

SLEEP

```
SLEEP [n]
```

Execution is suspended for n seconds

SOUND

```
SOUND [frequency], [duration]
```

Unlike the BEEP command, this produces a sound from the PC speakers that is of a variable frequency and duration. The frequency is measured in Hertz and has a range from 37 to 32767. Put in one of these numbers in the frequency section. The duration is clock ticks that is defaulted at 18.2 ticks per second.

STR$

Converts a numeric value into a text (string) character

```
A$ = STR$(expression yielding a numeric value)
```

The numeric value is converted into text characters and placed into A$. Use to convert numbers into a text string.

WARNINGS.

1) If the result is positive, a leading 'space' is added (STR$(123) = " 123" and not "123" as might be expected). If the result is negative, instead of a space you get a '-' (minus sign), i.e. STR$(-123) = "-123" and not " -123" as might be expected from the positive behaviour.

2) When converting a float (mumb!, numb#) less than 0.1, the string value may be rendered in 'scientific notation', with 'D' used rather than '*10^' (for example "5.nnnnnnD-02" rather than " .05nnnnnn" or "5.nnnnnn*10^-02"). This only occurs when the number of significant digits needs to be preserved (so .03000000 is rendered as " .03", whilst .030000001 becomes " 3.0000001D-02"), again perhaps not what you might expect.

See also CHR$ for converting an ascii value into a string character.

See also LEFT$, MID$, RIGHT$ for extracting sub-strings from a line of text.

SYSTEM

```
SYSTEM
```

The .bas exits, the QBasic.exe interpreter is closed and 'control' passes to the Command Window c:\ prompt (or next line of a calling .cmd script etc.)

NOTE!: This only works when you start your program at the command prompt using the "/run" parameter! (EX: "Qbasic /run MyProg.bas") Otherwise, Qbasic assumes you opened your program to make changes, and thus "SYSTEM" drops you back at the editor screen.

THEN

```
[Command] [variable] = [value] THEN GOTO [line command value]
```

Used in conjunction with the GOTO or IF condition commands. It tells the computer what to do if a certain condition has been met.

TO

```
[Command] [Variable] = [Value] TO [Value]
```

Usually used to input a number of variables.

```
FOR a = 400 TO 500
PRINT a
NEXT a
```

This example will print all numbers from 400 to 500. Instead of declaring all values separately, we can get them all declared in one go.

USING

```
USING "format";
```

Used to format the output of data from PRINT commands. Normally, the QBasic interpreter will print a number as 8 characters with as many leading spaces as necessary. To change this behavour, the USING command can be used to format the output. For example ..

```
IF n > 99 THEN PRINT #1, USING "###"; n; ELSE IF n > 9 AND n<=99
```

THEN PRINT #1, USING "0##"; n; ELSE PRINT #1, USING "00#"; n;

.. will output n from 0 to 999 with leading zeros. Note the ';' after the n. This means 'don't start a new line' and results in the next PRINT #1 adding data directly after the comma (',') Qbasic automatically inserts instead of a line.

VAL()

```
name=VAL([variable$])
```

Converts the [variable string] contents into a numeric value so it can be used in calculations. If (name) is an INTEGER type, the VAL is rounded down. See also STR$.

A$ = "2"

B$ = "3"

X = VAL(A$) + VAL(B$)

PRINT A$; " + "; B$; " ="; X

WHILE ... WEND

```
WHILE {NOT} [test condition is true]
[program code to execute]
WEND
```

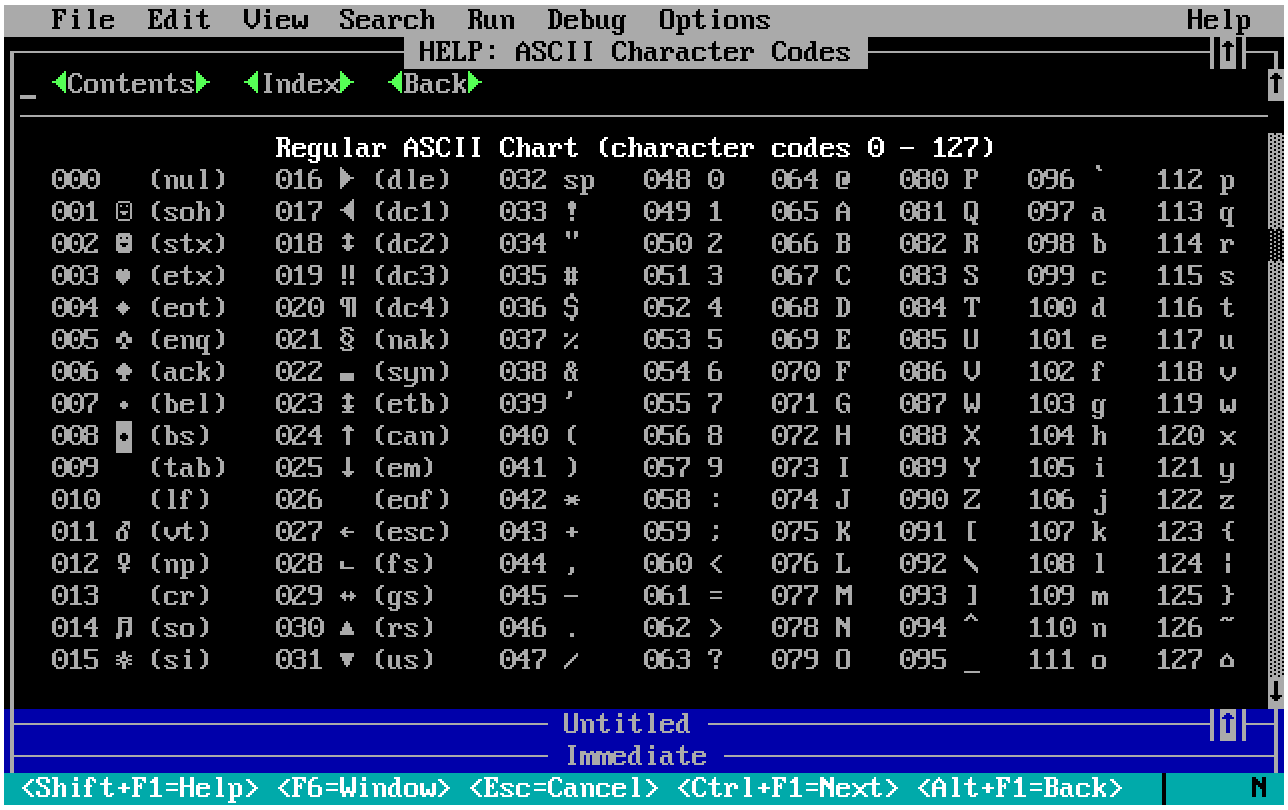
The condition is tested and if true (or NOT true) the [program] code is executed until WEND is reached, at which point control passes back to the WHILE line.

```
WHILE NOT (EOF(1))
LINE INPUT #1, A$
PRINT #2, A$
WEND
```

While the end of file #1 has not been reached, read each complete line and write it to file #2.

Unlike FOR and DO, it is not possible to EXIT from a WHILE loop

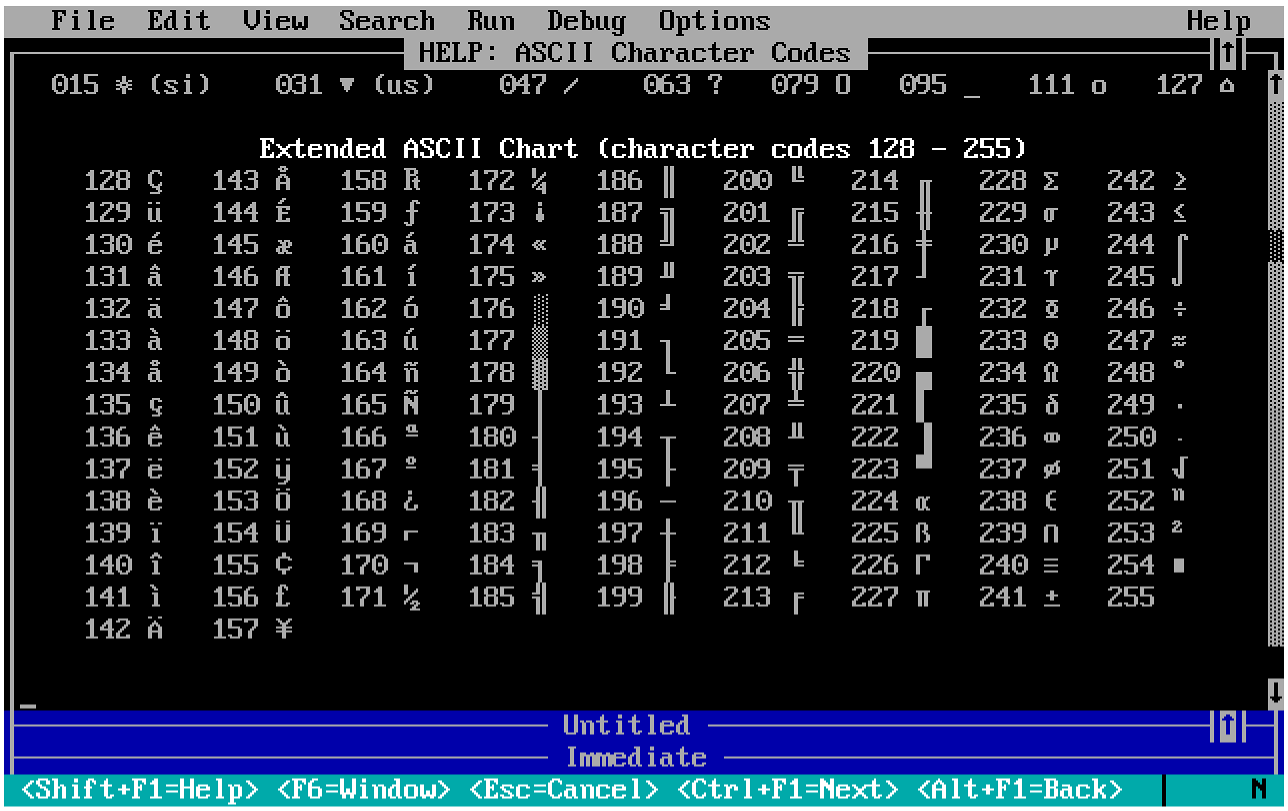
ASCII Chart


File Edit View Search Run Debug Options Help
HELP: ASCII Character Codes
◀Contents▶ ◀Index▶ ◀Back▶
Untitled
Immediate
<Shift+F1=Help> <F6=Window> <Esc=Cancel> <Ctrl+F1=Next> <Alt+F1=Back>
N

```
                    Regular ASCII Chart (character codes 0 - 127)
000   (nul)   016 ► (dle)   032 sp   048 0   064 @   080 P   096 `   112 p
001 ☺ (soh)   017 ◄ (dc1)   033 !    049 1   065 A   081 Q   097 a   113 q
002 ☻ (stx)   018 ↕ (dc2)   034 "    050 2   066 B   082 R   098 b   114 r
003 ♥ (etx)   019 ‼ (dc3)   035 #    051 3   067 C   083 S   099 c   115 s
004 ♦ (eot)   020 ¶ (dc4)   036 $    052 4   068 D   084 T   100 d   116 t
005 ♣ (enq)   021 § (nak)   037 %    053 5   069 E   085 U   101 e   117 u
006 ♠ (ack)   022 ▬ (syn)   038 &    054 6   070 F   086 V   102 f   118 v
007 • (bel)   023 ↨ (etb)   039 '    055 7   071 G   087 W   103 g   119 w
008 ◘ (bs)    024 ↑ (can)   040 (    056 8   072 H   088 X   104 h   120 x
009   (tab)   025 ↓ (em)    041 )    057 9   073 I   089 Y   105 i   121 y
010   (lf)    026   (eof)   042 *    058 :   074 J   090 Z   106 j   122 z
011 ♂ (vt)    027 ← (esc)   043 +    059 ;   075 K   091 [   107 k   123 {
012 ♀ (np)    028 ∟ (fs)    044 ,    060 <   076 L   092 \   108 l   124 ¦
013   (cr)    029 ↔ (gs)    045 -    061 =   077 M   093 ]   109 m   125 }
014 ♫ (so)    030 ▲ (rs)    046 .    062 >   078 N   094 ^   110 n   126 ~
015 ☼ (si)    031 ▼ (us)    047 /    063 ?   079 O   095 _   111 o   127 ⌂
```

Authors

The authors of this work are:



```
  File  Edit  View  Search  Run  Debug  Options                         Help
                                 HELP: ASCII Character Codes
  015 ☼ (si)    031 ▼ (us)    047 /    063 ?    079 O    095 _    111 o    127 ⌂

               Extended ASCII Chart (character codes 128 - 255)
    128 Ç    143 Å    158 ₧    172 ¼    186 ║    200 ╚    214 ╓    228 Σ    242 ≥
    129 ü    144 É    159 ƒ    173 ¡    187 ╗    201 ╔    215 ╫    229 σ    243 ≤
    130 é    145 æ    160 á    174 «    188 ╝    202 ╩    216 ╪    230 µ    244 ⌠
    131 â    146 Æ    161 í    175 »    189 ╜    203 ╦    217 ┘    231 τ    245 ⌡
    132 ä    147 ô    162 ó    176 ░    190 ╛    204 ╠    218 ┌    232 Φ    246 ÷
    133 à    148 ö    163 ú    177 ▒    191 ┐    205 ═    219 █    233 Θ    247 ≈
    134 å    149 ò    164 ñ    178 ▓    192 └    206 ╬    220 ▄    234 Ω    248 °
    135 ç    150 û    165 Ñ    179 │    193 ┴    207 ╧    221 ▌    235 δ    249 ∙
    136 ê    151 ù    166 ª    180 ┤    194 ┬    208 ╨    222 ▐    236 ∞    250 ·
    137 ë    152 ÿ    167 º    181 ╡    195 ├    209 ╤    223 ▀    237 φ    251 √
    138 è    153 Ö    168 ¿    182 ╢    196 ─    210 ╥    224 α    238 ε    252 ⁿ
    139 ï    154 Ü    169 ⌐    183 ╖    197 ┼    211 ╙    225 ß    239 ∩    253 ²
    140 î    155 ¢    170 ¬    184 ╕    198 ╞    212 ╘    226 Γ    240 ≡    254 ■
    141 ì    156 £    171 ½    185 ╣    199 ╟    213 ╒    227 π    241 ±    255
    142 Ä    157 ¥

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                                   Untitled
                                   Immediate
 <Shift+F1=Help> <F6=Window> <Esc=Cancel> <Ctrl+F1=Next> <Alt+F1=Back>     N
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