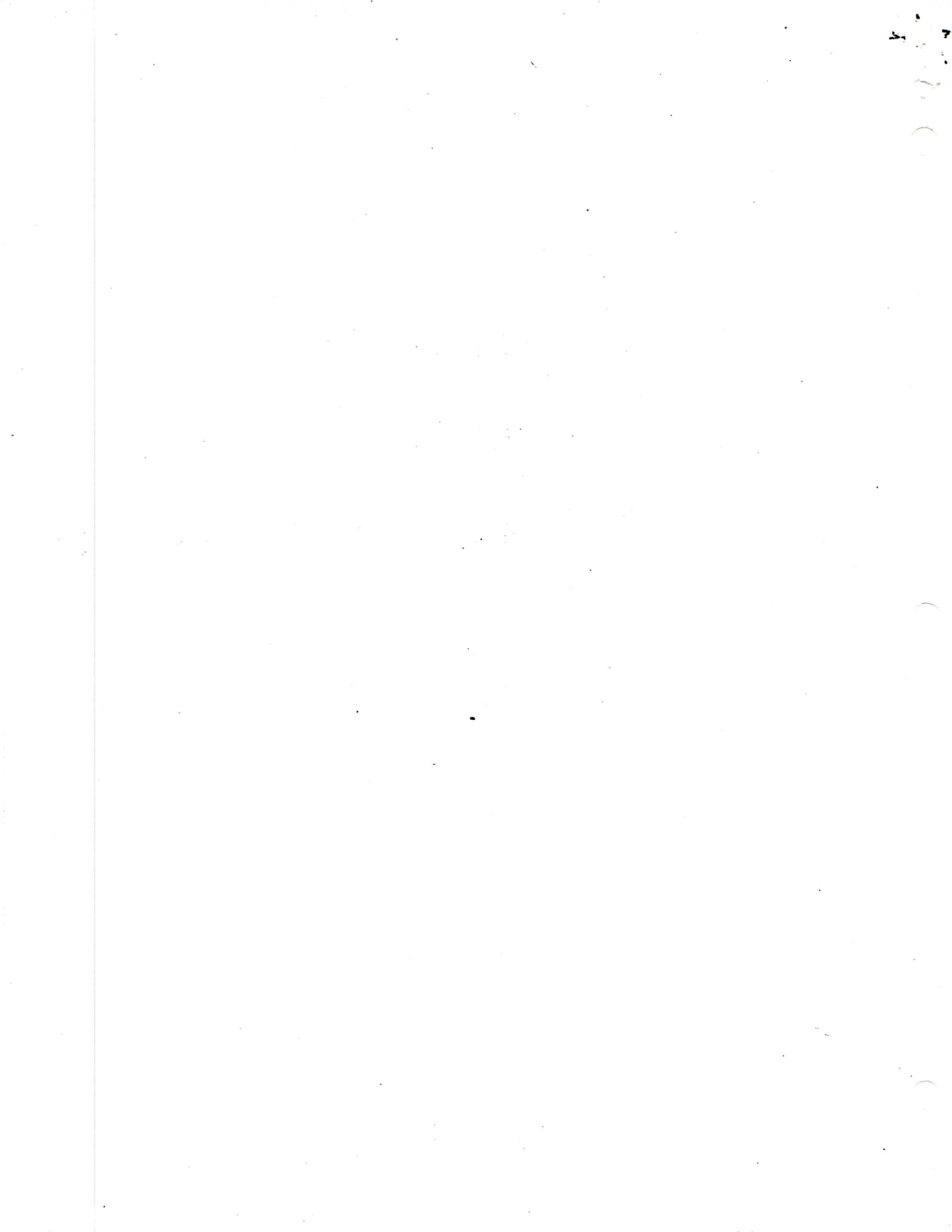


DECUS

PROGRAM LIBRARY

DECUS NO.	FOCAL8-208
TITLE	Random Number Generator in FOCAL with Normal Distribution
AUTHOR	Stan Vivian
COMPANY	University of Manitoba Winnipeg, Canada
DATE	January 1972
SOURCE LANGUAGE	FOCAL '69



A NORMALLY DISTRIBUTED RANDOM NUMBER GENERATOR IN FOCAL

In Monte Carlo simulation studies and, in general, for any check out of a new or modified statistical procedure, a method of obtaining normally distributed random numbers is essential.

A two line program has been written in FOCAL that will provide a normally distributed random number from a population of mean zero and specified standard deviation S . Besides the input standard deviation S , the subroutine uses two variables X and Y . The normally distributed number is returned as X .

As the FOCAL 1969 random number function FRAN is considerably defective, the left two digits were discarded to obtain a more representative random number.

Another version of the subroutine is also provided. This is for use with the modified random number generator FOCAL 8-150. In this version the subroutine is a single line of FOCAL and executes faster.

A demonstration program is also included which will calculate the first four moments and plot a bar graph of the resulting distribution.

The demonstration program requires approximately an average of 1 second per data point. The subroutine alone requires about 600 milliseconds to return a number.

W
C-8K FOCAL @1969

01.01 C***** DEMONSTRATION PROGRAM FOR SUBROUTINE 'NORAND' *****
01.02 C-----COMPUTES MEAN, STANDARD DEVIATION, SKEWNESS, AND KURTOSIS
01.03 C----- FOR SAMPLES OF SIZE N AND PLOTS A BAR GRAPH OF THE
01.04 C----- FREQUENCY DISTRIBUTION.

01.10 E
01.15 S IC=8/25
01.20 A !!!"POPULATION STANDARD DEVIATION: "S," SAMPLE SIZE: "N
01.30 T !" MEAN SD SKEW KURT.
01.35 T !%5.04,0,%7.04,S,0,3," <<< EXPECTED VALUES
01.40 S X1=0;S X2=0;S X3=0;S X4=0;F I=1,N;D 30;D 1.9;D 2
01.50 S M1=X1/N;S M2=X2/N;S M3=X3/N;S M4=X4/N
01.52 S U2=M2-M1²;S U3=M3-3*M1*M2+2*M1³
01.54 S U4=M4-4*M1*M3+6*M1²*M2-3*M1⁴
01.58 T !%5.04,M1,%7.04,FSQ(T(U2));S SK=1;I (0-U3)1.62,1.62,1.6
01.60 S SK=-1
01.62 T " "%5.04,SK*FSQ(T(U3+2/U2+3)),%7.04,U4/U2+2
01.64 T " <<< SAMPLE ESTIMATES
01.70 I (N-200)1.72;F I=1,25;S H(I)=H(I)*200/N
01.72 D 3
01.80 T !!!;QUIT
01.90 S X1=X1+X;S X2=X2+X+2;S X3=X3+X+3;S X4=X4+X+4

02.01 C----- FREQUENCY TABULATOR
02.10 S T=-4+IC;S X=X/S
02.20 F J=1,25;I (X-T)2.3;S T=T+IC
02.30 S H(J)=H(J)+1;S J=26

03.01 C-----PLOT
03.05 T !!!".....FREQUENCY DISTRIBUTION
03.10 F J=1,25;T !".";I (H(J)-1)3.01;F I=1,H(J);T "X

30.01 C***** SUBROUTINE 'NORAND' *****
30.02 C-----GENERATES A NORMALLY DISTRIBUTED RANDOM NUMBER
30.03 C----- FOR A GIVEN POPULATION STANDARD DEVIATION (S)
30.10 S X=100*FRAN();S X=X-FITR(X);S Y=100*FRAN();S Y=Y-FITR(Y)
30.20 S X=(X-.5)*10;I (1/FEXP(X*X/2)-Y)30.1;S X=X*S

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DECUS Program Library Write-up

ABSTRACT

This overlay is a modified version of DECUS No. FOCAL8-1 which was an adaptation of Brady's random number generator for FOCAL W. This version is simply rewritten for FOCAL '69 without extended functions. It is relocatable, and can be easily adapted for use with extended functions.

/FRAN8-IMPROVED RANDOM NUMBER
/FUNCTION FOR FOCAL 69 WITHOUT
/EXTENDED FUNCTIONS
/ADAPTED FROM FOCAL8-1 (DECUS)
/LOAD AS AN OVERLAY AFTER
/COMPLETING INITIAL DIALOGUE

0035	5277	*35
		5277
		*400
0400	5300	5300
		*5300
5300	1366	TAD LSPR
5301	7004	RAL
5302	0360	AND CONST2
5303	3363	DCA LSPS
5304	1365	TAD MSPR
5305	0357	AND CONST1
5306	1363	TAD LSPS
5307	7006	RTL
5310	7006	RTL
5311	7004	RAL
5312	3361	DCA MAXSPS
5313	1366	TAD LSPR
5314	0357	AND CONST1
5315	7006	RTL
5316	7006	RTL
5317	7004	RAL
5320	1365	TAD MSPR
5321	3362	DCA MSPS
5322	7430	SZL
5323	2361	ISZ MAXSPS
5324	7000	NOP
5325	1366	TAD LSPR
5326	7104	CLL RAL
5327	7430	SZL
5330	2362	ISZ MSPS
5331	7410	SKP
5332	2361	ISZ MAXSPS
5333	7000	NOP
5334	7100	CLL
5335	1366	TAD LSPR
5336	3366	DCA LSPR
5337	1365	TAD MSPR
5340	7004	RAL
5341	7430	SZL
5342	2361	ISZ MAXSPS
5343	7000	NOP
5344	7100	CLL
5345	1362	TAD MSPS
5346	3365	DCA MSPR
5347	1364	TAD MAXSPR

/NEW BOTTOM

/PATCH TO XTRAN

5350	7004		RAL
5351	1364		TAD MAXSPR
5352	1361		TAD MAXSPS
5353	3364		DCA MAXSPR
5354	1364		TAD MAXSPR
5355	3045		DCA Z 45
5356	5536		JMP Z I 136
5357	0177	CONST1,	0177
5360	7400	CONST2,	7400
5361	0000	MAXSPS,	0
5362	0000	MSPS,	0
5363	0000	LSPS,	0
5364	0000	MAXSPR,	0
5365	0000	MSPR,	0
5366	0001	LSPR,	1

CONST1	5357
CONST2	5360
LSPR	5366
LSPS	5363
MAXSPR	5364
MAXSPS	5361
MSPR	5365
MSPS	5362

