

บรรณานุกรม

ภาษาไทย

ดาวระดา ธรรม "การเปรียบเทียบอำนาจการทดสอบของตัวสถิติบางตัวที่ใช้ทดสอบการแจกแจงแบบแกมม่า ไวบูลล์ และลอกนอร์มอล." วิทยานิพนธ์ปริญมหาบัณฑิต ภาควิชาสถิติ บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย, 2533.

สอาด นีวงศ์ "การเปรียบเทียบอำนาจการทดสอบของตัวสถิติบางตัวที่ใช้ทดสอบการแจกแจงแบบเอกซ์โปเนนเชียล." วิทยานิพนธ์ปริญมหาบัณฑิต ภาควิชาสถิติ บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย, 2532.

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ภาคผนวก

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C*****
C**  A COMPARISON ON THE POWER OF SOME STANDARD TEST STATISTICS  **C
C**          FOR EXPONENTIAL DISTRIBUTION                        **C
C**          BY LAMPANG SAENCHAN ,MISS          C223120          **C
C*****C
C**  MAIN PROGRAM TO COMPUTE TYPE I ERROR AND POWER OF TEST      **C
C*****C

      DOUBLE PRECISION X,T,STJ,STI,SSTI,SX,SA,B1,C,D
      *,AA,F

      COMMON/SEED/IX, KK

      DIMENSION X(10),T(10),AA(10),ST(10)

      INTIGER R1,R2

      REAL NORMAL

      ZA10=0.0

      ZA05=0.0

      BF10=0.0

      BF05=0.0

      RU=500

      N=100

      IK=2

      DMEAN=0.0

      SIG=1.0

      NDF=3

      ALPHA1=3.0

      BETA=1.0

      IX=65479

      R1=1

      R2=2

      KK=0
```

WA01=0.0

WA05=0.0

DO 500 L=1,500

C*****C

C***** SELECT POPULATION FOR TEST STATISTICS *****C

C*****C

GOTO(20,60,80,85),IK

20 DO 30 J1=1,N

X(J1)=EXP(NORMAL(DMEAN,SIG)

30 CONTINUE

GOTO 95

60 DO 70 J2=1,N

X(J2)=GAMMA(ALPHA1,BETA)

70 CONTINUE

GOTO 95

80 DO 90 J3=1,N

X(J3)=CSD(NDF,DMEA1,SIG)

90 CONTINUE

GOTO 95

85 DO 87 J4=1,N

X(J4)=WEIB(ALPHA1,BETA)

87 CONTINUE

GOTO 95

95 RANK(N,X)

C*****C

C***** REGRESSION TEST (Z) *****C

C*****C

KZ=N-R1-R2

```

DO 100 II=2,N
NM=II-1
T(II)=(NM)*(X(II)-X(IM))
100 COTINUE
TA=KZ-2
BA1=SQRT(12.0/TA)
KZ1=KZ-1
SX=0.0
DO 110 I=1,KZ1
ZK=KZ/2.0
AA(IJ)=IJ-ZK
SS=AA(IJ)*T(R1+IJ+1)
SA=SA+SS
121 CONTINUE
ZA=(BA1*SA)/SX
IF(ABS(ZA).GT.1.645)ZA10=ZA10+1
IF(ABS(ZA).GT.1.960)ZA05=ZA05+1
C*****C
C***** SHAPIRO AND WILK TEST *****C
C*****C
STI=0.0
SSTI=0.0
DO 990 I3=2,KZ
K1=KZ+1
JJJ=I3+1
IF(JJJ.GT.KZ) GOTO 601
STJ=0.0
DO 600 J9=JJJ,KZ

```

```

        STJ=STJ+T(R1+J9)
600  COTINUE
        RM=(KZ-13+1)
        RK=13-1
        RR=RK/RM
601  IF(13.EQ.KZ)STJ=0.0
        ST(13)=2.0*STJ
        STI=STI+T(R1+13)
        SSTII=((RR*T(R113))*(T(R1+13)+ST(13)))
        SSTI=SSTII
990  CONTINUE
        IF(W.GT.0.0810.AND.W.LT.0.4162)THEN
        W10=W10+0
        ELSE
        W10=W10+1
        IF(W.GT.0.0700.AND.W.LT.0.4852)THEN
        W05=W05+0
        ELSE
        W05=W05+1
        ENDIF
C*****C
C*****          BIVARIATE F TEST          *****C
C*****C
        B1=0.0
        KB1=2
        KB2=KB1+1
        DO 112 11=2,KB2
        B1=B1+T(R1+11)

```

```
112 CONTINUE
      S1=B1/KB1
      KB3=KB1+2
      KB4=KZ+-1-(2*KB1)
      KB6=KZ-KB1
      C=0.0
      DO 100 I=KB3,KB6
      C =C+T(R1+I)
100 CONTINUE
      S2=C/KB4
      KB5=KZ-KB1+1
      D=0.0
      DO 114 IF =KB5,M
      D=D+T(R1IF)
114 CONTINUE
      S3=D/KZ
      FL=S1/S2
      FU=S3/S2
      IF(FL.GT.0.104 AND.FL.LT.9.60.OR.FU.GT.0.104.AND.FU.LT.9.60)THEN
      BF10=BF10+0
      ELSE
      BF10=BF10+1
      ENDIF
      IF(FL.GT.0.156 AND.FL.LT.6.39 .OR.FU.GT.0.156.AND.FU.LT.6.39 )THEN
      BF05=BF05+0
      ELSE
      BF05=BF05+1
      ENDIF
```

500 CONTINUE

C*****C

C***** COMPUTE TYPE I ERROR OR POWER OF TEST *****C

C*****C

PZA10=ZA10/RU

PZA05=ZA05/RU

PF10=BF10/RU

PF05=BF05/RU

PW10=W10/RU

PW05=W05/RU

WRITE(6,512)R1,R2,N,IK

512 FORMAT('R1=',I2,10X,'R2=',I2,10X,'N=',I3,10X,'IK=',I1)

WRITE(6,520)PZA10,PZA05,PF10,PF05,PW10,PW05

520 FORMAT(5X,'REGRESSION ',5X,'Z10=',F10.8,10X,'Z05=',F10.8,

*/5X,'BIVARIATE F TEST',5X,F10.8,'BF10=',10X,'BF05=',F10.8,

*/5X,'SHAPIRO AND WILK ',5X,'W10=',F10.8,10X,'W05=',F10.8)

STOP

END

C*****C

C***** FUNCTION RANDOMM *****C

C*****C

FUNCTION RAND(IX)

IX=IX*16807

IF(IX.LT.0)IX=IX+2147483647+1

Y=IX

RAND=Y*0.465661E-9

RETURN

END


```

C*****C
C***** FUNCTION NORMAL(DMEAN,SIG) *****C
C*****C

```

```

FUNCTION NORMAL(DMEAN,SIG)

```

```

REAL NORMAL

```

```

COMMON/SEED/IX, KK

```

```

PI=3.145926

```

```

IF(KK.EQ.1) GOTO 10

```

```

RONE =RAND(IX)

```

```

RTWO =RAND(IX)

```

```

ZONE =SQRT(-2*ALOG(RONE))*COS(2*PI*RTWO)

```

```

10 NORMAL = ZONE*SIG+DMEAN

```

```

KK=0

```

```

RETURN

```

```

END

```

```

C*****C
C***** FUNCTION GAMMA DISTRIBUTION *****C
C*****C

```

```

FUNCTION GAMMA(ALPHA1,BETA)

```

```

COMMON/SEED/IX, KK

```

```

ALPHA = ALPHA1

```

```

U = 0.0

```

```

5 YFL = RAND(IX)

```

```

V = -LOG(YFL)

```

```

U = U+V

```

```

IF(ALPHA.EQ.1.0) GOTO 10

```

```

ALPHA = ALPHA-1.0

```

```

GOTO 5

```

```

10   GAMMA1= BETA*U

      RETURN

      END

      END

```

```

C*****C

```

```

C*****      SUBROUTINE FOR RANKING OBSERVATION      *****C

```

```

C*****C

```

```

      SUBROUTINE RANK(N,X)

      COMMON/SEED/IX, KK

      DOUBLE PRECISION X, TT

      DIMENSION X(10)

      N1=N-1

      DO 10 K=I, N1

      I1=I+1

      DO 10 K =I1, N

      IF (X(I).LE.X(K)) GOTO 10

      TT = X(I)

      X(I)=X(K)

      X(K)=TT

10   CONTINUE

      RETURN

      END

```

```

C*****C

```

```

C*****      FUNCTION CHI-SQUARE DISTRIBUTION      *****C

```

```

C*****C

```

```

      FUNCTION CSD(NDF, DMEAN, SIG)

      COMMON/SEED/IX, KK

```

```
REAL NORMAL
```

```
CSD=0.0
```

```
DO 10 I=1,NDF
```

```
CSD=CSD+(NORMAL(DMEAN,SIG)**2)
```

```
10 CONTINUE
```

```
RETURN
```

```
END
```

```
C*****C
```

```
C*****      FUNCTION WEIBULL DISTRIBUTION      *****C
```

```
C*****C
```

```
FUNCTION WEIB(ALPHA1,BETA)
```

```
COMMON/SEED/IX,KK .
```

```
VK=RAND(IX)
```

```
WK=-ALOG(1-VK)
```

```
AX=1.0/ALPHA1
```

```
WEIB=BETA*(WK**AX)
```

```
RETURN
```

```
END
```

ตาราง ๒ CUMULATIVE NORMAL DISTRIBUTION

$$F(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-t^2/2} dt$$

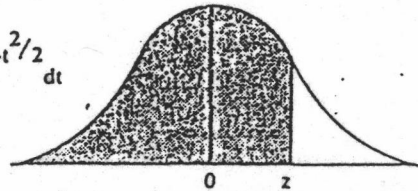


Table entries are cumulative probabilities represented in the shaded area above.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

z	1.282	1.645	1.960	2.326	2.575	3.090	3.291	3.981	4.417
F(z)	.90	.95	.975	.99	.995	.999	.9995	.99995	.999995

Adopted by permission from A. M. Mood, INTRODUCTION TO THE THEORY OF STATISTICS, Table II, New York: McGraw-Hill Book Company, 1950.

TABLE II. VALUE OF F

Den. df	A	Numerator df								
		1	2	3	4	5	6	7	8	9
1	.50	1.00	1.50	1.71	1.82	1.89	1.94	1.98	2.00	2.03
	.90	39.9	49.5	53.6	55.8	57.2	58.2	58.9	59.4	59.9
	.95	161	200	216	225	230	234	237	239	241
	.975	648	800	864	900	922	937	948	957	963
	.99	4,052	5,000	5,403	5,625	5,764	5,859	5,928	5,981	6,022
	.995	16,211	20,000	21,615	22,500	23,056	23,437	23,715	23,925	24,091
	.999	405,280	500,000	540,380	562,500	576,400	585,940	592,870	598,140	602,280
2	.50	0.667	1.00	1.13	1.21	1.25	1.28	1.30	1.32	1.33
	.90	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
	.95	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4
	.975	38.5	39.0	39.2	39.2	39.3	39.3	39.4	39.4	39.4
	.99	98.5	99.0	99.2	99.2	99.3	99.3	99.4	99.4	99.4
	.995	199	199	199	199	199	199	199	199	199
	.999	998.5	999.0	999.2	999.2	999.3	999.3	999.4	999.4	999.4
3	.50	0.585	0.881	1.00	1.06	1.10	1.13	1.15	1.16	1.17
	.90	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
	.95	10.1	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
	.975	17.4	16.0	15.4	15.1	14.9	14.7	14.6	14.5	14.5
	.99	34.1	30.8	29.5	28.7	28.2	27.9	27.7	27.5	27.3
	.995	55.6	49.8	47.5	46.2	45.4	44.8	44.4	44.1	43.9
	.999	167.0	148.5	141.1	137.1	134.6	132.8	131.6	130.6	129.9
4	.50	0.549	0.828	0.941	1.00	1.04	1.06	1.08	1.09	1.10
	.90	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
	.95	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
	.975	12.2	10.6	9.98	9.60	9.36	9.20	9.07	8.98	8.90
	.99	21.2	18.0	16.7	16.0	15.5	15.2	15.0	14.8	14.7
	.995	31.3	26.3	24.3	23.2	22.5	22.0	21.6	21.4	21.1
	.999	74.1	61.2	56.2	53.4	51.7	50.5	49.7	49.0	48.5
5	.50	0.528	0.799	0.907	0.965	1.00	1.02	1.04	1.05	1.06
	.90	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
	.95	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
	.975	10.0	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68
	.99	16.3	13.3	12.1	11.4	11.0	10.7	10.5	10.3	10.2
	.995	22.8	18.3	16.5	15.6	14.9	14.5	14.2	14.0	13.8
	.999	47.2	37.1	33.2	31.1	29.8	28.8	28.2	27.6	27.2
6	.50	0.515	0.780	0.886	0.942	0.977	1.00	1.02	1.03	1.04
	.90	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
	.95	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
	.975	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52
	.99	13.7	10.9	9.78	9.15	8.75	8.47	8.26	8.10	7.98
	.995	18.6	14.5	12.9	12.0	11.5	11.1	10.8	10.6	10.4
	.999	35.5	27.0	23.7	21.9	20.8	20.0	19.5	19.0	18.7
7	.50	0.506	0.767	0.871	0.926	0.960	0.983	1.00	1.01	1.02
	.90	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
	.95	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
	.975	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82
	.99	12.2	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
	.995	16.2	12.4	10.9	10.1	9.52	9.16	8.89	8.68	8.51
	.999	29.2	21.7	18.8	17.2	16.2	15.5	15.0	14.6	14.3

ตาราง ข (ต่อ) VALUE OF F

Den. df	A	Numerator df								
		10	12	15	20	24	30	60	120	∞
8	.50	1.02	1.03	1.04	1.05	1.06	1.07	1.08	1.08	1.09
	.90	2.54	2.50	2.46	2.42	2.40	2.38	2.34	2.32	2.29
	.95	3.35	3.28	3.22	3.15	3.12	3.08	3.01	2.97	2.93
	.975	4.30	4.20	4.10	4.00	3.95	3.89	3.78	3.73	3.67
	.99	5.81	5.67	5.52	5.36	5.28	5.20	5.03	4.95	4.86
	.995	7.21	7.01	6.81	6.61	6.50	6.40	6.18	6.06	5.95
.999	11.5	11.2	10.8	10.5	10.3	10.1	9.73	9.53	9.33	
9	.50	1.01	1.02	1.03	1.04	1.05	1.05	1.07	1.07	1.08
	.90	2.42	2.38	2.34	2.30	2.28	2.25	2.21	2.18	2.16
	.95	3.14	3.07	3.01	2.94	2.90	2.86	2.79	2.75	2.71
	.975	3.96	3.87	3.77	3.67	3.61	3.56	3.45	3.39	3.33
	.99	5.26	5.11	4.96	4.81	4.73	4.65	4.48	4.40	4.31
	.995	6.42	6.23	6.03	5.83	5.73	5.62	5.41	5.30	5.19
.999	9.89	9.57	9.24	8.90	8.72	8.55	8.19	8.00	7.81	
10	.50	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.06	1.07
	.90	2.32	2.28	2.24	2.20	2.18	2.16	2.11	2.08	2.06
	.95	2.98	2.91	2.84	2.77	2.74	2.70	2.62	2.58	2.54
	.975	3.72	3.62	3.52	3.42	3.37	3.31	3.20	3.14	3.08
	.99	4.85	4.71	4.56	4.41	4.33	4.25	4.08	4.00	3.91
	.995	5.85	5.66	5.47	5.27	5.17	5.07	4.86	4.75	4.64
.999	8.75	8.45	8.13	7.80	7.64	7.47	7.12	6.94	6.76	
12	.50	0.989	1.00	1.01	1.02	1.03	1.03	1.05	1.05	1.06
	.90	2.19	2.15	2.10	2.06	2.04	2.01	1.96	1.93	1.90
	.95	2.75	2.69	2.62	2.54	2.51	2.47	2.38	2.34	2.30
	.975	3.37	3.28	3.18	3.07	3.02	2.96	2.85	2.79	2.72
	.99	4.30	4.16	4.01	3.86	3.78	3.70	3.54	3.45	3.36
	.995	5.09	4.91	4.72	4.53	4.43	4.33	4.12	4.01	3.90
.999	7.29	7.00	6.71	6.40	6.25	6.09	5.76	5.59	5.42	
15	.50	0.977	0.989	1.00	1.01	1.02	1.02	1.03	1.04	1.05
	.90	2.06	2.02	1.97	1.92	1.90	1.87	1.82	1.79	1.76
	.95	2.54	2.48	2.40	2.33	2.29	2.25	2.16	2.11	2.07
	.975	3.06	2.96	2.86	2.76	2.70	2.64	2.52	2.46	2.40
	.99	3.80	3.67	3.52	3.37	3.29	3.21	3.05	2.96	2.87
	.995	4.42	4.25	4.07	3.88	3.79	3.69	3.48	3.37	3.26
.999	6.08	5.81	5.54	5.25	5.10	4.95	4.64	4.48	4.31	
20	.50	0.966	0.977	0.989	1.00	1.01	1.01	1.02	1.03	1.03
	.90	1.94	1.89	1.84	1.79	1.77	1.74	1.68	1.64	1.61
	.95	2.35	2.28	2.20	2.12	2.08	2.04	1.95	1.90	1.84
	.975	2.77	2.68	2.57	2.46	2.41	2.35	2.22	2.16	2.09
	.99	3.37	3.23	3.09	2.94	2.86	2.78	2.61	2.52	2.42
	.995	3.85	3.68	3.50	3.32	3.22	3.12	2.92	2.81	2.69
.999	5.08	4.82	4.56	4.29	4.15	4.00	3.70	3.54	3.38	
24	.50	0.961	0.972	0.983	0.994	1.00	1.01	1.02	1.02	1.03
	.90	1.88	1.83	1.78	1.73	1.70	1.67	1.61	1.57	1.53
	.95	2.25	2.18	2.11	2.03	1.98	1.94	1.84	1.79	1.73
	.975	2.64	2.54	2.44	2.33	2.27	2.21	2.08	2.01	1.94
	.99	3.17	3.03	2.89	2.74	2.66	2.58	2.40	2.31	2.21
	.995	3.59	3.42	3.25	3.06	2.97	2.87	2.66	2.55	2.43
.999	4.64	4.39	4.14	3.87	3.74	3.59	3.29	3.14	2.97	

ตาราง ข (ต่อ) VALUE OF F

Den. df A	Numerator df								
	1	2	3	4	5	6	7	8	9
30 .50	0.466	0.709	0.807	0.858	0.890	0.912	0.927	0.939	0.948
.90	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85
.95	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
.975	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57
.99	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07
.995	9.18	6.35	5.24	4.62	4.23	3.95	3.74	3.58	3.45
.999	13.3	8.77	7.05	6.12	5.53	5.12	4.82	4.58	4.39
60 .50	0.461	0.701	0.798	0.849	0.880	0.901	0.917	0.928	0.937
.90	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74
.95	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
.975	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33
.99	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72
.995	8.49	5.80	4.73	4.14	3.76	3.49	3.29	3.13	3.01
.999	12.0	7.77	6.17	5.31	4.76	4.37	4.09	3.86	3.69
120 .50	0.458	0.697	0.793	0.844	0.875	0.896	0.912	0.923	0.932
.90	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68
.95	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96
.975	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22
.99	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56
.995	8.18	5.54	4.50	3.92	3.55	3.28	3.09	2.93	2.81
.999	11.4	7.32	5.78	4.95	4.42	4.04	3.77	3.55	3.38
∞ .50	0.455	0.693	0.789	0.839	0.870	0.891	0.907	0.918	0.927
.90	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63
.95	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88
.975	5.02	3.69	3.12	2.79	2.57	2.41	2.29	2.19	2.11
.99	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41
.995	7.88	5.30	4.28	3.72	3.35	3.09	2.90	2.74	2.62
.999	10.8	6.91	5.42	4.62	4.10	3.74	3.47	3.27	3.10

ตาราง ข (ต่อ) VALUE OF F

Den. df	A	Numerator df								
		10	12	15	20	24	30	60	120	∞
1	.50	2.04	2.07	2.09	2.12	2.13	2.15	2.17	2.18	2.20
	.90	60.2	60.7	61.2	61.7	62.0	62.3	62.8	63.1	63.3
	.95	242	244	246	248	249	250	252	253	254
	.975	969	977	985	993	997	1,001	1,010	1,014	1,018
	.99	6,056	6,106	6,157	6,209	6,235	6,261	6,313	6,339	6,366
	.995	24,224	24,426	24,630	24,836	24,940	25,044	25,253	25,359	25,464
	.999	605,620	610,670	615,760	620,910	623,500	626,100	631,340	633,970	636,620
2	.50	1.34	1.36	1.38	1.39	1.40	1.41	1.43	1.43	1.44
	.90	9.39	9.41	9.42	9.44	9.45	9.46	9.47	9.48	9.49
	.95	19.4	19.4	19.4	19.4	19.5	19.5	19.5	19.5	19.5
	.975	39.4	39.4	39.4	39.4	39.5	39.5	39.5	39.5	39.5
	.99	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5
	.995	199	199	199	199	199	199	199	199	200
	.999	999.4	999.4	999.4	999.4	999.5	999.5	999.5	999.5	999.5
3	.50	1.18	1.20	1.21	1.23	1.23	1.24	1.25	1.26	1.27
	.90	5.23	5.22	5.20	5.18	5.18	5.17	5.15	5.14	5.13
	.95	8.79	8.74	8.70	8.66	8.64	8.62	8.57	8.55	8.53
	.975	14.4	14.3	14.3	14.2	14.1	14.1	14.0	13.9	13.9
	.99	27.2	27.1	26.9	26.7	26.6	26.5	26.3	26.2	26.1
	.995	43.7	43.4	43.1	42.8	42.6	42.5	42.1	42.0	41.8
	.999	129.2	128.3	127.4	126.4	125.9	125.4	124.5	124.0	123.5
4	.50	1.11	1.13	1.14	1.15	1.16	1.16	1.18	1.18	1.19
	.90	3.92	3.90	3.87	3.84	3.83	3.82	3.79	3.78	3.76
	.95	5.96	5.91	5.86	5.80	5.77	5.75	5.69	5.66	5.63
	.975	8.84	8.75	8.66	8.56	8.51	8.46	8.36	8.31	8.26
	.99	14.5	14.4	14.2	14.0	13.9	13.8	13.7	13.6	13.5
	.995	21.0	20.7	20.4	20.2	20.0	19.9	19.6	19.5	19.3
	.999	48.1	47.4	46.8	46.1	45.8	45.4	44.7	44.4	44.1
5	.50	1.07	1.09	1.10	1.11	1.12	1.12	1.14	1.14	1.15
	.90	3.30	3.27	3.24	3.21	3.19	3.17	3.14	3.12	3.11
	.95	4.74	4.68	4.62	4.56	4.53	4.50	4.43	4.40	4.37
	.975	6.62	6.52	6.43	6.33	6.28	6.23	6.12	6.07	6.02
	.99	10.1	9.89	9.72	9.55	9.47	9.38	9.20	9.11	9.02
	.995	13.6	13.4	13.1	12.9	12.8	12.7	12.4	12.3	12.1
	.999	26.9	26.4	25.9	25.4	25.1	24.9	24.3	24.1	23.8
6	.50	1.05	1.06	1.07	1.08	1.09	1.10	1.11	1.12	1.12
	.90	2.94	2.90	2.87	2.84	2.82	2.80	2.76	2.74	2.72
	.95	4.06	4.00	3.94	3.87	3.84	3.81	3.74	3.70	3.67
	.975	5.46	5.37	5.27	5.17	5.12	5.07	4.96	4.90	4.85
	.99	7.87	7.72	7.56	7.40	7.31	7.23	7.06	6.97	6.88
	.995	10.2	10.0	9.81	9.59	9.47	9.36	9.12	9.00	8.88
	.999	18.4	18.0	17.6	17.1	16.9	16.7	16.2	16.0	15.7
7	.50	1.03	1.04	1.05	1.07	1.07	1.08	1.09	1.10	1.10
	.90	2.70	2.67	2.63	2.59	2.58	2.56	2.51	2.49	2.47
	.95	3.64	3.57	3.51	3.44	3.41	3.38	3.30	3.27	3.23
	.975	4.76	4.67	4.57	4.47	4.42	4.36	4.25	4.20	4.14
	.99	6.62	6.47	6.31	6.16	6.07	5.99	5.82	5.74	5.65
	.995	8.38	8.18	7.97	7.75	7.65	7.53	7.31	7.19	7.08
	.999	14.1	13.7	13.3	12.9	12.7	12.5	12.1	11.9	11.7

ตาราง ข (ต่อ) VALUE OF F

Den. df	A	Numerator df								
		1	2	3	4	5	6	7	8	9
8	.50	0.499	0.757	0.860	0.915	0.948	0.971	0.988	1.00	1.01
	.90	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
	.95	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
	.975	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36
	.99	11.3	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
	.995	14.7	11.0	9.60	8.81	8.30	7.95	7.69	7.50	7.34
	.999	25.4	18.5	15.8	14.4	13.5	12.9	12.4	12.0	11.8
9	.50	0.494	0.749	0.852	0.906	0.939	0.962	0.978	0.990	1.00
	.90	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44
	.95	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
	.975	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	4.03
	.99	10.6	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
	.995	13.6	10.1	8.72	7.96	7.47	7.13	6.88	6.69	6.54
	.999	22.9	16.4	13.9	12.6	11.7	11.1	10.7	10.4	10.1
10	.50	0.490	0.743	0.845	0.899	0.932	0.954	0.971	0.983	0.992
	.90	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35
	.95	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
	.975	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78
	.99	10.0	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
	.995	12.8	9.43	8.08	7.34	6.87	6.54	6.30	6.12	5.97
	.999	21.0	14.9	12.6	11.3	10.5	9.93	9.52	9.20	8.96
12	.50	0.484	0.735	0.835	0.888	0.921	0.943	0.959	0.972	0.981
	.90	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21
	.95	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
	.975	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44
	.99	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
	.995	11.8	8.51	7.23	6.52	6.07	5.76	5.52	5.35	5.20
	.999	18.6	13.0	10.8	9.63	8.89	8.38	8.00	7.71	7.48
15	.50	0.478	0.726	0.826	0.878	0.911	0.933	0.949	0.960	0.970
	.90	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09
	.95	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
	.975	6.20	4.77	4.15	3.80	3.58	3.41	3.29	3.20	3.12
	.99	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89
	.995	10.8	7.70	6.48	5.80	5.37	5.07	4.85	4.67	4.54
	.999	16.6	11.3	9.34	8.25	7.57	7.09	6.74	6.47	6.26
20	.50	0.472	0.718	0.816	0.868	0.900	0.922	0.938	0.950	0.959
	.90	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96
	.95	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
	.975	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84
	.99	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
	.995	9.94	6.99	5.82	5.17	4.76	4.47	4.26	4.09	3.96
	.999	14.8	9.95	8.10	7.10	6.46	6.02	5.69	5.44	5.24
24	.50	0.469	0.714	0.812	0.863	0.895	0.917	0.932	0.944	0.953
	.90	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91
	.95	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
	.975	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70
	.99	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
	.995	9.55	6.66	5.52	4.89	4.49	4.20	3.99	3.83	3.69
	.999	14.0	9.34	7.55	6.59	5.98	5.55	5.23	4.99	4.80

ตาราง ข (ต่อ) VALUE OF F

Den. df	A	Numerator df								
		10	12	15	20	24	30	60	120	∞
30	.50	0.955	0.966	0.978	0.989	0.994	1.00	1.01	1.02	1.02
	.90	1.82	1.77	1.72	1.67	1.64	1.61	1.54	1.50	1.46
	.95	2.16	2.09	2.01	1.93	1.89	1.84	1.74	1.68	1.62
	.975	2.51	2.41	2.31	2.20	2.14	2.07	1.94	1.87	1.79
	.99	2.98	2.84	2.70	2.55	2.47	2.39	2.21	2.11	2.01
	.995	3.34	3.18	3.01	2.82	2.73	2.63	2.42	2.30	2.18
	.999	4.24	4.00	3.75	3.49	3.36	3.22	2.92	2.76	2.59
60	.50	0.945	0.956	0.967	0.978	0.983	0.989	1.00	1.01	1.01
	.90	1.71	1.66	1.60	1.54	1.51	1.48	1.40	1.35	1.29
	.95	1.99	1.92	1.84	1.75	1.70	1.65	1.53	1.47	1.39
	.975	2.27	2.17	2.06	1.94	1.88	1.82	1.67	1.58	1.48
	.99	2.63	2.50	2.35	2.20	2.12	2.03	1.84	1.73	1.60
	.995	2.90	2.74	2.57	2.39	2.29	2.19	1.96	1.83	1.69
	.999	3.54	3.32	3.08	2.83	2.69	2.55	2.25	2.08	1.89
120	.50	0.939	0.950	0.961	0.972	0.978	0.983	0.994	1.00	1.01
	.90	1.65	1.60	1.55	1.48	1.45	1.41	1.32	1.26	1.19
	.95	1.91	1.83	1.75	1.66	1.61	1.55	1.43	1.35	1.25
	.975	2.16	2.05	1.95	1.82	1.76	1.69	1.53	1.43	1.31
	.99	2.47	2.34	2.19	2.03	1.95	1.86	1.66	1.53	1.38
	.995	2.71	2.54	2.37	2.19	2.09	1.98	1.75	1.61	1.43
	.999	3.24	3.02	2.78	2.53	2.40	2.26	1.95	1.77	1.54
∞	.50	0.934	0.945	0.956	0.967	0.972	0.978	0.989	0.994	1.00
	.90	1.60	1.55	1.49	1.42	1.38	1.34	1.24	1.17	1.00
	.95	1.83	1.75	1.67	1.57	1.52	1.46	1.32	1.22	1.00
	.975	2.05	1.94	1.83	1.71	1.64	1.57	1.39	1.27	1.00
	.99	2.32	2.18	2.04	1.88	1.79	1.70	1.47	1.32	1.00
	.995	2.52	2.36	2.19	2.00	1.90	1.79	1.53	1.36	1.00
	.999	2.96	2.74	2.51	2.27	2.13	1.99	1.66	1.45	1.00

Source: Reprinted from Table 5 of Pearson and Hartley, *Biometrika Tables for Statisticians*, Volume 2, 1972, published by the Cambridge University Press, on behalf of The Biometrika Society, by permission of the authors and publishers.

PERCENTAGE POINTS OF W-EXPONENTIAL

n	.005	.01	.025	.05	.10	.50	.90	.95	.975	.99	.995
3	.2519	.2538	.2596	.2697	.2915	.5714	.9709	.9926	.9981	.9997	.99993
4	.1241	.1302	.1434	.1604	.1891	.3768	.7514	.8581	.9236	.9680	.9837
5	.0845	.0905	.1048	.1187	.1442	.2875	.5547	.6682	.7590	.8600	.9192
6	.0610	.0665	.0802	.0956	.1173	.2276	.4292	.5089	.5842	.6775	.7501
7	.0514	.0591	.0700	.0810	.0986	.1874	.3474	.4162	.4852	.5706	.6426
8	.0454	.0512	.0614	.0710	.0852	.1625	.2934	.3497	.4033	.4848	.5428
9	.0404	.0442	.0537	.0633	.0751	.1415	.2553	.3005	.3454	.4015	.4433
10	.0369	.0404	.0487	.0568	.0678	.1225	.2173	.2525	.2879	.3391	.3701
11	.0339	.0380	.0441	.0528	.0616	.1112	.1934	.2265	.2619	.3039	.3314
12	.0311	.0358	.0410	.0494	.0567	.1009	.1723	.2019	.2364	.2716	.2978
13	.0287	.0337	.0382	.0460	.0528	.0925	.1563	.1829	.2113	.2422	.2642
14	.0265	.0317	.0362	.0428	.0496	.0847	.1417	.1647	.1862	.2131	.2315
15	.0247	.0298	.0344	.0398	.0466	.0778	.1285	.1485	.1669	.1926	.2123
16	.0233	.0280	.0326	.0374	.0438	.0723	.1187	.1355	.1542	.1770	.1931
17	.0222	.0264	.0310	.0352	.0402	.0684	.1099	.1257	.1423	.1614	.1794
18	.0212	.0250	.0294	.0332	.0388	.0640	.1015	.1164	.1311	.1483	.1658
19	.0203	.0238	.0278	.0314	.0368	.0600	.0935	.1071	.1199	.1374	.1552
20	.0196	.0227	.0264	.0302	.0352	.0570	.0884	.1002	.1121	.1286	.1469
21	.0190	.0217	.0250	.0290	.0337	.0540	.0839	.0948	.1054	.1198	.1388
22	.0185	.0208	.0238	.0278	.0323	.0516	.0794	.0894	.0998	.1118	.1213
23	.0181	.0201	.0230	.0266	.0310	.0492	.0749	.0836	.0933	.1043	.1142
24	.0177	.0194	.0224	.0256	.0298	.0468	.0704	.0788	.0882	.0994	.1071
25	.0173	.0188	.0218	.0248	.0286	.0447	.0668	.0749	.0836	.0927	.1000
26	.0169	.0182	.0213	.0240	.0274	.0426	.0636	.0712	.0791	.0885	.0948
27	.0165	.0177	.0208	.0232	.0264	.0407	.0606	.0678	.0747	.0843	.0896
28	.0161	.0172	.0203	.0225	.0256	.0391	.0576	.0649	.0706	.0801	.0859
29	.0157	.0168	.0198	.0219	.0249	.0377	.0555	.0621	.0671	.0759	.0822
30	.0153	.0164	.0193	.0213	.0242	.0364	.0536	.0593	.0643	.0719	.0786
31	.0149	.0160	.0188	.0207	.0235	.0352	.0518	.0569	.0615	.0686	.0753
32	.0145	.0156	.0183	.0201	.0229	.0340	.0491	.0547	.0591	.0661	.0722
33	.0141	.0152	.0178	.0195	.0223	.0329	.0475	.0527	.0573	.0636	.0691
34	.0137	.0148	.0173	.0190	.0217	.0319	.0459	.0507	.0555	.0611	.0660
35	.0133	.0144	.0168	.0185	.0211	.0309	.0444	.0488	.0537	.0588	.0639
36	.0129	.0141	.0164	.0180	.0205	.0300	.0429	.0470	.0519	.0567	.0609

n	.005	.01	.025	.05	.10	.50	.90	.95	.975	.99	.995
37	.0125	.0138	.0160	.0176	.0200	.0291	.0414	.0454	.0501	.0546	.0578
38	.0122	.0135	.0156	.0172	.0195	.0293	.0400	.0440	.0483	.0525	.0553
39	.0120	.0133	.0152	.0168	.0190	.0275	.0386	.0426	.0465	.0512	.0531
40	.0118	.0131	.0148	.0164	.0186	.0267	.0375	.0414	.0447	.0499	.0510
41	.0116	.0129	.0144	.0161	.0182	.0260	.0364	.0402	.0430	.0476	.0493
42	.0114	.0127	.0140	.0158	.0178	.0253	.0355	.0389	.0417	.0464	.0482
43	.0112	.0125	.0137	.0155	.0174	.0248	.0346	.0379	.0405	.0452	.0471
44	.0110	.0123	.0134	.0152	.0170	.0243	.0338	.0369	.0394	.0440	.0460
45	.0108	.0121	.0131	.0149	.0166	.0238	.0329	.0359	.0385	.0423	.0449
46	.0106	.0119	.0129	.0146	.0162	.0233	.0320	.0349	.0376	.0416	.0438
47	.0104	.0117	.0127	.0143	.0158	.0228	.0311	.0340	.0367	.0394	.0427
48	.0103	.0115	.0125	.0141	.0155	.0223	.0303	.0332	.0358	.0382	.0416
49	.0102	.0113	.0123	.0139	.0152	.0218	.0295	.0324	.0349	.0371	.0405
50	.0101	.0111	.0122	.0137	.0149	.0213	.0288	.0317	.0340	.0360	.0394
51	.0100	.0109	.0120	.0135	.0147	.0209	.0282	.0310	.0331	.0349	.0383
52	.0099	.0107	.0119	.0133	.0145	.0205	.0276	.0303	.0323	.0341	.0373
53	.0097	.0106	.0118	.0131	.0143	.0201	.0270	.0296	.0315	.0332	.0363
54	.0095	.0104	.0116	.0129	.0141	.0197	.0264	.0289	.0307	.0329	.0353
55	.0094	.0103	.0115	.0127	.0139	.0193	.0258	.0282	.0299	.0321	.0343
56	.0093	.0102	.0113	.0125	.0137	.0189	.0252	.0275	.0292	.0313	.0333
57	.0092	.0101	.0112	.0123	.0135	.0185	.0247	.0268	.0285	.0306	.0324
58	.0091	.0100	.0110	.0121	.0133	.0182	.0242	.0262	.0279	.0301	.0318
59	.0090	.0099	.0109	.0119	.0131	.0179	.0238	.0257	.0274	.0296	.0312
60	.0089	.0095	.0108	.0117	.0129	.0176	.0234	.0252	.0270	.0291	.0306
61	.0088	.0093	.0107	.0115	.0127	.0173	.0230	.0247	.0266	.0286	.0301
62	.0087	.0092	.0105	.0113	.0125	.0170	.0226	.0242	.0262	.0281	.0296
63	.0086	.0091	.0104	.0112	.0123	.0167	.0222	.0238	.0257	.0276	.0291
64	.0085	.0090	.0102	.0111	.0121	.0164	.0218	.0234	.0252	.0271	.0286
65	.0084	.0089	.0101	.0109	.0119	.0161	.0215	.0230	.0247	.0266	.0281
66	.0082	.0088	.0099	.0108	.0117	.0159	.0211	.0225	.0242	.0261	.0276
67	.0081	.0087	.0098	.0107	.0115	.0157	.0207	.0221	.0237	.0256	.0271
68	.0080	.0086	.0096	.0105	.0114	.0155	.0204	.0217	.0232	.0251	.0266
69	.0079	.0085	.0095	.0104	.0113	.0152	.0198	.0213	.0227	.0246	.0261
70	.0078	.0084	.0094	.0103	.0111	.0150	.0194	.0209	.0222	.0241	.0256
71	.0077	.0083	.0093	.0102	.0109	.0147	.0191	.0205	.0218	.0237	.0251
72	.0076	.0082	.0092	.0101	.0108	.0145	.0188	.0201	.0214	.0232	.0246

TABLE 1 Continued

n	.005	.01	.025	.05	.10	.50	.90	.95	.975	.99	.995
73	.0075	.0081	.0091	.0100	.0107	.0143	.0185	.0198	.0211	.0228	.0241
74	.0074	.0080	.0090	.0098	.0106	.0141	.0182	.0195	.0208	.0224	.0236
75	.0073	.0079	.0089	.0097	.0105	.0139	.0179	.0192	.0205	.0220	.0231
76	.0073	.0078	.0088	.0096	.0104	.0137	.0176	.0189	.0202	.0217	.0227
77	.0072	.0077	.0087	.0095	.0103	.0135	.0173	.0186	.0199	.0214	.0223
78	.0071	.0077	.0086	.0093	.0101	.0134	.0170	.0183	.0196	.0211	.0219
79	.0070	.0076	.0085	.0092	.0100	.0132	.0168	.0180	.0193	.0208	.0215
80	.0070	.0075	.0084	.0091	.0099	.0131	.0166	.0177	.0190	.0205	.0211
81	.0069	.0074	.0083	.0090	.0098	.0129	.0164	.0175	.0187	.0202	.0207
82	.0068	.0074	.0082	.0088	.0097	.0128	.0162	.0173	.0184	.0199	.0203
83	.0067	.0073	.0081	.0087	.0095	.0126	.0160	.0170	.0181	.0196	.0199
84	.0067	.0073	.0080	.0086	.0095	.0125	.0158	.0168	.0178	.0193	.0196
85	.0066	.0072	.0079	.0085	.0094	.0123	.0156	.0166	.0174	.0190	.0193
86	.0066	.0071	.0078	.0085	.0093	.0122	.0154	.0164	.0172	.0187	.0190
87	.0065	.0071	.0077	.0084	.0092	.0120	.0152	.0162	.0170	.0184	.0187
88	.0065	.0070	.0077	.0084	.0091	.0119	.0150	.0160	.0168	.0181	.0185
89	.0064	.0070	.0076	.0083	.0090	.0117	.0148	.0158	.0166	.0179	.0183
90	.0064	.0069	.0075	.0082	.0089	.0116	.0147	.0156	.0164	.0176	.0181
91	.0063	.0068	.0075	.0082	.0088	.0114	.0145	.0154	.0162	.0173	.0179
92	.0063	.0068	.0074	.0081	.0087	.0113	.0143	.0153	.0160	.0171	.0177
93	.0062	.0067	.0073	.0081	.0086	.0112	.0141	.0151	.0158	.0168	.0175
94	.0062	.0067	.0073	.0080	.0085	.0110	.0139	.0149	.0156	.0165	.0173
95	.0061	.0066	.0072	.0079	.0084	.0109	.0138	.0147	.0154	.0163	.0171
96	.0061	.0065	.0072	.0078	.0083	.0108	.0136	.0145	.0153	.0161	.0169
97	.0060	.0065	.0071	.0077	.0082	.0107	.0134	.0143	.0152	.0159	.0167
98	.0060	.0064	.0070	.0076	.0081	.0105	.0133	.0142	.0151	.0157	.0165
99	.0059	.0064	.0070	.0075	.0080	.0104	.0132	.0140	.0150	.0155	.0163
100	.0059	.0063	.0069	.0074	.0079	.0103	.0131	.0139	.0149	.0153	.0161

ประวัติผู้เขียน

นางสาวลำปาง แสนจันทร์ เกิดเมื่อวันที่ 1 มกราคม 2509 จังหวัดยโสธร
ได้รับปริญญาวิทยาศาสตรบัณฑิต สาขาสถิติ (เกียรตินิยมอันดับ ๒) จากมหาวิทยาลัยศรีนครินทรวิโรฒ
มหาสารคาม ปีการศึกษา 2531 ได้เข้าศึกษาในภาควิชาสถิติ คณะพาณิชยศาสตร์และการบัญชี
จุฬาลงกรณ์มหาวิทยาลัย เมื่อปีการศึกษา 2532 โดยได้รับทุนอุดหนุนการศึกษาจากโครงการผลิต
และพัฒนาอาจารย์ (U.D.C) ของมหาวิทยาลัยเชียงใหม่ เมื่อปีการศึกษา 2532

