

## 1 SUMMARY

To compute values of the **Beta function**

$$B(x, y) = \int_0^1 t^{x-1} (1-t)^{y-1} dt$$

The relation  $B(x, y) = \Gamma(x)\Gamma(y)/\Gamma(x+y)$  is used. Approximations similar to those used by FC03A are used but taking advantage of the combined form that is being evaluated.

**ATTRIBUTES** — **Version:** 1.0.0. **Types:** FC05A; FC05AD. **Original date:** May 1963. **Origin:** S.Marlow, Harwell.

## 2 HOW TO USE THE PACKAGE

*The single precision version*

```
CALL FC05A(X, Y, BETA)
```

*The double precision version*

```
CALL FC05AD(X, Y, BETA)
```

X is a REAL (DOUBLE PRECISION in the D version) variable which must be set by the user to the value of  $x$ .  
**Restrictions:**  $x$  or  $x+y$  must not be a negative integer.

Y is a REAL (DOUBLE PRECISION in the D version) variable which must be set by the user to the value of  $y$ .  
**Restriction:**  $y$  or  $x+y$  must not be a negative integer.

BETA is a REAL (DOUBLE PRECISION in the D version) variable which is set by the subroutine to the computed value of  $B(x, y)$ .

## 3 GENERAL INFORMATION

**Use of common:** none.

**Workspace:** none.

**Other subroutines:** none.

**Input/Output:** an error message is printed if any of the restrictions are violated.

**Restrictions:**  $x$ ,  $y$  or  $x+y$  must not take the value of a negative integer.

**Accuracies:**

6 figures using 4-byte arithmetic

14 figures using 8-byte arithmetic

#### 4 METHOD

The function is evaluated using the relation

$$B(x, y) = \frac{\Gamma(x)\Gamma(y)}{\Gamma(x+y)}$$

where  $\Gamma(x)$  is the Gamma function, which is approximated in FC05 by a Chebyshev series.

Negative values of  $x$  and  $y$  are handled by using the recurrence relation

$$\Gamma(x+1) = x \Gamma(x)$$