# BETCDF

## PURPOSE

Compute the beta cumulative distribution function with shape parameters $\alpha$ and $\beta$.

## DESCRIPTION

The beta distribution has the following cumulative distribution function:

$$F(x) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)}\int_0^x t^{\alpha-1}(1-t)^{\beta-1}dt \qquad 0 < x < 1 \qquad \textbf{(EQ 8-113)}$$

where $\Gamma$ is the gamma function (see the documentation for the GAMMA command for a description of this function) and $\alpha$ and $\beta$ are positive numbers that define the shape parameters. The beta cdf function is also referred to as the incomplete beta function. The input value should be greater than 0 and less than 1. The returned value will be between 0 and 1.

## SYNTAX

LET <y2> = BETCDF(<y1>,<a>,<b>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a number, parameter, or variable containing values between 0 and 1;

<y2> is a variable or a parameter (depending on what <y1> is) where the computed beta cdf value is stored;

<a> is a number, parameter, or variable that specifies the first shape parameter;

<b> is a number, parameter, or variable that specifies the second shape parameter;

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

## EXAMPLES

LET A = BETCDF(0.3,10,8)
LET A = BETCDF(A1,10,8)
LET Y = BETCDF(X1,2,6)

## NOTE 1

Several other probability functions can be considered special cases of the beta distribution or they can be transformed to a beta distribution. See the books listed in the REFERENCE below for details.

## NOTE 2

DATAPLOT uses the routine DBETAI from the SLATEC Common Mathematical Library to compute this function. SLATEC is a large set of high quality, portable, public domain Fortran routines for various mathematical capabilities maintained by seven federal laboratories. The DBETAI routine is an implementation of the Bosten and Battiste algorithm (see the REFERENCE section below).

## DEFAULT

None

## SYNONYMS

BETAI

## RELATED COMMANDS

| | | |
|---|---|---|
| BETPDF | = | Compute the beta probability density function. |
| BETPPF | = | Compute the beta percent point function. |
| NCBCDF | = | Compute the non-central beta cumulative distribution function. |
| NCBPPF | = | Compute the non-central beta percent point function. |
| FCDF | = | Compute the F cumulative distribution function. |
| FPDF | = | Compute the F probability density function. |
| FPPF | = | Compute the F percent point function. |
| GAMCDF | = | Compute the gamma cumulative distribution function. |
| GAMPDF | = | Compute the gamma probability density function. |
| GAMPPF | = | Compute the gamma percent point function. |
| UNICDF | = | Compute the uniform cumulative distribution function. |
| UNIPDF | = | Compute the uniform probability density function. |
| UNIPPF | = | Compute the uniform percent point function. |

## REFERENCE

"Statistical Computing," Kennedy and Gentle, Marcel-Dekker, 1980 (chapter 5).

"Statistical Distributions," 2nd Edition, Evans, Hastings, and Peacock, 1970 (chapter 5).

## APPLICATIONS

Data Analysis

## IMPLEMENTATION DATE

94/9

## PROGRAM

```
SEGMENT 1 COORDINATES 64 38 69 38; SEGMENT 1 PATTERN SOLID
SEGMENT 2 COORDINATES 64 34 69 34; SEGMENT 2 PATTERN DASH
SEGMENT 3 COORDINATES 64 30 69 30; SEGMENT 3 PATTERN DOT
SEGMENT 4 COORDINATES 64 26 69 26; SEGMENT 4 PATTERN DA2
LEGEND 1 A = 2, B = 4; LEGEND 1 COORDINATES 70 37
LEGEND 2 A = 1, B = 1; LEGEND 2 COORDINATES 70 33
LEGEND 3 A = 0.5, B = 0.5; LEGEND 3 COORDINATES 70 29
LEGEND 4 A = 0.2, B = 1; LEGEND 4 COORDINATES 70 25
YLIMITS 0 1; MAJOR YTIC NUMBER 6
MINOR YTIC NUMBER 1; YTIC DECIMAL 1
XLIMITS 0 1; XTIC OFFSET 0.1 0.1
MAJOR XTIC NUMBER 6; MINOR XTIC NUMBER 1
LINES SOLID DASH DOT DASH2
X1LABEL X; Y1LABEL PROBABILITY
TITLE BETCDF FOR VARIOUS VALUES OF A AND B
PLOT BETCDF(X,2,4) FOR X = 0.01 0.01 0.99 AND
PLOT BETCDF(X,1,1) FOR X = 0.01 0.01 0.99 AND
PLOT BETCDF(X,0.5,0.5) FOR X = 0.01 0.01 0.99 AND
PLOT BETCDF(X,0.2,1) FOR X = 0.01 0.01 0.99
```