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1 8 '-----
2 9 'RELIABILITY DEMONSTRATION FOR BERNOULLI TRIALS (BERNOULLI.BAS)
3 10 '-----
4 11 CLS
5 12 Print
6 13 Print " RELIABILITY DEMONSTRATION FOR BERNOULLI TRIALS (BERNOULLI.BAS)"
7 14 Print " ORIGINAL DATE: Circa 1985"
8 15 Print " REVISION DATE: October 25, 2020"
9 16 Print " AUTHOR: Phil Rutherford"
10 17 Print " RUN DATE: ";Date$;
11 18 Print " (DD-MM-YYYY)
12 19 Print " RUN TIME: ";TIME$
13 20 Print " RUN WITH MMBASIC.EXE (www.mmbasic.com)"
14 21 Print
15 22 Print " RELIABILITY DEMONSTRATION USING BERNOULLI TRIALS. CALCULATES"
16 23 Print " THE NUMBER OF TRIALS FOR A GIVEN NUMBER OF FAILURES, OR THE"
17 24 Print " NUMBER OF FAILURES FOR A GIVEN NUMBER OF TRIALS. INPUT DESIRED"
18 25 Print " RELIABILITY TO BE DEMONSTRATED AT A SPECIFIC CONFIDENCE LEVEL"
19 26 Print " AND PRODUCER'S RISK."
20 27 Print " * CONSUMER'S RISK -- TRUE RELIABILITY < DESIRED RELIABILITY"
21 28 Print " * PRODUCER'S RISK -- TRUE RELIABILITY > DESIRED RELIABILITY"
22 29 Print
23 35 Print " TEST PROGRAM REQUIREMENTS"
24 40 Print
25 41 Input " ESTIMATED NO. OF TRIALS ";N
26 42 Input " ESTIMATED NO. OF FAILURES ";F
27 43 Input " DEMONSTRATED RELIABILITY ";RELCONS
28 44 Input " CONFIDENCE LEVEL (%)" ";CL
29 45 CRGOAL=100-CL
30 46 Print " CONSUMER'S RISK GOAL (%)" ";CRGOAL
31 50 Input " PRODUCER'S RISK GOAL (%)" ";PRGOAL
32 52 Input " ITERATE ON TRIALS (T) OR FAILURES (F)" ";OPT$
33 55 CRGOAL=CRGOAL/100
34 60 PRGOAL=PRGOAL/100
35 65 Print
36 70 Print " ITERATIVE DETERMINATION OF NEEDED TEST PROGRAM"
37 71 If OPT$="T" Then Print " ITERATE ON NUMBER OF TRIALS" Else Print " ITERATE ON
NUMBER OF FAILURES"
38 72 Print
39 80 Print TAB(3);"TRIALS";TAB(12);"FAILURES";TAB(22);"DEMONSTRATED";TAB(37);
40 82 Print "CONFIDENCE";TAB(52);"CONSUMER'S"
41 84 Print TAB(22);"RELIABILITY";TAB(37);"LEVEL (%)" ;TAB(52);"RISK (%)"
42 86 Print
43 125 NINITIAL=N
44 130 FINITIAL=F
45 140 If OPT$="T" Then Dim LFAC(10*N+1) Else Dim LFAC(N+1)
46 150 GOSUB 1000
47 200 If OPT$="T" Then 300
48 202 '-----
49 204 ' ITERATE ON FAILURES
50 206 '-----
51 210 GOSUB 1200
52 215 If F=0 Or FINAL7=1 Then 400
53 220 If F>FINITIAL Then 230
54 225 If CR>CRGOAL Then F=F-1 : GOSUB 1200
55 230 If F<FINITIAL Then 400
56 235 If CR<CRGOAL Then F=F+1 : GOSUB 1200
57 240 F=F-1 : FINAL7=1 : GOSUB 1200
58 245 Goto 400
59 250 '-----
60 260 ' ITERATE ON TRIALS
61 270 '-----
62 300 GOSUB 1200
63 312 If FINAL=1 Then 400
64 315 If N<NINITIAL Then 335
65 330 IF CR>CRGOAL THEN N=N+1 : GOSUB 1200

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66 335 If N>NINITIAL Then 400
67 340 If CR<CRGOAL Then N=N-1 : GOSUB 1200
68 345 N=N+1 : FINAL =1 : GOSUB 1200
69 399 '-----
70 400 ' PRINT PRODUCER'S RISK AND TRUE RELIABILITY
71 401 '-----
72 402 Print
73 403 Print TAB(4);"PRODUCER'S";TAB(21);"TRUE"
74 404 Print TAB(5);"RISK (%)";TAB(18);"RELIABILITY"
75 405 Print
76 408 RELPROD=RELCONS
77 410 GOSUB 2000
78 412 IF FINAL2=1 OR FINAL4=1 THEN 512
79 415 IF RELPROD<RELCONS THEN 435
80 430 If PR>PRGOAL Then RELPROD=RELPROD + 0.001 : GOSUB 2000
81 435 IF RELPROD>RELCONS THEN 512
82 440 If PR<PRGOAL Then RELPROD=RELPROD - 0.001 : GOSUB 2000
83 445 RELPROD=RELPROD + 0.001 : FINAL2=1 : GOSUB 2000
84 512 IF FINAL3=1 OR FINAL6=1 THEN 612
85 514 FINAL4=1
86 530 IF PR>PRGOAL THEN 545
87 540 If PR<PRGOAL Then RELPROD=RELPROD - 0.0001 : GOSUB 2000
88 545 RELPROD=RELPROD + 0.0001 : FINAL3=1 : GOSUB 2000
89 612 IF FINAL5=1 THEN 998
90 614 FINAL6=1
91 630 IF PR>PRGOAL THEN 645
92 640 If PR<PRGOAL Then RELPROD=RELPROD - 0.00001 : GOSUB 2000
93 645 RELPROD=RELPROD + 0.00001 : FINAL5=1 : GOSUB 2000
94 900 '-----
95 910 ' PRINT FINAL SUMMARY
96 920 '-----
97 998 GOSUB 3000 : Print : Print : End
98 999 '-----
99 1000 ' SUBROUTINE 1000
100 1001 '-----
101 1002 LFAC(0)=0
102 1003 If OPT$="T" Then IMAX=10*N Else IMAX=N
103 1010 FOR I=1 TO IMAX
104 1020 LFACN=LOG(I)
105 1030 LFAC(I)=LFAC(I-1)+LFACN
106 1040 NEXT I
107 1050 RETURN
108 1199 '-----
109 1200 ' SUBROUTINE - PRINT AT EACH ITERATION ON TESTS OR FAILURES
110 1201 '-----
111 1202 CR=0
112 1210 FOR X=0 TO F
113 1220 CR=CR+EXP(LFAC(N)-LFAC(N-X)-LFAC(X))*((1-RELCONS)^X)*(RELCONS^(N-X))
114 1230 NEXT X
115 1240 CL=1-CR
116 1250 Print TAB(3);N;
117 1255 Print TAB(14);F;
118 1260 Print TAB(24);RELCONS;
119 1265 Print TAB(36);CL*100;
120 1270 Print TAB(51);CR*100
121 1900 If OPT$="T" Then Goto 312 Else Goto 215
122 1999 '-----
123 2000 ' SUBROUTINE - PRINT AT EACH ITERATION ON PRODUCERS RISK
124 2001 '-----
125 2002 CPR=0
126 2010 FOR X=0 TO F
127 2020 CPR=CPR+EXP(LFAC(N)-LFAC(N-X)-LFAC(X))*((1-RELPROD)^X)*(RELPROD^(N-X))
128 2030 NEXT X
129 2040 PR=1-CPR
130 2050 Print TAB(3);PR*100;TAB(20);RELPROD
131 2060 Goto 412

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132 2999 '-----
133 3000 ' SUBROUTINE - PRINT SUMMARY
134 3010 '-----
135 3020 Print
136 3030 Print "  REQUIRED TEST PROGRAM SUMMARY"
137 3040 Print
138 3250 Print TAB(3);"TRIALS           ";TAB(25);N
139 3255 Print TAB(3);"FAILURES        ";TAB(25);F
140 3260 Print TAB(3);"REQUIRED RELIABILITY ";TAB(25);RELCONS
141 3265 Print TAB(3);"CONFIDENCE LEVEL (%)" ";TAB(25);CL*100
142 3270 Print TAB(3);"CONSUMER'S RISK (%)" ";TAB(25);CR*100
143 3280 Print TAB(3);"PRODUCER'S RISK (%)" ";TAB(25);PR*100
144 3290 Print TAB(3);"TRUE RELIABILITY   ";TAB(25);RELPROD
145 3300 Print
146 3310 Return
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