```
 1
 2     CHI-SQUARED ANALYSIS TO DEMONSTRATE MTBF (CHSQMTBF.BAS)
 3
 4     ORIGINAL DATE: Circa 1987
 5     REVISION DATE: October 28, 2020
 6     AUTHOR: Phil Rutherford (www.philrutherford.com)
 7     RUN DATE: 28-10-2020 (DD-MM-YYYY)
 8     RUN TIME: 19:37:56
 9     RUN WITH MMBASIC.EXE (www.mmbasic.com)
10
11     USING THE CHI-SQUARED DISTRIBUTION CALCULATE ...
12     PROBABILITY OF ACHIEVING AN OPERATING MTBF GOAL WITH 'NF' FAILURES IN A TEST PERIOD
       OF T HOURS
13     PROBABILITY OF ACHIEVING A DEMAND MTBF GOAL WITH 'NF' FAILURES IN T TRIALS
14
15     CHOOSE OPERATING (O) OR DEMAND (D) MTBF (O or D)? O
16
17     OPERATING 'MEAN TIME BETWEEN FAILURES' (MTBF)
18
19     MTBF GOAL (HOURS) =             ? 10000
20     FAILURE RATE GOAL (PER HOUR) =    0.0001
21
22     TEST TIME (HOURS) =             ? 105130
23     NO. OF FAILURES =               ? 5
24     DEGREES OF FREEDOM =              12
25     CHISQ =                           21.026
26
27     PROBABILITY DENSITY FUNCTION (PDF)    CUMULATIVE DENSITY FUNCTION (CDF)
28
29     Pr( 0 FAILURES) = 2.718079229e-05     Pr(<= 0 FAILURES) = 2.718079229e-05
30     Pr( 1 FAILURES) = 0.0002857516693     Pr(<= 1 FAILURES) = 0.0003129324616
31     Pr( 2 FAILURES) = 0.00150205365       Pr(<= 2 FAILURES) = 0.001814986111
32     Pr( 3 FAILURES) = 0.005263696673      Pr(<= 3 FAILURES) = 0.007078682785
33     Pr( 4 FAILURES) = 0.01383431078       Pr(<= 4 FAILURES) = 0.02091299357
34     Pr( 5 FAILURES) = 0.02908802185       Pr(<= 5 FAILURES) = 0.05000101542
35     Pr( 6 FAILURES) = 0.05096706229       Pr(<= 6 FAILURES) = 0.1009680777
36     Pr( 7 FAILURES) = 0.07654524654       Pr(<= 7 FAILURES) = 0.1775133242
37     Pr( 8 FAILURES) = 0.1005900221        Pr(<= 8 FAILURES) = 0.2781033464
38     Pr( 9 FAILURES) = 0.1175003225        Pr(<= 9 FAILURES) = 0.3956036689
39     Pr( 10 FAILURES) = 0.123528089        Pr(<= 10 FAILURES) = 0.5191317579
40     Pr( 11 FAILURES) = 0.1180591636       Pr(<= 11 FAILURES) = 0.6371909215
41     Pr( 12 FAILURES) = 0.1034296656       Pr(<= 12 FAILURES) = 0.7406205872
42     Pr( 13 FAILURES) = 0.08364277497      Pr(<= 13 FAILURES) = 0.8242633621
43     Pr( 14 FAILURES) = 0.06280974952      Pr(<= 14 FAILURES) = 0.8870731117
44     Pr( 15 FAILURES) = 0.04402125978      Pr(<= 15 FAILURES) = 0.9310943714
45     Pr( 16 FAILURES) = 0.028924719        Pr(<= 16 FAILURES) = 0.9600190904
46     Pr( 17 FAILURES) = 0.01788738652      Pr(<= 17 FAILURES) = 0.977906477
47     Pr( 18 FAILURES) = 0.01044722747      Pr(<= 18 FAILURES) = 0.9883537044
48     Pr( 19 FAILURES) = 0.005780615917     Pr(<= 19 FAILURES) = 0.9941343204
49     Pr( 20 FAILURES) = 0.003038580757     Pr(<= 20 FAILURES) = 0.9971729011
50
51     PROBABILITY OF MEETING MTBF GOAL WITH 5 FAILURES IN 105130 HOURS = 0.9499989846  =
       Pr(MTBF => 10000)
52     PROBABILITY OF MISSING MTBF GOAL WITH 5 FAILURES IN 105130 HOURS = 0.05000101542 =
       Pr(MTBF  < 10000)
53
54     5 FAILURES IN 105130 HOURS DEMONSTRATES AN MTBF GOAL OF 10000 HOURS TO A CONFIDENCE
       LEVEL OF 94.99989846 %
55
56   >
```