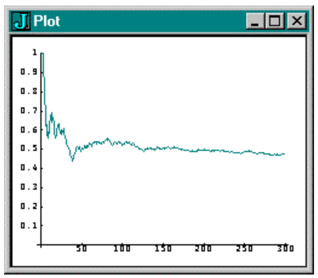
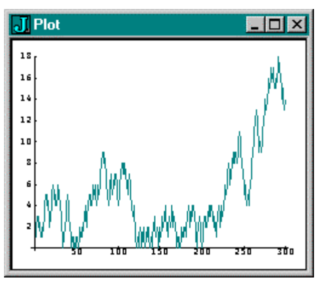
Coin Tossing

An unbiased coin is tossed 300 times and for each toss the ratio of the number of heads to the total number of throws and the cumulative excess in heads over tails are calculated. The required **J** statements and the corresponding graphs are as follows:

```
N=: 300
TossNum=: >: i. N
Heads=: +/\?N$2
Ratio=: Heads % TossNum
Diff=: |TossNum - 2*Heads
```




```
plot TossNum;Ratio
```




```
plot TossNum;Diff
```

Some of the characteristics of the **J** system, distributed by Strand Software Inc., are the following:

- **J** is available for Windows, WindowsCE, Mac, UNIX and Linux. The core language is identical in all versions.
- **J** for Windows 9x/NT gives a comprehensive programming environment including GUI, GDI and OpenGL graphics, and conventional ODBC and OLE database access.
- **J** can be integrated with other systems giving, for example, computational support to most graphics and spreadsheet packages.
- **J** programs may be distributed as executable files independent of the **J** system.
- **J** is available in three editions: Professional with manuals, CD-ROM and upgrades; Standard; and Educational to registered students.
- The full text of the manuals is included in the online help which also contains tutorials and demonstration packages.

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KS/Jun00

J is a general-purpose language available on a number of different computers and operating systems and intended as both a programming language and a simple, executable notation for teaching a wide range of subjects.

The principles underlying the design of **J** have been simplicity, brevity and generality. The data objects in **J** are scalars, one-dimensional lists, two-dimensional tables, and in general rectangular arrays of arbitrary dimension. In addition to the usual elementary arithmetical operations of addition, subtraction, multiplication and division, there is a large number of additional operations which are defined for arrays as well as for individual numbers.

J was developed by Kenneth Iverson as a modern dialect of APL, a language which he began to develop in the 1960s. **J** provides the simplicity and generality of APL, may be printed on standard printers since it uses the standard ASCII character set, and takes full advantage of recent developments in computer technology.

Visit Iverson Software Inc. at
www.jsoftware.com
for further information, tutorials, and links to related sites.

Descriptive Statistics I

The following are some percentage test scores which we wish summarize with a few simple descriptive measures:

```
   Marks
85 79 63 91 85 69 64 78 93 48 76 81 79

   sort=: /:~
   sort Marks
48 63 64 69 76 78 79 79 81 85 85 91 93

   size=: #
   mean=: +/ % #
   min=: <./
   max=: >./
   summary=: size,min,mean,max
   summary Marks
13 48 76.2308 93
```

An alternative to the well-known frequency distribution table is the stem-and-leaf diagram in which the unit digits, or "leaves", of the observations constitute the bars and the more significant digits, or "stems", give the vertical axis.

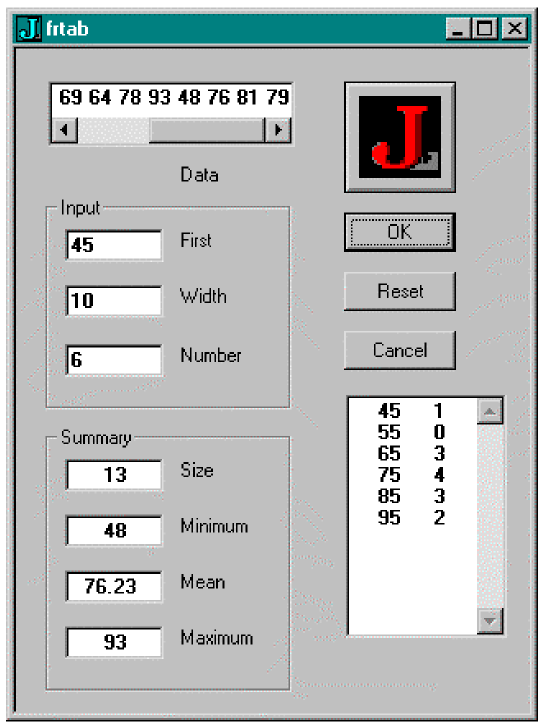
```
   stem=: 10&* @ <. @ %&10
   leaf=: 10&|
   diagram=: ~.@stem ;"0  stem </. leaf
   diagram sort Marks
```

40	8
60	3 4 9
70	6 8 9 9
80	1 5 5
90	1 3

Descriptive Statistics II

J programs may be incorporated into Windows forms designed by the user so that the programs may be used without any knowledge of the details of the computations or their implementation. These forms may be used within the **J** programming environment or independently of it.

As an example the form given below computes summary statistics and also the frequency distribution of a set of data, which may be either discrete or continuous, given the midpoint of the first class of the distribution, the class width and the number of classes. It is shown used for an analysis of the marks data given in the previous panel.



Linear Regression

The following data, taken from *Elementary Statistics. Second edition* by P. G. Hoel and modified slightly, give the yield in bushels per acre for amount of applied water in inches for a certain crop:

```
   x=: 12 18 24 30 36 42 48
   y=: 5.3 5.7 6.3 7.2 8 8.7 8.4
```

The regression coefficients are

```
   b=: y %. X=. 1,"0 x ,
```

where X is a two-column array with 1s in the first column and the values of the independent variable in the second, and b is equal to

```
   4.05 0.10119
```

giving the intercept and slope, respectively. The least-squares estimates of the yield are

```
   4.05 + 0.10119 * x
```

or approximately

```
   5.3 5.9 6.5 7.1 7.7 8.3 8.9  .
```

The following graph has been constructed by importing the observed and estimated values from **J** into MS Works: