THE UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
ANN ARBOR

TABLES OF d'

Technical Report No. 97

Electronic Defense Group
Department of Electrical Engineering

By: P. B. Elliott

Approved by: W. P. Tanner, Jr.

AFCRC TR 59-55

Contract No. AF19(604)-2277

Operational Applications Laboratory
Air Force Cambridge Research Center
Air Research and Development Command

October 1959

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

ABSTRACT

Tables of d' for yes-no and forced-choice experiments are presented along with explanations of the assumptions involved in the calculations.

TABLES OF d'

The tables contained in this report were compiled for use in a specific type of experiment in signal detectability. A single signal with fixed probability of occurrence is transmitted over a channel in which band-limited white Gaussian noise is added. At the end of a fixed observation interval the receiver must make a "yes-no" decision indicating whether signal plus noise or noise alone was present. Repetition of the task yields the data necessary to establish a value of d'. The statistic d' is not merely descriptive; it incorporates a comparison of obtained performance with "ideal" performance. "Ideal" implies that optimum use is made of the information available; however, due to the noise present in the channel even an ideal receiver will not achieve perfect detection. In terms of the signal-to-noise energy ratio in the channel, a value of d' represents the minimum value of $\sqrt{\frac{2E}{N_o}}$ necessary to lead to the performance obtained if an ideal receiver had been used in place of the receiver under study.

In the type of experiments for which the theory of signal detectability provides an appropriate model, d' has certain advantages over other measures such as percentage correct. To illustrate, d' is not a function of the a priori probability that a signal is present. Neither is d' affected by altering the values and costs of a correct answer. Whereas other measures are sensitive to both the receiver's specific criterion and the instructions given by the experimenter, changes in these parameters leave d' relatively invariant. In addition to these evidences of stability, d' is a tool for isolating aspects of the signal information which are utilized by the receiver. This subject is discussed in "Definitions of d' and η as Psychophysical Measures". (Ref. 1).

Before considering the way in which a specific signal to noise energy ratio can be described as ideal, or as associated with certain probabilities in the ideal case, it is useful to introduce some notation. The data necessary to establish a value of d' come from the detection rate and false alarm rate recorded during an experiment. The detection rate and the false alarm rate serve as estimates of the desired detection probability, $P_{SN}(A)$, and false alarm probability, $P_N(A)$.

SN - There is signal plus noise.

N - There is noise alone.

A - The receiver says there is signal plus noise.

CA - The receiver says there is noise alone.

$P_{SN}(A)$ - The probability of the receiver reporting SN when SN was present.

$P_N(A)$ - The probability of the receiver reporting SN when N was present.

	A	CA
SN	w	x
N	y	z

$$P_{SN}(A) = \frac{w}{w + x}$$

$$P_N(A) = \frac{y}{y + z}$$

Using the computed values of $P_{SN}(A)$ and $P_N(A)$ the appropriate value of d' may be read from the table.

For the signal-known-exactly case d' is defined as equal to $\sqrt{\frac{2E}{N_o}}$. This definition arises from consideration of a signal of known waveform. T denotes the waveform duration and W its bandwidth. The waveform has associated with it a signal voltage, s, and a noise voltage, n, so that the input voltage to the receiver is,

(1) $x(t) = n(t) + s(t)$ when the signal is present,

(2) or $x(t) = n(t)$ when noise alone is present.

Therefore at an arbitrary sample point, t_i,

$$x_i = n_i + s_i \quad (3)$$

Considering the ith sample point, the probability density of the noise voltage for white Gaussian noise of power N is

$$f_N\left[x_i\right] = f_N\left[n_i\right] = \sqrt{\frac{1}{2\pi N}}\, e^{-\frac{x_i^2}{2N}} \quad (4)$$

This equation represents a normal curve with zero mean and variance N. If however, the signal is also present at the ith point, the effect on the probability density distribution of x_i is to shift its mean from zero to s_i because the signal at any instantaneous point is simply a constant.

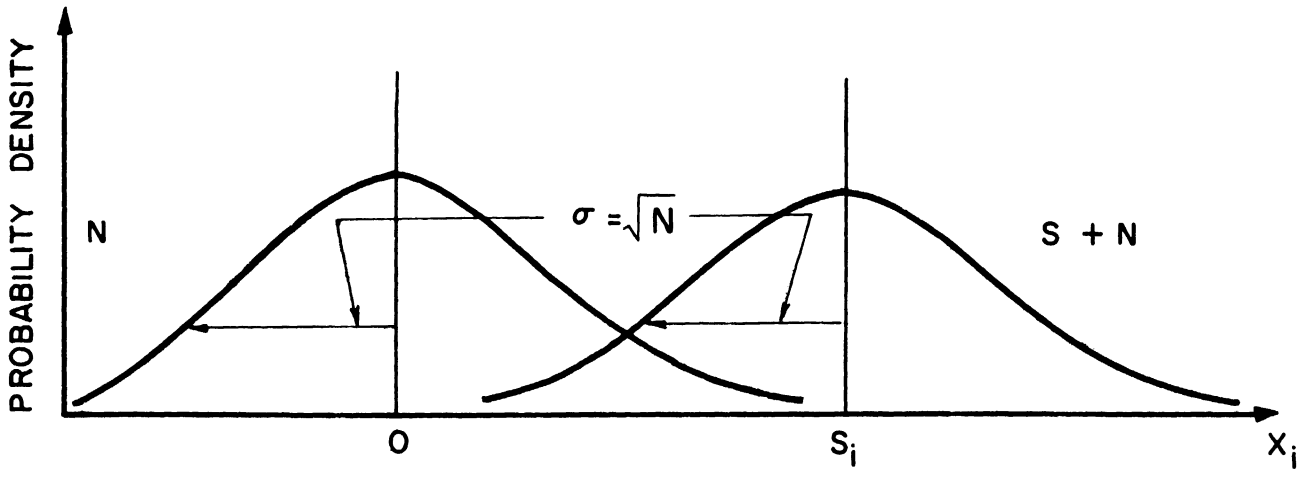

Fig. 1. Probability Densities for x at an Arbitrary Sample Point Conditional on Noise Alone and on Signal Plus Noise

The two equations are;

$$(4) \qquad f_N(x_i) = \sqrt{\frac{1}{2\pi N}}\, e^{-\frac{x_i^2}{2N}}$$

and

$$(5) \qquad f_{SN}(x_i) = \sqrt{\frac{1}{2\pi N}}\, e^{-\frac{(x_i - s_i)^2}{2N}}$$

For any given observation the receiver's decision is based on the ratio of the likelihood that the observed waveform occurred, if signal plus noise were present, to the likelihood of the occurrence of the waveform if noise alone were present (Ref. 1). This likelihood ratio, $\ell\left[x(t)\right]$, refers to the entire observation interval $0 < t < T$, so Eqs. 4 and 5 must first be extended over the interval before they are used to form a likelihood ratio.

Since the probability density function of the total waveform is the product of the individual probability densities at each independent sampling point (spaced 1/2W apart), equations (4) and (5) become

$$(6) \qquad f_N(x) = \prod_{i=1}^{2WT} f_N(x_i) = \left(\frac{1}{2\pi N}\right)^{WT} e^{-\frac{1}{2N}\sum_{i=1}^{2WT} x_i^2}$$

and

$$(7) \qquad f_{SN}(x) = \prod_{i=1}^{2WT} f_{SN}(x_i) = \left(\frac{1}{2\pi N}\right)^{WT} e^{-\frac{1}{2N}\sum_{i=1}^{2WT} (x_i - s_i)^2}$$

Forming the ratio;

$$(8) \qquad \ell(x) = \frac{f_{SN}(x)}{f_N(x)} = \frac{e^{-\frac{1}{2N}\sum_{i=1}^{2WT} (x_i - s_i)^2}}{e^{-\frac{1}{2N}\sum_{i=1}^{2WT} x_i^2}} = e^{\frac{1}{N}\sum_{i=1}^{2WT} x_i s_i - \frac{1}{2N}\sum_{i=1}^{2WT} s_i^2}$$

The natural logarithm of the likelihood ratio is equally useful in the decision task because it is the result of a monotonic transformation, and, in addition, its probability density functions are normally distributed.

$$\log_e \ell(x) = \frac{1}{N} \sum_{i=1}^{2WT} x_i s_i - \frac{1}{2N} \sum_{i=1}^{2WT} s_i^2 \tag{9}$$

Before determining the distribution of $\log_e \ell(x)$ it is convenient to state the sampling theorem (Ref. 2).

$$\frac{1}{2W} \sum_{i=1}^{2WT} s_i^2 = \int_0^T \left[s(t)\right]^2 dt = E(s). \tag{10}$$

where E(s) refers to the signal energy. Using this theorem,

$$\frac{1}{2N} \sum_{i=1}^{2WT} s_i^2 = \frac{1}{N_o} \cdot \frac{1}{2W} \sum_{i=1}^{2WT} s_i^2 = \frac{1}{N_o} \int_0^T \left[s(t)\right]^2 dt = \frac{E(s)}{N_o} . \tag{11}$$

The noise power N is converted to N_o, the noise power per unit bandwidth, by the relation $N_o = \frac{N}{W}$

To find the distribution of $\log_e \ell(x)$ it is necessary to know the mean and the variance for the case of noise alone and then for the case of signal plus noise. Considering the situation in which noise alone is present during the observation interval, to find the mean and variance of $\log_e \ell(x)$ it should be observed that the x_i's are independent and that each x_i has (4) for its probability density function. Since (4) is a normal distribution with zero mean and variance N, the mean of $\log_e \ell(x)$ is the sum of the means, and the variance is the sum of the variances. Because the signal is a constant at the ith point, working with Eq. 9,

(12) $$\mu_N(x_i s_i) = s_i \mu_N(x_i) = s_i \cdot 0 = 0.$$

This implies that

(13) $$\mu_N\left(\frac{1}{N}\sum_{i=1}^{2WT} x_i s_i\right) = 0 \quad .$$

Utilizing (13) and (11), equation (9) indicates that

(14) $$\mu_N\left[\log_e \ell(x)\right] = -\frac{E(s)}{N_o} \quad .$$

This same procedure is used to find the mean when the signal is present.

(15) $$\mu_{SN}(x_i s_i) = s_i \mu_{SN}(x_i) = s_i^2$$

then

(16) $$\mu_{SN}\left(\frac{1}{N}\sum_{i=1}^{2WT} x_i s_i\right) = \frac{1}{N}\sum_{i=1}^{2WT} s_i^2 = \frac{2E(s)}{N_o} \quad ,$$

and

(17) $$\mu_{SN}\left[\log_e \ell(x)\right] = \frac{2E(s)}{N_o} - \frac{E(s)}{N_o} = + \frac{E(s)}{N_o} \quad .$$

In Eq. 9 the only term which contributes to the variance is $\frac{1}{N}\sum_{i=1}^{2WT} x_i s_i$, so

(18) $$\sigma^2_{SN}\left[\log_e \ell(x)\right] = \sigma^2_N\left[\log_e \ell(x)\right] = \sigma^2\left(\frac{1}{N}\sum_{i=1}^{2WT} x_i s_i\right) \quad .$$

Applying the fact that the variance of the product of a constant and a random variable is equal to the product of the constant squared and the variance of the variable, at the ith point

(19) $$\sigma^2(x_i s_i) = s_i^2 \sigma^2(x_i) = s_i^2 N \quad .$$

By the same rule,

(20) $$\sigma^2\left(\frac{1}{N}\sum_{i=1}^{2WT} x_i s_i\right) = \frac{1}{N^2}\,\sigma^2\left(\sum_{i=1}^{2WT} x_i s_i\right) \quad .$$

The combination of Eqs. 19 and 20 and the use of the sampling theorem show the variance to be

$$(21) \qquad \sigma^2(\log_e \ell(x)) = \frac{1}{N^2} \sum_{i=1}^{2WT} N s_i^2 = \frac{1}{N} \sum_{i=1}^{2WT} s_i^2 = \frac{2E(s)}{N_o} .$$

To conclude the discussion of the definition of d' as based on the consideration of a waveform it is only necessary to divide the difference between the means for the two conditions by the standard deviation to arrive at d'.

$$\frac{\mu_{SN} - \mu_N}{\sigma} = \frac{\frac{E}{N_o} - \left(-\frac{E}{N_o}\right)}{\sqrt{\frac{2E}{N_o}}} = \sqrt{\frac{2E}{N_o}}$$

The two distributions are shown in Fig. 2.

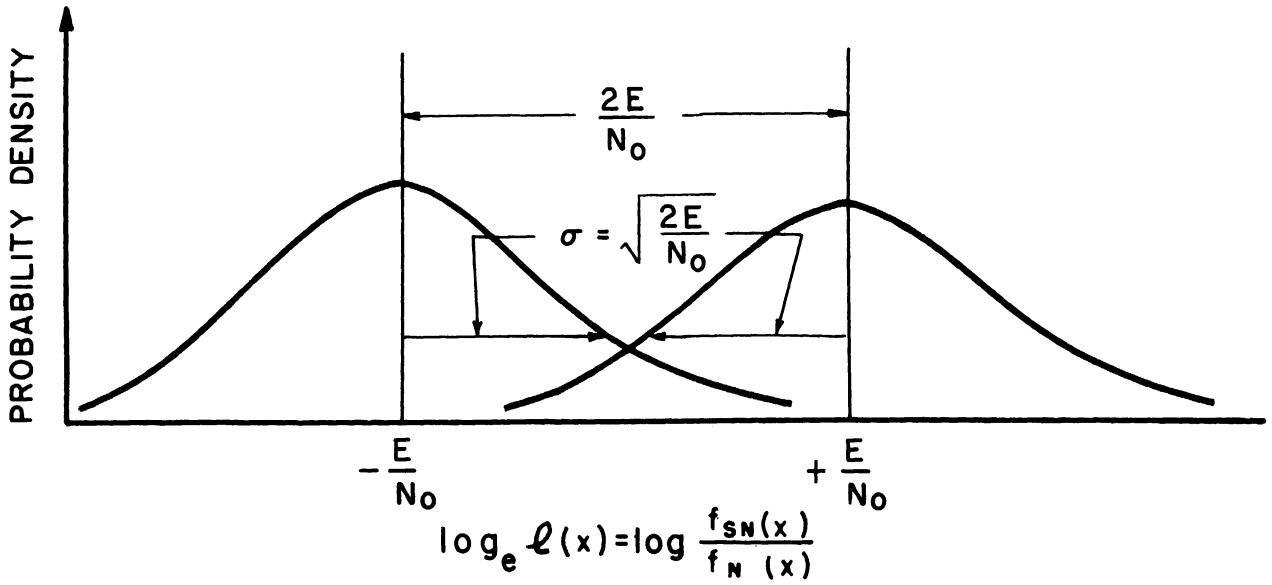

Fig. 2. Probability Densities for $\log_e \ell(x)$ Conditional on Noise Alone, and on Signal Plus Noise

Figure 2 leads directly to an interpretation of d' in terms of an ROC (receiver operating characteristic) curve. Whenever $\log_e \ell(x)$ is greater than a certain critical number (the β of Ref. 2) an optimum receiver will consistently choose to accept the observation as resulting from signal plus noise. The area under the noise curve to the right of the given value of $\log_e \ell(x)$ is the probability, $P_N(A)$, that if noise alone is present the receiver will say there is signal plus noise. Similarly, the area to the right of $\log_e \ell(x)$ under the signal plus noise curve is $P_{SN}(A)$. The coordinates $[P_N(A), P_{SN}(A)]$ locate a point on the ROC curve. Thus each point on the abscissa of Fig. 2 considered as a critical number in the decision process determines a point on the associated ROC curve. For the ideal receiver each value of d' yields a separate ROC curve. An example for d' = 1.00 is given in Fig. 3a. When a transformation of the axis is made from linear to probability scales, the same ROC curve appears as in Fig. 3b. Utilizing this double probability paper, it is possible to read off the signal to noise energy ratio which an ideal receiver would have needed to achieve any combination of $P_{SN}(A)$ and $P_N(A)$. Referring to the point on Fig. 3b, if a receiver gave a detection rate of .80 when its false alarm rate was .30, the ideal receiver would have required a $\sqrt{\frac{2E}{N_o}}$ of 1.365 to attain this performance. To avoid repeating this procedure for each experimental value the following table has been drawn up. The table facilitates the process of determining d' in the situation where a signal known exactly is presented during a fixed observation interval.

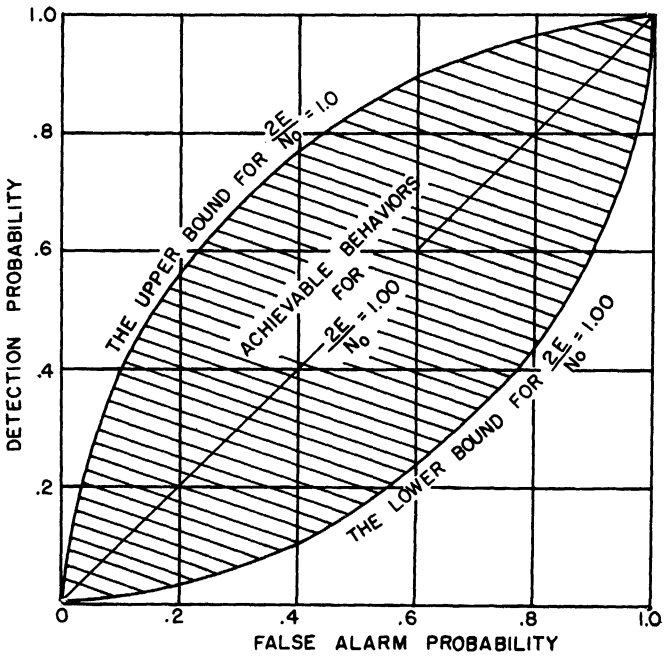

FIG. 3(a). RECEIVER OPERATING CHARACTERISTIC (ROC) FOR THE IDEAL RECEIVER WHEN $\frac{2E}{N_o} = 1.00$.

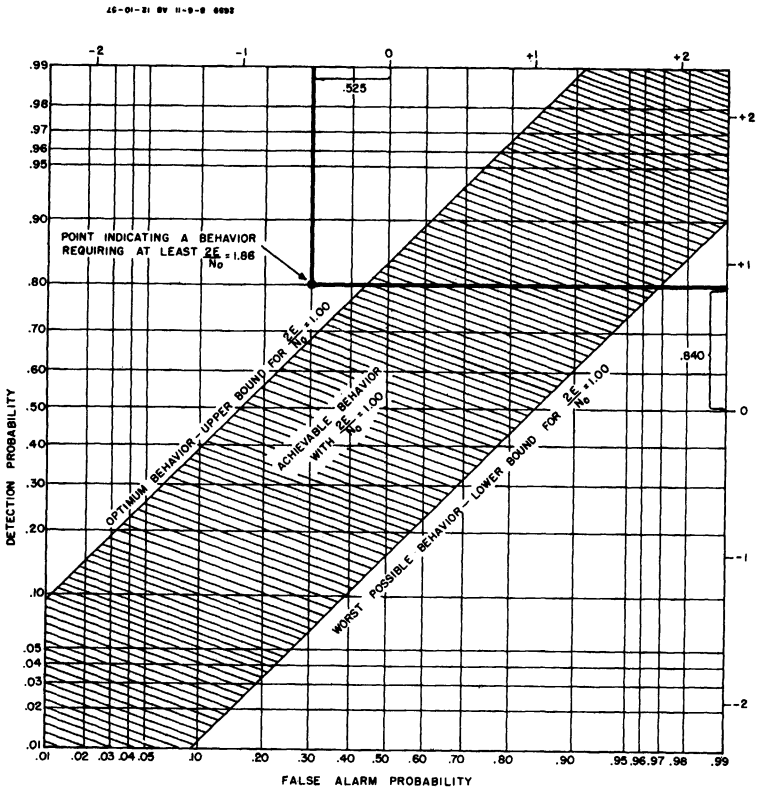

FIG. 3(b). TRANSFORMATION TO DOUBLE PROBABILITY PAPER FOR THE ROC CURVE OF FIG. 3(a).

TABLE I

d' FOR YES-NO

$P_{SN}(A)$ \ $P_N(A)$	.01	.02	.03	.04	.05	.06	.07	.08	.09	.10
.01	0	- .27	- .44	- .57	- .68	- .77	- .85	- .92	- .98	-1.04
.02	.27	0	- .17	- .30	- .41	- .50	- .58	- .65	- .71	- .77
.03	.44	.17	0	- .13	- .24	- .33	- .41	- .48	- .54	- .60
.04	.57	.30	.13	0	- .11	- .20	- .28	- .35	- .41	- .47
.05	.68	.41	.24	.11	0	- .09	- .17	- .24	- .30	- .36
.06	.77	.50	.33	.20	.09	0	- .08	- .15	- .21	- .27
.07	.85	.58	.41	.28	.17	.08	0	- .07	- .13	- .19
.08	.92	.65	.48	.35	.24	.15	.07	0	- .06	- .12
.09	.98	.71	.54	.41	.30	.21	.13	.06	0	- .06
.10	1.04	.77	.60	.47	.36	.27	.19	.12	.06	0
.11	1.09	.82	.65	.52	.41	.32	.24	.17	.11	.05
.12	1.14	.88	.70	.58	.46	.38	.30	.22	.16	.10
.13	1.19	.92	.75	.62	.51	.42	.34	.27	.21	.15
.14	1.24	.97	.80	.67	.56	.47	.39	.32	.26	.20
.15	1.28	1.01	.84	.71	.60	.51	.43	.36	.30	.24
.16	1.33	1.06	.89	.76	.65	.56	.48	.41	.35	.29
.17	1.37	1.10	.93	.80	.69	.60	.52	.45	.39	.33
.18	1.40	1.14	.96	.84	.72	.64	.56	.48	.42	.36
.19	1.44	1.17	1.00	.87	.76	.67	.59	.52	.46	.40
.20	1.48	1.21	1.04	.91	.80	.71	.63	.56	.50	.44
.21	1.52	1.24	1.08	.94	.84	.74	.66	.60	.54	.48
.22	1.55	1.28	1.11	.98	.87	.78	.70	.63	.57	.51
.23	1.58	1.31	1.14	1.01	.90	.81	.73	.66	.60	.54
.24	1.62	1.34	1.18	1.04	.94	.84	.76	.70	.64	.58
.25	1.64	1.38	1.20	1.08	.96	.88	.80	.72	.66	.60
.26	1.68	1.41	1.24	1.11	1.00	.91	.83	.76	.70	.64
.27	1.71	1.44	1.27	1.14	1.03	.94	.86	.79	.73	.67
.28	1.74	1.47	1.30	1.17	1.06	.97	.89	.82	.76	.70
.29	1.76	1.50	1.32	1.20	1.08	1.00	.92	.84	.78	.72
.30	1.80	1.52	1.36	1.22	1.12	1.02	.94	.88	.82	.76
.31	1.82	1.54	1.38	1.24	1.14	1.04	.96	.90	.84	.78
.32	1.85	1.58	1.41	1.28	1.17	1.08	1.00	.93	.87	.81
.33	1.88	1.61	1.44	1.31	1.20	1.11	1.03	.96	.90	.84
.34	1.91	1.64	1.47	1.34	1.23	1.14	1.06	.99	.93	.87
.35	1.94	1.66	1.50	1.36	1.26	1.16	1.08	1.02	.96	.90
.36	1.96	1.69	1.52	1.39	1.28	1.19	1.11	1.04	.98	.92
.37	1.99	1.72	1.55	1.42	1.31	1.22	1.14	1.07	1.01	.95
.38	2.02	1.74	1.58	1.44	1.34	1.24	1.16	1.10	1.04	.98
.39	2.04	1.77	1.60	1.47	1.36	1.27	1.19	1.12	1.06	1.00
.40	2.06	1.80	1.62	1.50	1.38	1.30	1.22	1.14	1.08	1.02
.41	2.09	1.82	1.65	1.52	1.41	1.32	1.24	1.17	1.11	1.05
.42	2.12	1.85	1.68	1.55	1.44	1.35	1.27	1.20	1.14	1.08
.43	2.14	1.87	1.70	1.57	1.46	1.37	1.29	1.22	1.16	1.10
.44	2.17	1.90	1.73	1.60	1.49	1.40	1.32	1.25	1.19	1.13
.45	2.19	1.92	1.75	1.62	1.51	1.42	1.34	1.27	1.21	1.15
.46	2.22	1.95	1.78	1.65	1.54	1.45	1.37	1.30	1.24	1.18
.47	2.24	1.98	1.80	1.68	1.56	1.48	1.40	1.32	1.26	1.20
.48	2.27	2.00	1.83	1.70	1.59	1.50	1.42	1.35	1.29	1.23
.49	2.30	2.02	1.86	1.72	1.62	1.52	1.44	1.38	1.32	1.26
.50	2.32	2.05	1.88	1.75	1.64	1.55	1.47	1.40	1.34	1.28

$P_{SN}(A)$ \ $P_N(A)$	.01	.02	.03	.04	.05	.06	.07	.08	.09	.10
.51	2.34	1.08	1.90	1.78	1.66	1.58	1.50	1.42	1.36	1.30
.52	2.37	2.10	1.93	1.80	1.69	1.60	1.52	1.45	1.39	1.33
.53	2.40	2.12	1.96	1.82	1.72	1.62	1.54	1.48	1.42	1.36
.54	2.42	2.15	1.98	1.85	1.74	1.65	1.57	1.50	1.44	1.38
.55	2.45	2.18	2.01	1.88	1.77	1.68	1.60	1.53	1.47	1.41
.56	2.47	2.20	2.03	1.90	1.79	1.70	1.62	1.55	1.49	1.43
.57	2.50	2.23	2.06	1.93	1.82	1.73	1.65	1.58	1.52	1.46
.58	2.52	2.25	2.08	1.95	1.84	1.75	1.67	1.60	1.54	1.48
.59	2.55	2.28	2.11	1.98	1.87	1.78	1.70	1.63	1.57	1.51
.60	2.58	2.30	2.14	2.00	1.90	1.80	1.72	1.66	1.60	1.54
.61	2.60	2.33	2.16	2.03	1.92	1.83	1.75	1.68	1.62	1.56
.62	2.62	2.36	2.18	2.06	1.94	1.86	1.78	1.70	1.64	1.58
.63	2.65	2.38	2.21	2.08	1.97	1.88	1.80	1.73	1.67	1.61
.64	2.68	2.41	2.24	2.11	2.00	1.91	1.83	1.76	1.70	1.64
.65	2.70	2.44	2.26	2.14	2.02	1.94	1.86	1.78	1.72	1.66
.66	2.73	2.46	2.29	2.16	2.05	1.96	1.88	1.81	1.75	1.69
.67	2.76	2.49	2.32	2.19	2.08	1.99	1.91	1.84	1.78	1.72
.68	2.79	2.52	2.35	2.22	2.11	2.02	1.94	1.87	1.81	1.75
.69	2.82	2.56	2.38	2.26	2.14	2.06	1.98	1.90	1.84	1.78
.70	2.84	2.58	2.40	2.28	2.16	2.08	2.00	1.92	1.86	1.80
.71	2.88	2.60	2.44	2.30	2.20	2.10	2.02	1.96	1.90	1.84
.72	2.90	2.63	2.46	2.33	2.22	2.13	2.05	1.98	1.92	1.86
.73	2.93	2.66	2.49	2.36	2.25	2.16	2.08	2.01	1.95	1.89
.74	2.96	2.69	2.52	2.39	2.28	2.19	2.11	2.04	1.98	1.92
.75	3.00	2.72	2.56	2.42	2.32	2.22	2.14	2.08	2.02	1.96
.76	3.02	2.76	2.58	2.46	2.34	2.26	2.18	2.10	2.04	1.98
.77	3.06	2.79	2.62	2.49	2.38	2.29	2.21	2.14	2.08	2.02
.78	3.09	2.82	2.65	2.52	2.41	2.32	2.24	2.17	2.11	2.05
.79	3.12	2.86	2.68	2.56	2.44	2.36	2.28	2.20	2.14	2.08
.80	3.16	2.89	2.72	2.59	2.48	2.39	2.31	2.24	2.18	2.12
.81	3.20	2.93	2.76	2.63	2.52	2.43	2.35	2.28	2.22	2.16
.82	3.24	2.96	2.80	2.66	2.56	2.46	2.38	2.32	2.26	2.20
.83	3.27	3.00	2.83	2.70	2.59	2.50	2.42	2.35	2.29	2.23
.84	3.31	3.04	2.87	2.74	2.63	2.54	2.46	2.39	2.33	2.27
.85	3.36	3.09	2.92	2.79	2.68	2.59	2.51	2.44	2.38	2.32
.86	3.40	3.13	2.96	2.83	2.72	2.63	2.55	2.48	2.42	2.36
.87	3.45	3.18	3.01	2.88	2.77	2.68	2.60	2.53	2.47	2.41
.88	3.50	3.22	3.06	2.92	2.82	2.72	2.64	2.58	2.52	2.46
.89	3.55	3.28	3.11	2.98	2.87	2.78	2.70	2.63	2.58	2.51
.90	3.60	3.33	3.16	3.03	2.92	2.83	2.75	2.68	2.62	2.56
.91	3.66	3.39	3.22	3.09	2.98	2.89	2.81	2.74	2.68	2.62
.92	3.72	3.45	3.28	3.15	3.04	2.95	2.87	2.80	2.74	2.68
.93	3.79	3.52	3.35	3.22	3.11	3.02	2.94	2.87	2.81	2.75
.94	3.87	3.60	3.43	3.30	3.19	3.10	3.02	2.95	2.89	2.83
.95	3.96	3.69	3.52	3.39	3.28	3.19	3.11	3.04	2.98	2.92
.96	4.07	3.80	3.63	3.50	3.39	3.30	3.22	3.15	3.09	3.03
.97	4.20	3.93	3.76	3.63	3.52	3.43	3.35	3.28	3.22	3.16
.98	4.37	4.10	3.93	3.80	3.69	3.60	3.52	3.45	3.39	3.33
.99	4.64	4.37	4.20	4.07	3.96	3.87	3.79	3.72	3.66	3.60

$P_{SN}(A)$ \ $P_N(A)$	.11	.12	.13	.14	.15	.16	.17	.18	.19	.20
.01	-1.09	-1.14	-1.19	-1.24	-1.28	-1.33	-1.37	-1.40	-1.44	-1.48
.02	- .82	- .88	- .92	- .97	-1.01	-1.06	-1.10	-1.14	-1.17	-1.21
.03	- .65	- .70	- .75	- .80	- .84	- .89	- .93	- .96	-1.00	-1.04
.04	- .52	- .58	- .62	- .67	- .71	- .76	- .80	- .84	- .87	- .91
.05	- .41	- .46	- .51	- .56	- .60	- .65	- .69	- .72	- .76	- .80
.06	- .32	- .38	- .42	- .47	- .51	- .56	- .60	- .64	- .67	- .71
.07	- .24	- .30	- .34	- .39	- .43	- .48	- .52	- .56	- .59	- .63
.08	- .17	- .22	- .27	- .32	- .36	- .41	- .45	- .48	- .52	- .56
.09	- .11	- .16	- .21	- .26	- .30	- .35	- .39	- .42	- .46	- .50
.10	- .05	- .10	- .15	- .20	- .24	- .29	- .33	- .36	- .40	- .44
.11	0	- .06	- .10	- .15	- .19	- .24	- .28	- .32	- .35	- .39
.12	.06	0	- .04	- .10	- .14	- .18	- .22	- .26	- .30	- .34
.13	.10	.04	0	- .05	- .09	- .14	- .18	- .22	- .25	- .29
.14	.15	.10	.05	0	- .04	- .09	- .13	- .16	- .20	- .24
.15	.19	.14	.09	.04	0	- .05	- .09	- .12	- .16	- .20
.16	.24	.18	.14	.09	.05	0	- .04	- .08	- .11	- .15
.17	.28	.22	.18	.13	.09	.04	0	- .04	- .07	- .11
.18	.32	.26	.22	.16	.12	.08	.04	0	- .04	- .08
.19	.35	.30	.25	.20	.16	.11	.07	.04	0	- .04
.20	.39	.34	.29	.24	.20	.15	.11	.08	.04	0
.21	.42	.37	.32	.28	.24	.18	.14	.11	.08	.04
.22	.46	.40	.36	.31	.27	.22	.18	.14	.11	.07
.23	.49	.44	.39	.34	.30	.25	.21	.18	.14	.10
.24	.52	.47	.42	.38	.34	.28	.24	.21	.18	.14
.25	.56	.50	.46	.40	.36	.32	.28	.24	.20	.16
.26	.59	.54	.49	.44	.40	.35	.31	.28	.24	.20
.27	.62	.56	.52	.47	.43	.38	.34	.30	.27	.23
.28	.65	.60	.55	.50	.46	.41	.37	.34	.30	.26
.29	.68	.62	.58	.52	.48	.44	.40	.36	.32	.28
.30	.70	.65	.60	.56	.52	.46	.42	.39	.36	.32
.31	.72	.67	.62	.58	.54	.48	.44	.41	.38	.34
.32	.76	.70	.66	.61	.57	.52	.48	.44	.41	.37
.33	.79	.74	.69	.64	.60	.55	.51	.48	.44	.40
.34	.82	.76	.72	.67	.63	.58	.54	.50	.47	.43
.35	.84	.79	.74	.70	.66	.60	.56	.53	.50	.46
.36	.87	.82	.77	.72	.68	.63	.59	.56	.52	.48
.37	.90	.84	.80	.75	.71	.66	.62	.58	.55	.51
.38	.92	.87	.72	.78	.74	.68	.64	.61	.58	.54
.39	.95	.90	.85	.80	.76	.71	.67	.64	.60	.56
.40	.98	.92	.88	.82	.78	.74	.70	.66	.62	.58
.41	1.00	.94	.90	.85	.81	.76	.72	.68	.65	.61
.42	1.03	.98	.93	.88	.84	.79	.75	.72	.68	.64
.43	1.05	1.00	.95	.90	.86	.81	.77	.74	.70	.66
.44	1.08	1.02	.98	.93	.89	.84	.80	.76	.73	.69
.45	1.10	1.04	1.00	.95	.91	.86	.82	.78	.75	.71
.46	1.13	1.08	1.03	.98	.94	.89	.85	.82	.78	.74
.47	1.16	1.10	1.06	1.00	.96	.92	.88	.84	.80	.76
.48	1.18	1.12	1.08	1.03	.99	.94	.90	.86	.83	.79
.49	1.20	1.15	1.10	1.06	1.02	.96	.92	.89	.86	.82
.50	1.23	1.18	1.13	1.08	1.04	.99	.95	.92	.88	.84

$P_{SN}(A)$ \ $P_N(A)$	.11	.12	.13	.14	.15	.16	.17	.18	.19	.20
.51	1.26	1.20	1.16	1.10	1.06	1.02	.98	.94	.90	.86
.52	1.28	1.22	1.18	1.13	1.09	1.04	1.00	.96	.93	.89
.53	1.30	1.25	1.20	1.16	1.12	1.06	1.02	.99	.96	.92
.54	1.33	1.28	1.23	1.18	1.14	1.09	1.05	1.02	.98	.94
.55	1.36	1.30	1.26	1.21	1.17	1.12	1.08	1.04	1.01	.97
.56	1.38	1.32	1.28	1.23	1.19	1.14	1.10	1.06	1.03	.99
.57	1.41	1.36	1.31	1.26	1.22	1.17	1.13	1.10	1.06	1.02
.58	1.43	1.38	1.33	1.28	1.24	1.19	1.15	1.12	1.08	1.04
.59	1.46	1.40	1.36	1.31	1.27	1.22	1.18	1.14	1.11	1.07
.60	1.48	1.43	1.38	1.34	1.30	1.24	1.20	1.17	1.14	1.10
.61	1.51	1.46	1.41	1.36	1.32	1.27	1.23	1.20	1.16	1.12
.62	1.54	1.48	1.44	1.38	1.34	1.30	1.26	1.22	1.18	1.14
.63	1.56	1.50	1.46	1.41	1.37	1.32	1.28	1.24	1.21	1.17
.64	1.59	1.54	1.49	1.44	1.40	1.35	1.31	1.28	1.24	1.20
.65	1.62	1.56	1.52	1.46	1.42	1.38	1.34	1.30	1.26	1.22
.66	1.64	1.58	1.54	1.49	1.45	1.40	1.36	1.32	1.29	1.25
.67	1.67	1.62	1.57	1.52	1.48	1.43	1.39	1.36	1.32	1.28
.68	1.70	1.64	1.60	1.55	1.51	1.46	1.42	1.38	1.35	1.31
.69	1.74	1.68	1.64	1.58	1.54	1.50	1.46	1.42	1.38	1.34
.70	1.76	1.70	1.66	1.60	1.56	1.52	1.48	1.44	1.40	1.36
.71	1.78	1.73	1.68	1.64	1.60	1.54	1.50	1.47	1.44	1.40
.72	1.81	1.76	1.71	1.66	1.62	1.57	1.53	1.50	1.46	1.42
.73	1.84	1.78	1.74	1.69	1.65	1.60	1.56	1.52	1.49	1.45
.74	1.87	1.82	1.77	1.72	1.68	1.63	1.59	1.56	1.52	1.48
.75	1.90	1.85	1.80	1.76	1.72	1.66	1.62	1.59	1.56	1.52
.76	1.94	1.88	1.84	1.78	1.74	1.70	1.66	1.62	1.58	1.54
.77	1.97	1.92	1.87	1.82	1.78	1.73	1.69	1.66	1.62	1.58
.78	2.00	1.94	1.90	1.85	1.81	1.76	1.72	1.68	1.65	1.61
.79	2.04	1.98	1.94	1.88	1.84	1.80	1.76	1.72	1.68	1.64
.80	2.07	2.02	1.97	1.92	1.88	1.83	1.79	1.76	1.72	1.68
.81	2.11	2.06	2.01	1.96	1.92	1.87	1.83	1.80	1.76	1.72
.82	2.14	2.09	2.04	2.00	1.96	1.90	1.86	1.83	1.80	1.76
.83	2.18	2.12	2.08	2.03	1.99	1.94	1.90	1.86	1.83	1.79
.84	2.22	2.16	2.12	2.07	2.03	1.98	1.94	1.90	1.87	1.83
.85	2.27	2.22	2.17	2.12	2.08	2.03	1.99	1.96	1.92	1.88
.86	2.31	2.26	2.21	2.16	2.12	2.07	2.03	2.00	1.96	1.92
.87	2.36	2.30	2.26	2.21	2.17	2.12	2.08	2.04	2.01	1.97
.88	2.40	2.35	2.30	2.26	2.22	2.16	2.12	2.09	2.06	2.02
.89	2.46	2.40	2.36	2.31	2.27	2.22	2.18	2.14	2.11	2.07
.90	2.51	2.46	2.41	2.36	2.32	2.27	2.23	2.20	2.16	2.12
.91	2.57	2.52	2.47	2.42	2.38	2.33	2.29	2.26	2.22	2.18
.92	2.63	2.58	2.53	2.48	2.44	2.39	2.35	2.32	2.28	2.24
.93	2.70	2.64	2.60	2.55	2.51	2.46	2.42	2.38	2.35	2.31
.94	2.78	2.72	2.68	2.63	2.59	2.54	2.50	2.46	2.43	2.39
.95	2.87	2.82	2.77	2.72	2.68	2.63	2.59	2.56	2.52	2.48
.96	2.98	2.92	2.88	2.83	2.79	2.74	2.70	2.66	2.63	2.59
.97	3.11	3.06	3.01	2.96	2.92	2.87	2.83	2.80	2.76	2.72
.98	3.28	3.22	3.18	3.13	3.09	3.04	3.00	2.96	2.93	2.89
.99	3.55	3.50	3.45	3.40	3.36	3.31	3.27	3.24	3.20	3.16

$P_{SN}(A)$ \ $P_N(A)$	.21	.22	.23	.24	.25	.26	.27	.28	.29	.30
.01	-1.52	-1.55	-1.58	-1.62	-1.64	-1.68	-1.71	-1.74	-1.76	-1.80
.02	-1.24	-1.28	-1.31	-1.34	-1.38	-1.41	-1.44	-1.47	-1.50	-1.52
.03	-1.08	-1.11	-1.14	-1.18	-1.20	-1.24	-1.27	-1.30	-1.32	-1.36
.04	- .94	- .98	-1.01	-1.04	-1.08	-1.11	-1.14	-1.17	-1.20	-1.22
.05	- .84	- .87	- .90	- .94	- .96	-1.00	-1.03	-1.06	-1.08	-1.12
.06	- .74	- .78	- .81	- .84	- .88	- .91	- .94	- .97	-1.00	-1.02
.07	- .66	- .70	- .73	- .76	- .80	- .83	- .86	- .89	- .92	- .94
.08	- .60	- .63	- .66	- .70	- .72	- .76	- .79	- .82	- .84	- .88
.09	- .54	- .57	- .60	- .64	- .66	- .70	- .73	- .76	- .78	- .82
.10	- .48	- .51	- .54	- .58	- .60	- .64	- .67	- .70	- .72	- .76
.11	- .42	- .46	- .49	- .52	- .56	- .59	- .62	- .65	- .68	- .70
.12	- .37	- .40	- .44	- .47	- .50	- .54	- .56	- .60	- .62	- .65
.13	- .32	- .36	- .39	- .42	- .46	- .49	- .52	- .55	- .58	- .60
.14	- .28	- .31	- .34	- .38	- .40	- .44	- .47	- .50	- .52	- .56
.15	- .24	- .27	- .30	- .34	- .36	- .40	- .43	- .46	- .48	- .52
.16	- .18	- .22	- .25	- .28	- .32	- .35	- .38	- .41	- .44	- .46
.17	- .14	- .18	- .21	- .24	- .28	- .31	- .34	- .37	- .40	- .42
.18	- .11	- .14	- .18	- .21	- .24	- .28	- .30	- .34	- .36	- .39
.19	- .08	- .11	- .14	- .18	- .20	- .24	- .27	- .30	- .32	- .36
.20	- .04	- .07	- .10	- .14	- .16	- .20	- .23	- .26	- .28	- .32
.21	0	- .04	- .06	- .10	- .13	- .16	- .20	- .22	- .25	- .28
.22	.04	0	- .03	- .06	- .10	- .13	- .16	- .19	- .22	- .24
.23	.06	.03	0	- .04	- .06	- .10	- .13	- .16	- .18	- .22
.24	.10	.06	.04	0	- .03	- .06	- .10	- .12	- .15	- .18
.25	.13	.10	.06	.03	0	- .04	- .06	- .10	- .12	- .15
.26	.16	.13	.10	.06	.04	0	- .03	- .06	- .08	- .12
.27	.20	.16	.13	.10	.06	.03	0	- .03	- .06	- .08
.28	.22	.19	.16	.12	.10	.06	.03	0	- .02	- .06
.29	.25	.20	.18	.15	.12	.08	.06	.02	0	- .03
.30	.28	.24	.22	.18	.15	.12	.08	.06	.03	0
.31	.30	.26	.24	.20	.17	.14	.10	.08	.05	.02
.32	.34	.30	.27	.24	.20	.17	.14	.11	.08	.06
.33	.36	.33	.30	.26	.24	.20	.17	.14	.12	.08
.34	.40	.36	.33	.30	.26	.23	.20	.17	.14	.12
.35	.42	.38	.36	.32	.29	.26	.22	.20	.17	.14
.36	.44	.41	.38	.34	.32	.28	.25	.22	.20	.16
.37	.48	.44	.41	.38	.34	.31	.28	.25	.22	.20
.38	.50	.46	.44	.40	.37	.34	.30	.28	.25	.22
.39	.52	.49	.46	.42	.40	.36	.33	.30	.28	.24
.40	.55	.52	.48	.45	.42	.38	.36	.32	.30	.27
.41	.58	.54	.51	.48	.44	.41	.38	.35	.32	.30
.42	.60	.57	.54	.50	.48	.44	.41	.38	.36	.32
.43	.62	.59	.56	.52	.50	.46	.43	.40	.38	.34
.44	.66	.62	.59	.56	.52	.49	.46	.43	.40	.38
.45	.68	.64	.61	.58	.54	.51	.48	.45	.42	.40
.46	.70	.67	.64	.60	.58	.54	.51	.48	.46	.42
.47	.73	.70	.66	.63	.60	.56	.54	.50	.48	.45
.48	.76	.72	.69	.66	.62	.59	.56	.53	.50	.48
.49	.78	.74	.72	.68	.65	.62	.58	.56	.53	.50
.50	.80	.77	.74	.70	.68	.64	.61	.58	.56	.52

$P_{SN}(A)$ \ $P_N(A)$	.21	.22	.23	.24	.25	.26	.27	.28	.29	.30
.51	.83	.80	.76	.73	.70	.66	.64	.60	.58	.55
.52	.86	.82	.79	.76	.72	.69	.66	.63	.60	.58
.53	.88	.84	.82	.78	.75	.72	.68	.66	.63	.60
.54	.90	.87	.84	.80	.78	.74	.71	.68	.66	.62
.55	.94	.90	.87	.84	.80	.77	.74	.71	.68	.66
.56	.96	.92	.89	.86	.82	.79	.76	.73	.70	.68
.57	.98	.95	.92	.88	.86	.82	.79	.76	.74	.70
.58	1.00	.97	.94	.90	.88	.84	.81	.78	.76	.72
.59	1.04	1.00	.97	.94	.90	.87	.84	.81	.78	.76
.60	1.06	1.02	1.00	.96	.93	.90	.86	.84	.81	.78
.61	1.08	1.05	1.02	.98	.96	.92	.89	.86	.84	.80
.62	1.11	1.08	1.04	1.01	.98	.94	.92	.88	.86	.83
.63	1.14	1.10	1.07	1.04	1.00	.97	.94	.91	.88	.86
.64	1.16	1.13	1.10	1.06	1.04	1.00	.97	.94	.92	.88
.65	1.19	1.16	1.12	1.09	1.06	1.02	1.00	.96	.94	.91
.66	1.22	1.18	1.15	1.12	1.08	1.05	1.02	.99	.96	.94
.67	1.24	1.21	1.18	1.14	1.12	1.08	1.05	1.02	1.00	.96
.68	1.28	1.24	1.21	1.18	1.14	1.11	1.08	1.05	1.02	1.00
.69	1.31	1.28	1.24	1.21	1.18	1.14	1.12	1.08	1.06	1.03
.70	1.33	1.30	1.26	1.23	1.20	1.16	1.14	1.10	1.08	1.05
.71	1.36	1.32	1.30	1.26	1.23	1.20	1.16	1.14	1.11	1.08
.72	1.38	1.35	1.32	1.28	1.26	1.22	1.19	1.16	1.14	1.10
.73	1.42	1.38	1.35	1.32	1.28	1.25	1.22	1.19	1.16	1.14
.74	1.44	1.41	1.38	1.34	1.32	1.28	1.25	1.22	1.20	1.16
.75	1.48	1.44	1.42	1.38	1.35	1.32	1.28	1.26	1.23	1.20
.76	1.51	1.48	1.44	1.41	1.38	1.34	1.32	1.28	1.26	1.23
.77	1.54	1.51	1.48	1.44	1.42	1.38	1.35	1.32	1.30	1.26
.78	1.58	1.54	1.51	1.48	1.44	1.41	1.38	1.35	1.32	1.30
.79	1.61	1.58	1.54	1.51	1.48	1.44	1.42	1.38	1.36	1.33
.80	1.64	1.61	1.58	1.54	1.52	1.48	1.45	1.42	1.40	1.36
.81	1.68	1.65	1.62	1.58	1.56	1.52	1.49	1.46	1.44	1.40
.82	1.72	1.68	1.66	1.62	1.59	1.56	1.52	1.50	1.47	1.44
.83	1.76	1.72	1.69	1.66	1.62	1.59	1.56	1.53	1.50	1.48
.84	1.80	1.76	1.73	1.70	1.66	1.63	1.60	1.57	1.54	1.52
.85	1.84	1.81	1.78	1.74	1.72	1.68	1.65	1.62	1.60	1.56
.86	1.88	1.85	1.82	1.78	1.76	1.72	1.69	1.66	1.64	1.60
.87	1.94	1.90	1.87	1.84	1.80	1.77	1.74	1.71	1.68	1.66
.88	1.98	1.94	1.92	1.88	1.85	1.82	1.78	1.76	1.73	1.70
.89	2.04	2.00	1.97	1.94	1.90	1.87	1.84	1.81	1.78	1.76
.90	2.08	2.05	2.02	1.98	1.96	1.92	1.89	1.86	1.84	1.80
.91	2.14	2.11	2.08	2.04	2.02	1.98	1.95	1.92	1.90	1.86
.92	2.20	2.17	2.14	2.10	2.08	2.04	2.01	1.98	1.96	1.92
.93	2.28	2.24	2.21	2.18	2.14	2.11	2.08	2.05	2.02	2.00
.94	2.36	2.32	2.29	2.26	2.22	2.19	2.16	2.13	2.10	2.08
.95	2.44	2.41	2.38	2.34	2.32	2.28	2.25	2.22	2.20	2.16
.96	2.56	2.52	2.49	2.46	2.42	2.39	2.36	2.33	2.30	2.28
.97	2.68	2.65	2.62	2.58	2.56	2.52	2.49	2.46	2.44	2.40
.98	2.86	2.82	2.79	2.76	2.72	2.69	2.66	2.63	2.60	2.58
.99	3.12	3.09	3.06	3.02	3.00	2.96	2.93	2.90	2.88	2.84

$P_{SN}(A)$ \ $P_N(A)$	.31	.32	.33	.34	.35	.36	.37	.38	.39	.40
.01	-1.82	-1.85	-1.88	-1.91	-1.94	-1.96	-1.99	-2.02	-2.04	-2.06
.02	-1.54	-1.58	-1.61	-1.64	-1.66	-1.69	-1.72	-1.74	-1.77	-1.80
.03	-1.38	-1.41	-1.44	-1.47	-1.50	-1.52	-1.55	-1.58	-1.60	-1.62
.04	-1.24	-1.28	-1.31	-1.33	-1.36	-1.39	-1.42	-1.44	-1.47	-1.50
.05	-1.14	-1.17	-1.20	-1.23	-1.26	-1.28	-1.31	-1.34	-1.36	-1.38
.06	-1.04	-1.08	-1.11	-1.14	-1.16	-1.19	-1.22	-1.24	-1.27	-1.30
.07	- .96	-1.00	-1.03	-1.06	-1.08	-1.11	-1.14	-1.16	-1.19	-1.22
.08	- .90	- .93	- .96	- .99	-1.02	-1.04	-1.07	-1.10	-1.12	-1.14
.09	- .84	- .87	- .90	- .93	- .96	- .98	-1.01	-1.04	-1.06	-1.08
.10	- .78	- .81	- .84	- .87	- .90	- .92	- .95	- .98	-1.00	-1.02
.11	- .72	- .76	- .79	- .82	- .84	- .87	- .90	- .92	- .95	- .98
.12	- .67	- .70	- .74	- .76	- .79	- .82	- .84	- .87	- .90	- .92
.13	- .62	- .66	- .69	- .72	- .74	- .77	- .80	- .82	- .85	- .88
.14	- .58	- .61	- .64	- .67	- .70	- .72	- .75	- .78	- .80	- .82
.15	- .54	- .57	- .60	- .63	- .66	- .68	- .71	- .74	- .76	- .78
.16	- .48	- .52	- .55	- .58	- .60	- .63	- .66	- .68	- .71	- .74
.17	- .44	- .48	- .51	- .54	- .56	- .59	- .62	- .64	- .67	- .70
.18	- .41	- .44	- .48	- .50	- .53	- .56	- .58	- .61	- .64	- .66
.19	- .38	- .41	- .44	- .47	- .50	- .52	- .55	- .58	- .60	- .62
.20	- .34	- .37	- .40	- .43	- .46	- .48	- .51	- .54	- .56	- .58
.21	- .30	- .34	- .36	- .40	- .42	- .44	- .48	- .50	- .52	- .55
.22	- .26	- .30	- .33	- .36	- .38	- .41	- .44	- .46	- .49	- .52
.23	- .24	- .27	- .30	- .33	- .36	- .38	- .41	- .44	- .46	- .48
.24	- .20	- .24	- .26	- .30	- .32	- .34	- .38	- .40	- .42	- .45
.25	- .17	- .20	- .24	- .26	- .29	- .32	- .34	- .37	- .40	- .42
.26	- .14	- .17	- .20	- .23	- .26	- .28	- .31	- .34	- .36	- .38
.27	- .10	- .14	- .17	- .20	- .22	- .25	- .28	- .30	- .33	- .36
.28	- .08	- .11	- .14	- .17	- .20	- .22	- .25	- .28	- .30	- .32
.29	- .05	- .08	- .12	- .14	- .17	- .20	- .22	- .25	- .28	- .30
.30	- .02	- .06	- .08	- .12	- .14	- .16	- .20	- .22	- .24	- .27
.31	0	- .04	- .06	- .10	- .12	- .14	- .18	- .20	- .22	- .25
.32	.04	0	- .03	- .06	- .08	- .11	- .14	- .16	- .19	- .22
.33	.06	.03	0	- .03	- .06	- .08	- .11	- .14	- .16	- .18
.34	.10	.06	.03	0	- .02	- .05	- .08	- .10	- .13	- .16
.35	.12	.08	.06	.02	0	- .02	- .06	- .08	- .10	- .13
.36	.14	.11	.08	.05	.02	0	- .03	- .06	- .08	- .10
.37	.18	.14	.11	.08	.06	.03	0	- .02	- .05	- .08
.38	.20	.16	.14	.10	.08	.06	.02	0	- .02	- .05
.39	.22	.19	.16	.13	.10	.08	.05	.02	0	- .02
.40	.25	.22	.18	.16	.13	.10	.08	.05	.02	0
.41	.28	.24	.21	.18	.16	.13	.10	.08	.05	.02
.42	.30	.27	.24	.21	.18	.16	.13	.10	.08	.06
.43	.32	.29	.26	.23	.20	.18	.15	.12	.10	.08
.44	.36	.32	.29	.26	.24	.21	.18	.16	.13	.10
.45	.38	.34	.31	.28	.26	.23	.20	.18	.15	.12
.46	.40	.37	.34	.31	.28	.26	.23	.20	.18	.16
.47	.43	.40	.36	.34	.31	.28	.26	.23	.20	.18
.48	.46	.42	.39	.36	.34	.31	.28	.26	.23	.20
.49	.48	.44	.42	.38	.36	.34	.30	.28	.26	.23
.50	.50	.47	.44	.41	.38	.36	.33	.30	.28	.26

$P_{SN}(A)$ \ $P_N(A)$	.31	.32	.33	.34	.35	.36	.37	.38	.39	.40
.51	.53	.50	.46	.44	.41	.38	.36	.33	.30	.28
.52	.56	.52	.49	.46	.44	.41	.38	.36	.33	.30
.53	.58	.54	.52	.48	.46	.44	.40	.38	.36	.33
.54	.60	.57	.54	.51	.48	.46	.43	.40	.38	.36
.55	.64	.60	.57	.54	.52	.49	.46	.44	.41	.38
.56	.66	.62	.59	.56	.54	.51	.48	.46	.43	.40
.57	.68	.65	.62	.59	.56	.54	.51	.48	.46	.44
.58	.70	.67	.64	.61	.58	.56	.53	.50	.48	.46
.59	.74	.70	.67	.64	.62	.59	.56	.54	.51	.48
.60	.76	.72	.70	.66	.64	.62	.58	.56	.54	.51
.61	.78	.75	.72	.69	.66	.64	.61	.58	.56	.54
.62	.81	.78	.74	.72	.69	.66	.64	.61	.58	.56
.63	.84	.80	.77	.74	.72	.69	.66	.64	.61	.58
.64	.86	.83	.80	.77	.74	.72	.69	.66	.64	.62
.65	.89	.86	.82	.80	.77	.74	.72	.69	.66	.64
.66	.92	.88	.85	.82	.80	.77	.74	.72	.69	.66
.67	.94	.91	.88	.85	.82	.80	.77	.74	.72	.70
.68	.98	.94	.91	.88	.86	.83	.80	.78	.75	.72
.69	1.01	.98	.94	.92	.89	.86	.84	.81	.78	.76
.70	1.03	1.00	.96	.94	.91	.88	.86	.83	.80	.78
.71	1.06	1.02	1.00	.96	.94	.92	.88	.86	.84	.81
.72	1.08	1.05	1.02	.99	.96	.94	.91	.88	.86	.84
.73	1.12	1.08	1.05	1.02	1.00	.97	.94	.92	.89	.86
.74	1.14	1.11	1.08	1.05	1.02	1.00	.97	.94	.92	.90
.75	1.18	1.14	1.12	1.08	1.06	1.04	1.00	.98	.96	.93
.76	1.21	1.18	1.14	1.12	1.09	1.06	1.04	1.01	.98	.96
.77	1.24	1.21	1.18	1.15	1.12	1.10	1.07	1.04	1.02	1.00
.78	1.28	1.24	1.21	1.18	1.16	1.13	1.10	1.08	1.05	1.02
.79	1.31	1.28	1.24	1.22	1.19	1.16	1.14	1.11	1.08	1.06
.80	1.34	1.31	1.28	1.25	1.22	1.20	1.17	1.14	1.12	1.10
.81	1.38	1.35	1.32	1.29	1.26	1.24	1.21	1.18	1.16	1.14
.82	1.42	1.38	1.36	1.32	1.30	1.28	1.24	1.22	1.20	1.17
.83	1.46	1.42	1.39	1.36	1.34	1.31	1.28	1.26	1.23	1.20
.84	1.50	1.46	1.43	1.40	1.38	1.35	1.32	1.30	1.27	1.24
.85	1.54	1.51	1.48	1.45	1.42	1.40	1.37	1.34	1.32	1.30
.86	1.58	1.55	1.52	1.49	1.46	1.44	1.41	1.38	1.36	1.34
.87	1.64	1.60	1.57	1.54	1.52	1.49	1.46	1.44	1.41	1.38
.88	1.68	1.64	1.62	1.58	1.56	1.54	1.50	1.48	1.46	1.43
.89	1.74	1.70	1.67	1.64	1.62	1.59	1.56	1.54	1.51	1.48
.90	1.78	1.75	1.72	1.69	1.66	1.64	1.61	1.58	1.56	1.54
.91	1.84	1.81	1.78	1.75	1.72	1.70	1.67	1.64	1.62	1.60
.92	1.90	1.87	1.84	1.81	1.78	1.76	1.73	1.70	1.68	1.66
.93	1.98	1.94	1.91	1.88	1.86	1.83	1.80	1.78	1.75	1.72
.94	2.06	2.02	1.99	1.96	1.94	1.91	1.88	1.86	1.83	1.80
.95	2.14	2.11	2.08	2.05	2.02	2.00	1.97	1.94	1.92	1.90
.96	2.26	2.22	2.19	2.16	2.14	2.11	2.08	2.06	2.03	2.00
.97	2.38	2.35	2.32	2.29	2.26	2.24	2.21	2.18	2.16	2.14
.98	2.56	2.52	2.49	2.46	2.44	2.41	2.38	2.36	2.33	2.30
.99	2.82	2.79	2.76	2.73	2.70	2.68	2.65	2.62	2.60	2.58

$P_{SN}(A)$ \ $P_N(A)$	.41	.42	.43	.44	.45	.46	.47	.48	.49	.50
.01	-2.09	-2.12	-2.14	-2.17	-2.19	-2.22	-2.24	-2.27	-2.30	-2.32
.02	-1.82	-1.85	-1.87	-1.90	-1.92	-1.95	-1.98	-2.00	-2.02	-2.05
.03	-1.65	-1.68	-1.70	-1.73	-1.75	-1.78	-1.80	-1.83	-1.86	-1.88
.04	-1.52	-1.55	-1.57	-1.60	-1.62	-1.65	-1.68	-1.70	-1.72	-1.75
.05	-1.41	-1.44	-1.46	-1.49	-1.51	-1.54	-1.56	-1.59	-1.62	-1.64
.06	-1.32	-1.35	-1.37	-1.40	-1.42	-1.45	-1.48	-1.50	-1.52	-1.55
.07	-1.24	-1.27	-1.29	-1.32	-1.34	-1.37	-1.40	-1.42	-1.44	-1.47
.08	-1.17	-1.20	-1.22	-1.25	-1.27	-1.30	-1.32	-1.35	-1.38	-1.40
.09	-1.11	-1.14	-1.16	-1.19	-1.21	-1.24	-1.26	-1.29	-1.32	-1.34
.10	-1.05	-1.08	-1.10	-1.13	-1.15	-1.18	-1.20	-1.23	-1.26	-1.28
.11	-1.00	-1.03	-1.05	-1.08	-1.10	-1.13	-1.16	-1.18	-1.20	-1.23
.12	- .94	- .98	-1.00	-1.02	-1.04	-1.08	-1.10	-1.12	-1.15	-1.18
.13	- .90	- .93	- .95	- .98	-1.00	-1.03	-1.06	-1.08	-1.10	-1.13
.14	- .85	- .88	- .90	- .93	- .95	- .98	-1.00	-1.03	-1.06	-1.08
.15	- .81	- .84	- .86	- .89	- .91	- .94	- .96	- .99	-1.02	-1.04
.16	- .76	- .79	- .81	- .84	- .86	- .89	- .92	- .94	- .96	- .99
.17	- .72	- .75	- .77	- .80	- .82	- .85	- .88	- .90	- .92	- .95
.18	- .68	- .72	- .74	- .76	- .78	- .82	- .84	- .86	- .89	- .92
.19	- .65	- .68	- .70	- .73	- .75	- .78	- .80	- .83	- .86	- .88
.20	- .61	- .64	- .66	- .69	- .71	- .74	- .76	- .79	- .82	- .84
.21	- .58	- .60	- .62	- .66	- .68	- .70	- .73	- .76	- .78	- .80
.22	- .54	- .57	- .59	- .62	- .64	- .67	- .70	- .72	- .74	- .77
.23	- .51	- .54	- .56	- .59	- .61	- .64	- .66	- .69	- .72	- .74
.24	- .48	- .50	- .52	- .56	- .58	- .60	- .63	- .66	- .68	- .70
.25	- .44	- .48	- .50	- .52	- .54	- .58	- .60	- .62	- .65	- .68
.26	- .41	- .44	- .46	- .49	- .51	- .54	- .56	- .59	- .62	- .64
.27	- .38	- .41	- .43	- .46	- .48	- .51	- .54	- .56	- .58	- .61
.28	- .35	- .38	- .40	- .43	- .45	- .48	- .50	- .53	- .56	- .58
.29	- .32	- .36	- .38	- .40	- .42	- .46	- .48	- .50	- .53	- .56
.30	- .30	- .32	- .34	- .38	- .40	- .42	- .45	- .48	- .50	- .52
.31	- .28	- .30	- .32	- .36	- .38	- .40	- .43	- .46	- .48	- .50
.32	- .24	- .27	- .29	- .32	- .34	- .37	- .40	- .42	- .44	- .47
.33	- .21	- .24	- .26	- .29	- .31	- .34	- .36	- .39	- .42	- .44
.34	- .18	- .21	- .23	- .26	- .28	- .31	- .34	- .36	- .38	- .41
.35	- .16	- .18	- .20	- .24	- .26	- .28	- .31	- .34	- .36	- .38
.36	- .13	- .16	- .18	- .21	- .23	- .26	- .28	- .31	- .34	- .36
.37	- .10	- .13	- .15	- .18	- .20	- .23	- .26	- .28	- .30	- .33
.38	- .08	- .10	- .12	- .16	- .18	- .20	- .23	- .26	- .28	- .30
.39	- .05	- .08	- .10	- .13	- .15	- .18	- .20	- .23	- .26	- .28
.40	- .02	- .06	- .08	- .10	- .12	- .16	- .18	- .20	- .23	- .26
.41	0	- .03	- .05	- .08	- .10	- .13	- .16	- .18	- .20	- .23
.42	.03	0	- .02	- .05	- .07	- .10	- .12	- .15	- .18	- .20
.43	.05	.02	0	- .03	- .05	- .08	- .10	- .13	- .16	- .18
.44	.08	.05	.03	0	- .02	- .05	- .08	- .10	- .13	- .15
.45	.10	.07	.05	.02	0	- .03	- .06	- .08	- .10	- .13
.46	.13	.10	.08	.05	.03	0	- .02	- .05	- .08	- .10
.47	.16	.12	.10	.08	.06	.02	0	- .02	- .05	- .08
.48	.18	.15	.13	.10	.08	.05	.02	0	- .02	- .05
.49	.20	.18	.16	.13	.10	.08	.05	.02	0	- .02
.50	.23	.20	.18	.15	.13	.10	.08	.05	.02	0

$P_{SN}(A)$ \ $P_N(A)$	.41	.42	.43	.44	.45	.46	.47	.48	.49	.50
.51	.26	.22	.20	.18	.16	.12	.10	.08	.05	.02
.52	.28	.25	.23	.20	.18	.15	.12	.10	.08	.05
.53	.30	.28	.26	.22	.20	.18	.15	.12	.10	.08
.54	.33	.30	.28	.25	.23	.20	.18	.15	.12	.10
.55	.36	.33	.31	.28	.26	.23	.20	.18	.16	.13
.56	.38	.35	.33	.30	.28	.25	.22	.20	.18	.15
.57	.41	.38	.36	.33	.31	.28	.26	.23	.20	.18
.58	.43	.40	.38	.35	.33	.30	.28	.25	.22	.20
.59	.46	.43	.41	.38	.36	.33	.30	.28	.26	.23
.60	.48	.46	.44	.40	.38	.36	.33	.30	.28	.26
.61	.51	.48	.46	.43	.41	.38	.36	.33	.30	.28
.62	.54	.50	.48	.46	.44	.40	.38	.36	.33	.30
.63	.56	.53	.51	.48	.46	.43	.40	.38	.36	.33
.64	.59	.56	.54	.51	.49	.46	.44	.41	.38	.36
.65	.62	.58	.56	.54	.52	.48	.46	.44	.41	.38
.66	.64	.61	.59	.56	.54	.51	.48	.46	.44	.41
.67	.67	.64	.62	.59	.57	.54	.52	.49	.46	.44
.68	.70	.67	.65	.62	.60	.57	.54	.52	.50	.47
.69	.74	.70	.68	.66	.64	.60	.58	.56	.53	.50
.70	.76	.72	.70	.68	.66	.62	.60	.58	.55	.52
.71	.78	.76	.74	.70	.68	.66	.63	.60	.58	.56
.72	.81	.78	.76	.73	.71	.68	.66	.63	.60	.58
.73	.84	.81	.79	.76	.74	.71	.68	.66	.64	.61
.74	.87	.84	.82	.79	.77	.74	.72	.69	.66	.64
.75	.90	.88	.86	.82	.80	.78	.75	.72	.70	.68
.76	.94	.90	.88	.86	.84	.80	.78	.76	.73	.70
.77	.97	.94	.92	.89	.87	.84	.82	.79	.76	.74
.78	1.00	.97	.95	.92	.90	.87	.84	.82	.80	.77
.79	1.04	1.00	.98	.96	.94	.90	.88	.86	.83	.80
.80	1.07	1.04	1.02	.99	.97	.94	.92	.89	.86	.84
.81	1.11	1.08	1.06	1.03	1.01	.98	.96	.93	.90	.88
.82	1.14	1.12	1.10	1.06	1.04	1.02	.99	.96	.94	.92
.83	1.18	1.15	1.13	1.10	1.08	1.05	1.02	1.00	.98	.95
.84	1.22	1.19	1.17	1.14	1.12	1.09	1.06	1.04	1.02	.99
.85	1.27	1.24	1.22	1.19	1.17	1.14	1.12	1.09	1.06	1.04
.86	1.31	1.28	1.26	1.23	1.21	1.18	1.16	1.13	1.10	1.08
.87	1.36	1.33	1.31	1.28	1.26	1.23	1.20	1.18	1.16	1.13
.88	1.40	1.38	1.36	1.32	1.30	1.28	1.25	1.22	1.20	1.18
.89	1.46	1.43	1.41	1.38	1.36	1.33	1.30	1.28	1.26	1.23
.90	1.51	1.48	1.46	1.43	1.41	1.38	1.36	1.33	1.30	1.28
.91	1.57	1.54	1.52	1.49	1.47	1.44	1.42	1.39	1.36	1.34
.92	1.63	1.60	1.58	1.55	1.53	1.50	1.48	1.45	1.42	1.40
.93	1.70	1.67	1.65	1.62	1.60	1.57	1.54	1.52	1.50	1.47
.94	1.78	1.75	1.73	1.70	1.68	1.65	1.62	1.60	1.58	1.55
.95	1.87	1.84	1.82	1.79	1.77	1.74	1.72	1.69	1.66	1.64
.96	1.98	1.95	1.93	1.90	1.88	1.85	1.82	1.80	1.78	1.75
.97	2.11	2.08	2.06	2.03	2.01	1.98	1.96	1.93	1.90	1.88
.98	2.28	2.25	2.23	2.20	2.18	2.15	2.12	2.10	2.08	2.05
.99	2.55	2.52	2.50	2.47	2.45	2.42	2.48	2.37	2.34	2.32

$P_{SN}(A)$ \ $P_N(A)$	.51	.52	.53	.54	.55	.56	.57	.58	.59	.60
.01	-2.34	-2.37	-2.40	-2.42	-2.45	-2.47	-2.50	-2.52	-2.55	-2.58
.02	-2.08	-2.10	-2.12	-2.15	-2.18	-2.20	-2.23	-2.25	-2.28	-2.30
.03	-1.90	-1.93	-1.96	-1.98	-2.01	-2.03	-2.06	-2.08	-2.11	-2.14
.04	-1.78	-1.80	-1.82	-1.85	-1.88	-1.90	-1.93	-1.95	-1.98	-2.00
.05	-1.66	-1.69	-1.72	-1.74	-1.77	-1.79	-1.82	-1.84	-1.87	-1.90
.06	-1.58	-1.60	-1.62	-1.65	-1.68	-1.70	-1.73	-1.75	-1.78	-1.80
.07	-1.50	-1.52	-1.54	-1.57	-1.60	-1.62	-1.65	-1.67	-1.70	-1.72
.08	-1.42	-1.45	-1.48	-1.50	-1.53	-1.55	-1.58	-1.60	-1.63	-1.66
.09	-1.36	-1.39	-1.42	-1.44	-1.47	-1.49	-1.52	-1.54	-1.57	-1.60
.10	-1.30	-1.33	-1.36	-1.38	-1.41	-1.43	-1.46	-1.48	-1.51	-1.54
.11	-1.26	-1.28	-1.30	-1.33	-1.36	-1.38	-1.41	-1.43	-1.46	-1.48
.12	-1.20	-1.22	-1.25	-1.28	-1.30	-1.32	-1.36	-1.38	-1.40	-1.43
.13	-1.16	-1.18	-1.20	-1.23	-1.26	-1.28	-1.31	-1.33	-1.36	-1.38
.14	-1.10	-1.13	-1.16	-1.18	-1.21	-1.23	-1.26	-1.28	-1.31	-1.34
.15	-1.06	-1.09	-1.12	-1.14	-1.17	-1.19	-1.22	-1.24	-1.27	-1.30
.16	-1.02	-1.04	-1.06	-1.09	-1.12	-1.14	-1.17	-1.19	-1.22	-1.24
.17	- .98	-1.00	-1.02	-1.05	-1.08	-1.10	-1.13	-1.15	-1.18	-1.20
.18	- .94	- .96	- .99	-1.02	-1.04	-1.06	-1.10	-1.12	-1.14	-1.17
.19	- .90	- .93	- .96	- .98	-1.01	-1.03	-1.06	-1.08	-1.11	-1.14
.20	- .86	- .89	- .92	- .94	- .97	- .99	-1.02	-1.04	-1.07	-1.10
.21	- .83	- .86	- .88	- .90	- .94	- .96	- .98	-1.00	-1.04	-1.06
.22	- .80	- .82	- .84	- .87	- .90	- .92	- .95	- .97	-1.00	-1.02
.23	- .76	- .79	- .82	- .84	- .87	- .89	- .92	- .94	- .97	-1.00
.24	- .73	- .76	- .78	- .80	- .84	- .86	- .88	- .90	- .94	- .96
.25	- .70	- .72	- .75	- .78	- .80	- .82	- .86	- .88	- .90	- .93
.26	- .66	- .69	- .72	- .74	- .77	- .79	- .82	- .84	- .87	- .90
.27	- .64	- .66	- .68	- .71	- .74	- .76	- .79	- .81	- .84	- .86
.28	- .60	- .63	- .66	- .68	- .71	- .73	- .76	- .78	- .81	- .84
.29	- .58	- .60	- .63	- .66	- .68	- .70	- .74	- .76	- .78	- .81
.30	- .55	- .58	- .60	- .62	- .66	- .68	- .70	- .72	- .76	- .78
.31	- .53	- .56	- .58	- .60	- .64	- .66	- .68	- .70	- .74	- .76
.32	- .50	- .52	- .54	- .57	- .60	- .62	- .65	- .67	- .70	- .72
.33	- .46	- .49	- .52	- .54	- .57	- .59	- .62	- .64	- .67	- .70
.34	- .44	- .46	- .48	- .51	- .54	- .56	- .59	- .61	- .64	- .66
.35	- .41	- .44	- .46	- .48	- .52	- .54	- .56	- .58	- .62	- .64
.36	- .38	- .41	- .44	- .46	- .49	- .51	- .54	- .56	- .59	- .62
.37	- .36	- .38	- .40	- .43	- .46	- .48	- .51	- .53	- .56	- .58
.38	- .33	- .36	- .38	- .40	- .44	- .46	- .48	- .50	- .54	- .56
.39	- .30	- .33	- .36	- .38	- .41	- .43	- .46	- .48	- .51	- .54
.40	- .28	- .30	- .33	- .36	- .38	- .40	- .44	- .46	- .48	- .51
.41	- .26	- .28	- .30	- .33	- .36	- .38	- .41	- .43	- .46	- .48
.42	- .22	- .25	- .28	- .30	- .33	- .35	- .38	- .40	- .43	- .46
.43	- .20	- .23	- .26	- .28	- .31	- .33	- .36	- .38	- .41	- .44
.44	- .18	- .20	- .22	- .25	- .28	- .30	- .33	- .35	- .38	- .40
.45	- .16	- .18	- .20	- .23	- .26	- .28	- .31	- .33	- .36	- .38
.46	- .12	- .15	- .18	- .20	- .23	- .25	- .28	- .30	- .33	- .36
.47	- .10	- .12	- .15	- .18	- .20	- .22	- .26	- .28	- .30	- .33
.48	- .08	- .10	- .12	- .15	- .18	- .20	- .23	- .25	- .28	- .30
.49	- .05	- .08	- .10	- .12	- .16	- .18	- .20	- .22	- .26	- .28
.50	- .02	- .05	- .08	- .10	- .13	- .15	- .18	- .20	- .23	- .26

$P_{SN}(A)$ \ $P_N(A)$	.51	.52	.53	.54	.55	.56	.57	.58	.59	.60
.51	0	- .02	- .05	- .08	- .10	- .12	- .16	- .18	- .20	- .23
.52	.02	0	- .02	- .05	- .08	- .10	- .13	- .15	- .18	- .20
.53	.05	.02	0	- .02	- .06	- .08	- .10	- .12	- .16	- .18
.54	.08	.05	.02	0	- .03	- .05	- .08	- .10	- .13	- .16
.55	.10	.08	.06	.03	0	- .02	- .05	- .07	- .10	- .12
.56	.12	.10	.08	.05	.02	0	- .03	- .05	- .08	- .10
.57	.16	.13	.10	.08	.05	.03	0	- .02	- .05	- .08
.58	.18	.15	.12	.10	.07	.05	.02	0	- .03	- .06
.59	.20	.18	.16	.13	.10	.08	.05	.03	0	- .02
.60	.23	.20	.18	.16	.12	.10	.08	.06	.02	0
.61	.26	.23	.20	.18	.15	.13	.10	.08	.05	.02
.62	.28	.26	.23	.20	.18	.16	.12	.10	.08	.05
.63	.30	.28	.26	.23	.20	.18	.15	.13	.10	.08
.64	.34	.31	.28	.26	.23	.21	.18	.16	.13	.10
.65	.36	.34	.31	.28	.26	.24	.20	.18	.16	.13
.66	.38	.36	.34	.31	.28	.26	.23	.21	.18	.16
.67	.42	.39	.36	.34	.31	.29	.26	.24	.21	.18
.68	.44	.42	.40	.37	.34	.32	.29	.27	.24	.22
.69	.48	.46	.43	.40	.38	.36	.32	.30	.28	.25
.70	.50	.48	.45	.42	.40	.38	.34	.32	.30	.27
.71	.53	.50	.48	.46	.42	.40	.38	.36	.32	.30
.72	.56	.53	.50	.48	.45	.43	.40	.38	.35	.32
.73	.58	.56	.54	.51	.48	.46	.43	.41	.38	.36
.74	.62	.59	.56	.54	.51	.49	.46	.44	.41	.38
.75	.65	.62	.60	.58	.54	.52	.50	.48	.44	.42
.76	.68	.66	.63	.60	.58	.56	.52	.50	.48	.45
.77	.72	.69	.66	.64	.61	.59	.56	.54	.51	.48
.78	.74	.72	.70	.67	.64	.62	.59	.57	.54	.52
.79	.78	.76	.73	.70	.68	.66	.62	.60	.58	.55
.80	.82	.79	.76	.74	.71	.69	.66	.64	.61	.58
.81	.86	.83	.80	.78	.75	.73	.70	.68	.65	.62
.82	.89	.86	.84	.82	.78	.76	.74	.72	.68	.66
.83	.92	.90	.88	.85	.82	.80	.77	.75	.72	.70
.84	.96	.94	.92	.89	.86	.84	.81	.79	.76	.74
.85	1.02	.99	.96	.94	.91	.89	.86	.84	.81	.78
.86	1.06	1.03	1.00	.98	.95	.93	.90	.88	.85	.82
.87	1.10	1.08	1.06	1.03	1.00	.98	.95	.93	.90	.88
.88	1.15	1.12	1.10	1.08	1.04	1.02	1.00	.98	.94	.92
.89	1.20	1.18	1.16	1.13	1.10	1.08	1.05	1.03	1.00	.98
.90	1.26	1.23	1.20	1.18	1.15	1.13	1.10	1.08	1.05	1.02
.91	1.32	1.29	1.26	1.24	1.21	1.19	1.16	1.14	1.11	1.08
.92	1.38	1.35	1.32	1.30	1.27	1.25	1.22	1.20	1.17	1.14
.93	1.44	1.42	1.40	1.37	1.34	1.32	1.29	1.27	1.24	1.22
.94	1.52	1.50	1.48	1.45	1.42	1.40	1.37	1.35	1.32	1.30
.95	1.62	1.59	1.56	1.54	1.51	1.49	1.46	1.44	1.41	1.38
.96	1.72	1.70	1.68	1.65	1.62	1.60	1.57	1.55	1.52	1.50
.97	1.86	1.83	1.80	1.78	1.75	1.73	1.70	1.68	1.65	1.62
.98	2.02	2.00	1.98	1.95	1.92	1.90	1.87	1.85	1.82	1.80
.99	2.30	2.27	2.24	2.22	2.19	2.17	2.14	2.12	2.09	2.06

$P_{SN}(A)$ \ $P_N(A)$	.61	.62	.63	.64	.65	.66	.67	.68	.69	.70
.01	-2.60	-2.62	-2.65	-2.68	-2.70	-2.73	-2.76	-2.79	-2.82	-2.84
.02	-2.33	-2.36	-2.38	-2.41	-2.44	-2.46	-2.49	-2.52	-2.56	-2.58
.03	-2.16	-2.18	-2.21	-2.24	-2.26	-2.29	-2.32	-2.35	-2.38	-2.40
.04	-2.03	-2.06	-2.08	-2.11	-2.14	-2.16	-2.19	-2.22	-2.26	-2.28
.05	-1.92	-1.94	-1.97	-2.00	-2.02	-2.05	-2.08	-2.11	-2.14	-2.16
.06	-1.83	-1.86	-1.88	-1.91	-1.94	-1.96	-1.99	-2.02	-2.06	-2.08
.07	-1.75	-1.78	-1.80	-1.83	-1.86	-1.88	-1.91	-1.94	-1.98	-2.00
.08	-1.68	-1.70	-1.73	-1.76	-1.78	-1.81	-1.84	-1.87	-1.90	-1.92
.09	-1.62	-1.64	-1.67	-1.70	-1.72	-1.75	-1.78	-1.81	-1.84	-1.86
.10	-1.56	-1.58	-1.61	-1.64	-1.66	-1.69	-1.72	-1.75	-1.78	-1.80
.11	-1.51	-1.54	-1.56	-1.59	-1.62	-1.64	-1.67	-1.70	-1.74	-1.76
.12	-1.46	-1.48	-1.50	-1.54	-1.56	-1.58	-1.62	-1.64	-1.68	-1.70
.13	-1.41	-1.44	-1.46	-1.49	-1.52	-1.54	-1.57	-1.60	-1.64	-1.66
.14	-1.36	-1.38	-1.41	-1.44	-1.46	-1.49	-1.52	-1.55	-1.58	-1.60
.15	-1.32	-1.34	-1.37	-1.40	-1.42	-1.45	-1.48	-1.51	-1.54	-1.56
.16	-1.27	-1.30	-1.32	-1.35	-1.38	-1.40	-1.43	-1.46	-1.50	-1.52
.17	-1.23	-1.26	-1.28	-1.31	-1.34	-1.36	-1.39	-1.42	-1.46	-1.48
.18	-1.20	-1.22	-1.24	-1.28	-1.30	-1.32	-1.36	-1.38	-1.42	-1.44
.19	-1.16	-1.18	-1.21	-1.24	-1.26	-1.29	-1.32	-1.35	-1.38	-1.40
.20	-1.12	-1.14	-1.17	-1.20	-1.22	-1.25	-1.28	-1.31	-1.34	-1.36
.21	-1.08	-1.11	-1.14	-1.16	-1.19	-1.22	-1.24	-1.28	-1.31	-1.33
.22	-1.05	-1.08	-1.10	-1.13	-1.16	-1.18	-1.21	-1.24	-1.28	-1.30
.23	-1.02	-1.04	-1.07	-1.10	-1.12	-1.15	-1.18	-1.21	-1.24	-1.26
.24	- .98	-1.01	-1.04	-1.06	-1.09	-1.12	-1.14	-1.18	-1.21	-1.23
.25	- .96	- .98	-1.00	-1.04	-1.06	-1.08	-1.12	-1.14	-1.18	-1.20
.26	- .92	- .94	- .97	-1.00	-1.02	-1.05	-1.08	-1.11	-1.14	-1.16
.27	- .89	- .92	- .94	- .97	-1.00	-1.02	-1.05	-1.08	-1.12	-1.14
.28	- .86	- .88	- .91	- .94	- .96	- .99	-1.02	-1.05	-1.08	-1.10
.29	- .84	- .86	- .88	- .92	- .94	- .96	-1.00	-1.02	-1.06	-1.08
.30	- .80	- .83	- .86	- .88	- .91	- .94	- .96	-1.00	-1.03	-1.05
.31	- .78	- .81	- .84	- .86	- .89	- .92	- .94	- .98	-1.01	-1.03
.32	- .75	- .78	- .80	- .83	- .86	- .88	- .91	- .94	- .98	-1.00
.33	- .72	- .74	- .77	- .80	- .82	- .85	- .88	- .91	- .94	- .96
.34	- .69	- .72	- .74	- .77	- .80	- .82	- .85	- .88	- .92	- .94
.35	- .66	- .69	- .72	- .74	- .77	- .80	- .82	- .86	- .89	- .91
.36	- .64	- .66	- .69	- .72	- .74	- .77	- .80	- .83	- .86	- .88
.37	- .61	- .64	- .66	- .69	- .72	- .74	- .77	- .80	- .84	- .86
.38	- .58	- .61	- .64	- .66	- .69	- .72	- .74	- .78	- .81	- .83
.39	- .56	- .58	- .61	- .64	- .66	- .69	- .72	- .75	- .78	- .80
.40	- .54	- .56	- .58	- .62	- .64	- .66	- .70	- .72	- .76	- .78
.41	- .51	- .54	- .56	- .59	- .62	- .64	- .67	- .70	- .74	- .76
.42	- .48	- .50	- .53	- .56	- .58	- .61	- .64	- .67	- .70	- .72
.43	- .46	- .48	- .51	- .54	- .56	- .59	- .62	- .65	- .68	- .70
.44	- .43	- .46	- .48	- .51	- .54	- .56	- .59	- .62	- .66	- .68
.45	- .41	- .44	- .46	- .49	- .52	- .54	- .57	- .60	- .64	- .66
.46	- .38	- .40	- .43	- .46	- .48	- .51	- .54	- .57	- .60	- .62
.47	- .36	- .38	- .40	- .44	- .46	- .48	- .52	- .54	- .58	- .60
.48	- .33	- .36	- .38	- .41	- .44	- .46	- .49	- .52	- .56	- .58
.49	- .30	- .33	- .36	- .38	- .41	- .44	- .46	- .50	- .53	- .55
.50	- .28	- .30	- .33	- .36	- .38	- .41	- .44	- .47	- .50	- .52

$P_{SN}(A)$ \ $P_N(A)$	.61	.62	.63	.64	.65	.66	.67	.68	.69	.70
.51	- .26	- .28	- .30	- .34	- .36	- .38	- .42	- .44	- .48	- .50
.52	- .23	- .26	- .28	- .31	- .34	- .36	- .39	- .42	- .46	- .48
.53	- .20	- .23	- .26	- .28	- .31	- .34	- .36	- .40	- .43	- .45
.54	- .18	- .20	- .23	- .26	- .28	- .31	- .34	- .37	- .40	- .42
.55	- .15	- .18	- .20	- .23	- .26	- .28	- .31	- .34	- .38	- .40
.56	- .13	- .14	- .18	- .21	- .24	- .26	- .29	- .32	- .36	- .38
.57	- .10	- .12	- .15	- .18	- .20	- .23	- .26	- .29	- .32	- .34
.58	- .08	- .10	- .13	- .16	- .18	- .21	- .24	- .27	- .30	- .32
.59	- .05	- .08	- .10	- .13	- .16	- .18	- .21	- .24	- .28	- .30
.60	- .02	- .05	- .08	- .10	- .13	- .16	- .18	- .22	- .25	- .27
.61	0	- .02	- .05	- .08	- .10	- .13	- .16	- .19	- .22	- .24
.62	.02	0	- .02	- .06	- .08	- .10	- .14	- .16	- .20	- .22
.63	.05	.02	0	- .03	- .06	- .08	- .11	- .14	- .18	- .20
.64	.08	.06	.03	0	- .02	- .05	- .08	- .11	- .14	- .16
.65	.10	.08	.06	.02	0	- .02	- .06	- .08	- .12	- .14
.66	.13	.10	.08	.05	.02	0	- .03	- .06	- .10	- .12
.67	.16	.14	.11	.08	.06	.03	0	- .03	- .06	- .08
.68	.19	.16	.14	.11	.08	.06	.03	0	- .04	- .06
.69	.22	.20	.18	.14	.12	.10	.06	.04	0	- .02
.70	.24	.22	.20	.16	.14	.12	.08	.06	.02	0
.71	.28	.25	.22	.20	.17	.14	.12	.08	.05	.03
.72	.30	.28	.25	.22	.20	.17	.14	.11	.08	.06
.73	.33	.30	.28	.25	.22	.20	.17	.14	.10	.08
.74	.36	.34	.31	.28	.26	.23	.20	.17	.14	.12
.75	.40	.37	.34	.32	.29	.26	.24	.20	.17	.15
.76	.42	.40	.38	.34	.32	.30	.26	.24	.20	.18
.77	.46	.44	.41	.38	.36	.33	.30	.27	.24	.22
.78	.49	.46	.44	.41	.38	.36	.33	.30	.26	.24
.79	.52	.50	.48	.44	.42	.40	.36	.33	.30	.28
.80	.56	.54	.51	.48	.46	.43	.40	.37	.34	.32
.81	.60	.58	.55	.52	.50	.47	.44	.41	.38	.36
.82	.64	.61	.58	.56	.53	.50	.48	.44	.41	.39
.83	.67	.64	.62	.59	.56	.54	.51	.48	.44	.42
.84	.71	.68	.66	.63	.60	.58	.55	.52	.48	.46
.85	.76	.74	.71	.68	.66	.63	.60	.57	.54	.52
.86	.80	.78	.75	.72	.70	.67	.64	.61	.58	.56
.87	.85	.82	.80	.77	.74	.72	.69	.66	.62	.60
.88	.90	.87	.84	.82	.79	.76	.74	.70	.67	.65
.89	.95	.92	.90	.87	.84	.82	.79	.76	.72	.70
.90	1.00	.98	.95	.92	.90	.87	.84	.81	.78	.76
.91	1.06	1.04	1.01	.98	.96	.93	.90	.87	.84	.82
.92	1.12	1.10	1.07	1.04	1.02	.99	.96	.93	.90	.88
.93	1.19	1.16	1.14	1.11	1.08	1.06	1.03	1.00	.96	.94
.94	1.27	1.24	1.22	1.19	1.16	1.14	1.11	1.08	1.04	1.02
.95	1.36	1.34	1.31	1.28	1.26	1.23	1.20	1.17	1.14	1.12
.96	1.47	1.44	1.42	1.39	1.36	1.34	1.31	1.28	1.24	1.22
.97	1.60	1.58	1.55	1.52	1.50	1.47	1.44	1.41	1.38	1.36
.98	1.77	1.74	1.72	1.69	1.66	1.64	1.61	1.58	1.54	1.52
.99	2.04	2.02	1.99	1.96	1.94	1.91	1.88	1.85	1.82	1.80

$P_{SN}(A)$ \ $P_N(A)$	.71	.72	.73	.74	.75	.76	.77	.78	.79	.80
.01	-2.88	-2.90	-2.93	-2.96	-3.00	-3.02	-3.06	-3.09	-3.12	-3.16
.02	-2.60	-2.63	-2.66	-2.69	-2.72	-2.76	-2.79	-2.82	-2.86	-2.89
.03	-2.44	-2.46	-2.49	-2.52	-2.56	-2.58	-2.62	-2.65	-2.68	-2.72
.04	-2.30	-2.33	-2.36	-2.39	-2.42	-2.46	-2.49	-2.52	-2.56	-2.59
.05	-2.20	-2.22	-2.25	-2.28	-2.32	-2.34	-2.38	-2.41	-2.44	-2.48
.06	-2.10	-2.13	-2.16	-2.19	-2.22	-2.26	-2.29	-2.32	-2.36	-2.39
.07	-2.02	-2.05	-2.08	-2.11	-2.14	-2.18	-2.21	-2.24	-2.28	-2.31
.08	-1.96	-1.98	-2.01	-2.04	-2.08	-2.10	-2.14	-2.17	-2.20	-2.24
.09	-1.90	-1.92	-1.95	-1.98	-2.02	-2.04	-2.08	-2.11	-2.14	-2.18
.10	-1.84	-1.86	-1.89	-1.92	-1.96	-1.98	-2.02	-2.05	-2.08	-2.12
.11	-1.78	-1.81	-1.84	-1.87	-1.90	-1.94	-1.97	-2.00	-2.04	-2.07
.12	-1.73	-1.76	-1.78	-1.82	-1.85	-1.88	-1.92	-1.94	-1.98	-2.02
.13	-1.68	-1.71	-1.74	-1.77	-1.80	-1.84	-1.87	-1.90	-1.94	-1.97
.14	-1.64	-1.66	-1.69	-1.72	-1.76	-1.78	-1.82	-1.85	-1.88	-1.92
.15	-1.60	-1.62	-1.65	-1.68	-1.72	-1.74	-1.78	-1.81	-1.84	-1.88
.16	-1.54	-1.57	-1.60	-1.63	-1.66	-1.70	-1.73	-1.76	-1.80	-1.83
.17	-1.50	-1.53	-1.56	-1.59	-1.62	-1.66	-1.69	-1.72	-1.76	-1.79
.18	-1.47	-1.50	-1.52	-1.56	-1.59	-1.62	-1.66	-1.68	-1.72	-1.76
.19	-1.44	-1.46	-1.49	-1.52	-1.56	-1.58	-1.62	-1.65	-1.68	-1.72
.20	-1.40	-1.42	-1.45	-1.48	-1.52	-1.54	-1.58	-1.61	-1.64	-1.68
.21	-1.36	-1.38	-1.42	-1.44	-1.48	-1.51	-1.54	-1.58	-1.61	-1.64
.22	-1.32	-1.35	-1.38	-1.41	-1.44	-1.48	-1.51	-1.54	-1.58	-1.61
.23	-1.30	-1.32	-1.35	-1.38	-1.42	-1.44	-1.48	-1.51	-1.54	-1.58
.24	-1.26	-1.28	-1.32	-1.34	-1.38	-1.41	-1.44	-1.48	-1.51	-1.54
.25	-1.23	-1.26	-1.28	-1.32	-1.35	-1.38	-1.42	-1.44	-1.48	-1.52
.26	-1.20	-1.22	-1.25	-1.28	-1.32	-1.34	-1.38	-1.41	-1.44	-1.48
.27	-1.16	-1.19	-1.22	-1.25	-1.28	-1.32	-1.35	-1.38	-1.42	-1.45
.28	-1.14	-1.16	-1.19	-1.22	-1.26	-1.28	-1.32	-1.35	-1.38	-1.42
.29	-1.11	-1.14	-1.16	-1.20	-1.23	-1.26	-1.30	-1.32	-1.36	-1.40
.30	-1.08	-1.10	-1.14	-1.16	-1.20	-1.23	-1.26	-1.30	-1.33	-1.36
.31	-1.06	-1.08	-1.12	-1.14	-1.18	-1.21	-1.24	-1.28	-1.31	-1.34
.32	-1.02	-1.05	-1.08	-1.11	-1.14	-1.18	-1.21	-1.24	-1.28	-1.31
.33	-1.00	-1.02	-1.05	-1.08	-1.12	-1.14	-1.18	-1.21	-1.24	-1.28
.34	- .96	- .99	-1.02	-1.05	-1.08	-1.12	-1.15	-1.18	-1.22	-1.25
.35	- .94	- .96	-1.00	-1.02	-1.06	-1.09	-1.12	-1.16	-1.19	-1.22
.36	- .92	- .94	- .97	-1.00	-1.04	-1.06	-1.10	-1.13	-1.16	-1.20
.37	- .88	- .91	- .94	- .97	-1.00	-1.04	-1.07	-1.10	-1.14	-1.17
.38	- .86	- .88	- .92	- .94	- .98	-1.01	-1.04	-1.08	-1.11	-1.14
.39	- .84	- .86	- .89	- .92	- .96	- .98	-1.02	-1.05	-1.08	-1.12
.40	- .81	- .84	- .86	- .90	- .93	- .96	-1.00	-1.02	-1.06	-1.10
.41	- .78	- .81	- .84	- .87	- .90	- .94	- .97	-1.00	-1.04	-1.07
.42	- .76	- .78	- .81	- .84	- .88	- .90	- .94	- .97	-1.00	-1.04
.43	- .74	- .76	- .79	- .82	- .86	- .88	- .92	- .95	- .98	-1.02
.44	- .70	- .73	- .76	- .79	- .82	- .86	- .89	- .92	- .96	- .99
.45	- .68	- .71	- .74	- .77	- .80	- .84	- .87	- .90	- .94	- .97
.46	- .66	- .68	- .71	- .74	- .78	- .80	- .84	- .87	- .90	- .94
.47	- .63	- .66	- .68	- .72	- .75	- .78	- .82	- .84	- .88	- .92
.48	- .60	- .63	- .66	- .69	- .72	- .76	- .79	- .82	- .86	- .89
.49	- .58	- .60	- .64	- .66	- .70	- .73	- .76	- .80	- .83	- .86
.50	- .56	- .58	- .61	- .64	- .68	- .70	- .74	- .77	- .80	- .84

$P_{SN}(A)$ \ $P_N(A)$	.71	.72	.73	.74	.75	.76	.77	.78	.79	.80
.51	- .53	- .56	- .58	- .62	- .65	- .68	- .72	- .74	- .78	- .82
.52	- .50	- .53	- .56	- .59	- .62	- .66	- .69	- .72	- .76	- .79
.53	- .48	- .50	- .54	- .56	- .60	- .63	- .66	- .70	- .73	- .76
.54	- .46	- .48	- .51	- .54	- .58	- .60	- .64	- .67	- .70	- .74
.55	- .42	- .45	- .48	- .51	- .54	- .58	- .61	- .64	- .68	- .71
.56	- .40	- .43	- .46	- .49	- .52	- .56	- .59	- .62	- .66	- .69
.57	- .38	- .40	- .43	- .46	- .50	- .52	- .56	- .59	- .62	- .66
.58	- .36	- .38	- .41	- .44	- .48	- .50	- .54	- .57	- .60	- .64
.59	- .32	- .35	- .38	- .41	- .44	- .48	- .51	- .54	- .58	- .61
.60	- .30	- .32	- .36	- .38	- .42	- .45	- .48	- .52	- .55	- .58
.61	- .28	- .30	- .33	- .36	- .40	- .42	- .46	- .49	- .52	- .56
.62	- .25	- .28	- .30	- .34	- .37	- .40	- .44	- .46	- .50	- .54
.63	- .22	- .25	- .28	- .31	- .34	- .38	- .41	- .44	- .48	- .51
.64	- .20	- .22	- .25	- .28	- .32	- .34	- .38	- .41	- .44	- .48
.65	- .17	- .20	- .22	- .26	- .29	- .32	- .36	- .38	- .42	- .46
.66	- .14	- .17	- .20	- .23	- .26	- .30	- .33	- .36	- .40	- .43
.67	- .12	- .14	- .17	- .20	- .24	- .26	- .30	- .33	- .36	- .40
.68	- .08	- .11	- .14	- .17	- .20	- .24	- .27	- .30	- .34	- .37
.69	- .05	- .08	- .10	- .14	- .17	- .20	- .24	- .26	- .30	- .34
.70	- .03	- .06	- .08	- .12	- .15	- .18	- .22	- .24	- .28	- .32
.71	0	- .02	- .06	- .08	- .12	- .15	- .18	- .22	- .25	- .28
.72	.02	0	- .03	- .06	- .10	- .12	- .16	- .19	- .22	- .26
.73	.06	.03	0	- .03	- .06	- .10	- .13	- .16	- .20	- .23
.74	.08	.06	.03	0	- .04	- .06	- .10	- .13	- .16	- .20
.75	.12	.10	.06	.04	0	- .03	- .06	- .10	- .13	- .16
.76	.15	.12	.10	.06	.03	0	- .04	- .06	- .10	- .14
.77	.18	.16	.13	.10	.06	.04	0	- .03	- .06	- .10
.78	.22	.19	.16	.13	.10	.06	.03	0	- .04	- .07
.79	.25	.22	.20	.16	.13	.10	.06	.04	0	- .04
.80	.28	.26	.23	.20	.16	.14	.10	.07	.04	0
.81	.32	.30	.27	.24	.20	.18	.14	.11	.08	.04
.82	.36	.34	.30	.28	.24	.21	.18	.14	.11	.08
.83	.40	.37	.34	.31	.28	.24	.21	.18	.14	.11
.84	.44	.41	.38	.35	.32	.28	.25	.22	.18	.15
.85	.48	.46	.43	.40	.36	.34	.30	.27	.24	.20
.86	.52	.50	.47	.44	.40	.38	.34	.31	.28	.24
.87	.58	.55	.52	.49	.46	.42	.39	.36	.32	.29
.88	.62	.60	.56	.54	.50	.47	.44	.40	.37	.34
.89	.68	.65	.62	.59	.56	.52	.49	.46	.42	.39
.90	.72	.70	.67	.64	.60	.58	.54	.51	.48	.44
.91	.78	.76	.73	.70	.66	.64	.60	.57	.54	.50
.92	.84	.82	.79	.76	.72	.70	.66	.63	.60	.56
.93	.92	.89	.86	.83	.80	.76	.73	.70	.66	.63
.94	1.00	.97	.94	.91	.88	.84	.81	.78	.74	.71
.95	1.08	1.06	1.03	1.00	.96	.94	.90	.87	.84	.80
.96	1.20	1.17	1.14	1.11	1.08	1.04	1.01	.98	.94	.91
.97	1.32	1.30	1.27	1.24	1.20	1.18	1.14	1.11	1.08	1.04
.98	1.50	1.47	1.44	1.41	1.38	1.34	1.31	1.28	1.24	1.21
.99	1.76	1.74	1.71	1.68	1.64	1.62	1.58	1.55	1.52	1.48

$P_{SN}(A)$ \ $P_N(A)$	.81	.82	.83	.84	.85	.86	.87	.88	.89	.90
.01	-3.20	-3.24	-3.27	-3.31	-3.36	-3.40	-3.45	-3.50	-3.55	-3.60
.02	-2.93	-2.96	-3.00	-3.04	-3.09	-3.13	-3.18	-3.22	-3.28	-3.33
.03	-2.76	-2.80	-2.83	-2.87	-2.92	-2.96	-3.01	-3.06	-3.11	-3.16
.04	-2.63	-2.66	-2.70	-2.74	-2.79	-2.83	-2.88	-2.92	-2.98	-3.03
.05	-2.52	-2.56	-2.59	-2.63	-2.68	-2.72	-2.77	-2.82	-2.87	-2.92
.06	-2.43	-2.46	-2.50	-2.54	-2.59	-2.63	-2.68	-2.72	-2.78	-2.83
.07	-2.35	-2.38	-2.42	-2.46	-2.51	-2.55	-2.60	-2.64	-2.70	-2.75
.08	-2.28	-2.32	-2.35	-2.39	-2.44	-2.48	-2.53	-2.58	-2.63	-2.68
.09	-2.22	-2.26	-2.29	-2.33	-2.38	-2.42	-2.47	-2.52	-2.57	-2.62
.10	-2.16	-2.20	-2.23	-2.27	-2.32	-2.36	-2.41	-2.46	-2.51	-2.56
.11	-2.11	-2.14	-2.18	-2.22	-2.27	-2.31	-2.36	-2.40	-2.46	-2.51
.12	-2.06	-2.09	-2.12	-2.16	-2.22	-2.26	-2.30	-2.35	-2.40	-2.46
.13	-2.01	-2.04	-2.08	-2.12	-2.17	-2.21	-2.26	-2.30	-2.36	-2.41
.14	-1.96	-2.00	-2.03	-2.07	-2.12	-2.16	-2.21	-2.26	-2.31	-2.36
.15	-1.92	-1.96	-1.99	-2.03	-2.08	-2.12	-2.17	-2.22	-2.27	-2.32
.16	-1.87	-1.90	-1.94	-1.98	-2.03	-2.07	-2.12	-2.16	-2.22	-2.27
.17	-1.83	-1.86	-1.90	-1.94	-1.99	-2.03	-2.08	-2.12	-2.18	-2.23
.18	-1.80	-1.83	-1.86	-1.90	-1.96	-2.00	-2.04	-2.09	-2.14	-2.20
.19	-1.76	-1.80	-1.83	-1.87	-1.92	-1.96	-2.01	-2.06	-2.11	-2.16
.20	-1.72	-1.76	-1.79	-1.83	-1.88	-1.92	-1.97	-2.02	-2.07	-2.12
.21	-1.68	-1.72	-1.76	-1.80	-1.84	-1.88	-1.94	-1.98	-2.04	-2.08
.22	-1.65	-1.68	-1.72	-1.76	-1.81	-1.85	-1.90	-1.94	-2.00	-2.05
.23	-1.62	-1.66	-1.69	-1.73	-1.78	-1.82	-1.87	-1.92	-1.97	-2.02
.24	-1.58	-1.62	-1.66	-1.70	-1.74	-1.78	-1.84	-1.88	-1.94	-1.98
.25	-1.56	-1.59	-1.62	-1.66	-1.72	-1.76	-1.80	-1.85	-1.90	-1.96
.26	-1.52	-1.56	-1.59	-1.63	-1.68	-1.72	-1.77	-1.82	-1.87	-1.92
.27	-1.49	-1.52	-1.56	-1.60	-1.65	-1.69	-1.74	-1.78	-1.84	-1.89
.28	-1.46	-1.50	-1.53	-1.57	-1.62	-1.66	-1.71	-1.76	-1.81	-1.86
.29	-1.44	-1.47	-1.50	-1.54	-1.60	-1.64	-1.68	-1.73	-1.78	-1.84
.30	-1.40	-1.44	-1.48	-1.52	-1.56	-1.60	-1.66	-1.70	-1.76	-1.80
.31	-1.38	-1.42	-1.46	-1.50	-1.54	-1.58	-1.64	-1.68	-1.74	-1.78
.32	-1.35	-1.38	-1.42	-1.46	-1.51	-1.55	-1.60	-1.64	-1.70	-1.75
.33	-1.32	-1.36	-1.39	-1.43	-1.48	-1.52	-1.57	-1.62	-1.67	-1.72
.34	-1.29	-1.32	-1.36	-1.40	-1.45	-1.49	-1.54	-1.58	-1.64	-1.69
.35	-1.26	-1.30	-1.34	-1.38	-1.42	-1.46	-1.52	-1.56	-1.62	-1.66
.36	-1.24	-1.28	-1.31	-1.35	-1.40	-1.44	-1.49	-1.54	-1.59	-1.64
.37	-1.21	-1.24	-1.28	-1.32	-1.37	-1.41	-1.46	-1.50	-1.56	-1.61
.38	-1.18	-1.22	-1.26	-1.30	-1.34	-1.38	-1.44	-1.48	-1.54	-1.58
.39	-1.16	-1.20	-1.23	-1.27	-1.32	-1.36	-1.41	-1.46	-1.51	-1.56
.40	-1.14	-1.17	-1.20	-1.24	-1.30	-1.34	-1.38	-1.43	-1.48	-1.54
.41	-1.11	-1.14	-1.18	-1.22	-1.27	-1.31	-1.36	-1.40	-1.46	-1.51
.42	-1.08	-1.12	-1.15	-1.19	-1.24	-1.28	-1.33	-1.38	-1.43	-1.48
.43	-1.06	-1.10	-1.13	-1.17	-1.22	-1.26	-1.31	-1.36	-1.41	-1.46
.44	-1.03	-1.06	-1.10	-1.14	-1.19	-1.23	-1.28	-1.32	-1.38	-1.43
.45	-1.01	-1.04	-1.08	-1.12	-1.17	-1.21	-1.26	-1.30	-1.36	-1.41
.46	- .98	-1.02	-1.05	-1.09	-1.14	-1.18	-1.23	-1.28	-1.33	-1.38
.47	- .96	- .99	-1.02	-1.06	-1.12	-1.16	-1.20	-1.25	-1.30	-1.36
.48	- .93	- .96	-1.00	-1.04	-1.09	-1.13	-1.18	-1.22	-1.28	-1.33
.49	- .90	- .94	- .98	-1.02	-1.06	-1.10	-1.16	-1.20	-1.26	-1.30
.50	- .88	- .92	- .95	- .99	-1.04	-1.08	-1.13	-1.18	-1.23	-1.28

$P_{SN}(A)$ \ $P_N(A)$	.81	.82	.83	.84	.85	.86	.87	.88	.89	.90
.51	- .86	- .89	- .92	- .96	-1.02	-1.06	-1.10	-1.15	-1.20	-1.26
.52	- .83	- .86	- .90	- .94	- .99	-1.03	-1.08	-1.12	-1.18	-1.23
.53	- .80	- .84	- .88	- .92	- .96	-1.00	-1.06	-1.10	-1.16	-1.20
.54	- .78	- .82	- .85	- .89	- .94	- .98	-1.03	-1.08	-1.13	-1.18
.55	- .75	- .78	- .82	- .86	- .91	- .95	-1.00	-1.04	-1.10	-1.15
.56	- .73	- .76	- .80	- .84	- .89	- .93	- .98	-1.02	-1.08	-1.13
.57	- .70	- .74	- .77	- .81	- .86	- .90	- .95	-1.00	-1.05	-1.10
.58	- .68	- .72	- .75	- .79	- .84	- .88	- .93	-..98	-1.03	-1.08
.59	- .65	- .68	- .72	- .76	- .81	- .85	- .90	- .94	-1.00	-1.05
.60	- .62	- .66	- .70	- .74	- .78	- .82	- .88	- .92	- .98	-1.02
.61	- .60	- .64	- .67	- .71	- .76	- .80	- .85	- .90	- .95	-1.00
.62	- .58	- .61	- .64	- .68	- .74	- .78	- .82	- .87	- .92	- .98
.63	- .55	- .58	- .62	- .66	- .71	- .75	- .80	- .84	- .90	- .95
.64	- .52	- .56	- .59	- .63	- .68	- .72	- .77	- .82	- .87	- .92
.65	- .50	- .53	- .56	- .60	- .66	- .70	- .74	- .79	- .84	- .90
.66	- .47	- .50	- .54	- .58	- .63	- .67	- .72	- .76	- .82	- .87
.67	- .44	- .48	- .51	- .55	- .60	- .64	- .69	- .74	- .79	- .84
.68	- .41	- .44	- .48	- .52	- .57	- .61	- .66	- .70	- .76	- .81
.69	- .38	- .41	- .44	- .48	- .54	- .58	- .62	- .67	- .72	- .78
.70	- .36	- .39	- .42	- .46	- .52	- .56	- .60	- .65	- .70	- .76
.71	- .32	- .36	- .40	- .44	- .48	- .52	- .58	- .62	- .68	- .72
.72	- .30	- .34	- .37	- .41	- .46	- .50	- .55	- .60	- .65	- .70
.73	- .27	- .30	- .34	- .38	- .43	- .47	- .52	- .56	- .62	- .67
.74	- .24	- .28	- .31	- .35	- .40	- .44	- .49	- .54	- .59	- .64
.75	- .20	- .24	- .28	- .32	- .36	- .40	- .46	- .50	- .56	- .60
.76	- .18	- .21	- .24	- .28	- .34	- .38	- .42	- .47	- .52	- .58
.77	- .14	- .18	- .21	- .25	- .30	- .34	- .39	- .44	- .49	- .54
.78	- .11	- .14	- .18	- .22	- .27	- .31	- .36	- .40	- .46	- .51
.79	- .08	- .11	- .14	- .18	- .24	- .28	- .32	- .37	- .42	- .48
.80	- .04	- .08	- .11	- .15	- .20	- .24	- .29	- .34	- .39	- .44
.81	0	- .04	- .07	- .11	- .16	- .20	- .25	- .30	- .35	- .40
.82	.04	0	- .04	- .08	- .12	- .16	- .22	- .26	- .32	- .36
.83	.07	.04	0	- .04	- .09	- .13	- .18	- .22	- .28	- .33
.84	.11	.08	.04	0	- .05	- .09	- .14	- .18	- .24	- .29
.85	.16	.12	.09	.05	0	- .04	- .09	- .14	- .19	- .24
.86	.20	.16	.13	.09	.04	0	- .05	- .10	- .15	- .20
.87	.25	.22	.18	.14	.09	.05	0	- .04	- .10	- .15
.88	.30	.26	.22	.18	.14	.10	.04	0	- .06	- .10
.89	.35	.32	.28	.24	.19	.15	.10	.06	0	- .05
.90	.40	.36	.33	.29	.24	.20	.15	.10	.05	0
.91	.46	.42	.39	.35	.30	.26	.21	.16	.11	.06
.92	.52	.48	.45	.41	.36	.32	.27	.22	.17	.12
.93	.59	.56	.52	.48	.43	.39	.34	.30	.24	.19
.94	.67	.64	.60	.56	.51	.47	.42	.38	.32	.27
.95	.76	.72	.69	.65	.60	.56	.51	.46	.41	.36
.96	.87	.84	.80	.76	.71	.67	.62	.58	.52	.47
.97	1.00	.96	.93	.89	.84	.80	.75	.70	.65	.60
.98	1.17	1.14	1.10	1.06	1.01	.97	.92	.88	.82	.77
.99	1.44	1.40	1.37	1.33	1.28	1.24	1.19	1.14	1.09	1.04

$P_{SN}(A)$ \ $P_N(A)$	.91	.92	.93	.94	.95	.96	.97	.98	.99
.01	-3.66	-3.72	-3.79	-3.87	-3.96	-4.07	-4.20	-4.37	-4.64
.02	-3.39	-3.45	-3.52	-3.60	-3.69	-3.80	-3.93	-4.10	-4.37
.03	-3.22	-3.28	-3.35	-3.43	-3.52	-3.63	-3.76	-3.93	-4.20
.04	-3.09	-3.15	-3.22	-3.30	-3.39	-3.50	-3.63	-3.80	-4.07
.05	-2.98	-3.04	-3.11	-3.19	-3.28	-3.39	-3.52	-3.69	-3.96
.06	-2.89	-2.95	-3.02	-3.10	-3.19	-3.30	-3.43	-3.60	-3.87
.07	-2.81	-2.87	-2.94	-3.02	-3.11	-3.22	-3.35	-3.52	-3.79
.08	-2.74	-2.80	-2.87	-2.95	-3.04	-3.15	-3.28	-3.45	-3.72
.09	-2.68	-2.74	-2.81	-2.89	-2.98	-3.09	-3.22	-3.39	-3.66
.10	-2.62	-2.68	-2.75	-2.83	-2.92	-3.03	-3.16	-3.33	-3.60
.11	-2.57	-2.63	-2.70	-2.78	-2.87	-2.98	-3.11	-3.28	-3.55
.12	-2.52	-2.58	-2.64	-2.72	-2.82	-2.92	-3.06	-3.22	-3.50
.13	-2.47	-2.53	-2.60	-2.68	-2.77	-2.88	-3.01	-3.18	-3.45
.14	-2.42	-2.48	-2.55	-2.63	-2.72	-2.83	-2.96	-3.13	-3.40
.15	-2.38	-2.44	-2.51	-2.59	-2.68	-2.79	-2.92	-3.09	-3.36
.16	-2.33	-2.39	-2.46	-2.54	-2.63	-2.74	-2.87	-3.04	-3.31
.17	-2.29	-2.35	-2.42	-2.50	-2.59	-2.70	-2.83	-3.00	-3.27
.18	-2.26	-2.32	-2.38	-2.46	-2.56	-2.66	-2.80	-2.96	-3.24
.19	-2.22	-2.28	-2.35	-2.43	-2.52	-2.63	-2.76	-2.93	-3.20
.20	-2.18	-2.24	-2.31	-2.39	-2.48	-2.59	-2.72	-2.89	-3.16
.21	-2.14	-2.20	-2.28	-2.36	-2.44	-2.56	-2.68	-2.86	-3.12
.22	-2.11	-2.17	-2.24	-2.32	-2.41	-2.52	-2.65	-2.82	-3.09
.23	-2.08	-2.14	-2.21	-2.29	-2.38	-2.49	-2.62	-2.79	-3.06
.24	-2.04	-2.10	-2.18	-2.26	-2.34	-2.46	-2.58	-2.76	-3.02
.25	-2.02	-2.08	-2.14	-2.22	-2.32	-2.42	-2.56	-2.72	-3.00
.26	-1.98	-2.04	-2.11	-2.19	-2.28	-2.39	-2.52	-2.69	-2.96
.27	-1.95	-2.01	-2.08	-2.16	-2.25	-2.36	-2.49	-2.66	-2.93
.28	-1.92	-1.98	-2.05	-2.13	-2.22	-2.33	-2.46	-2.63	-2.90
.29	-1.90	-1.96	-2.02	-2.10	-2.20	-2.30	-2.44	-2.60	-2.88
.30	-1.86	-1.92	-2.00	-2.08	-2.16	-2.28	-2.40	-2.58	-2.84
.31	-1.84	-1.90	-1.98	-2.06	-2.14	-2.26	-2.38	-2.56	-2.82
.32	-1.81	-1.87	-1.94	-2.02	-2.11	-2.22	-2.35	-2.52	-2.79
.33	-1.78	-1.84	-1.91	-1.99	-2.08	-2.19	-2.32	-2.49	-2.76
.34	-1.75	-1.81	-1.88	-1.96	-2.05	-2.16	-2.29	-2.46	-2.73
.35	-1.72	-1.78	-1.86	-1.94	-2.02	-2.14	-2.26	-2.44	-2.70
.36	-1.70	-1.76	-1.83	-1.91	-2.00	-2.11	-2.24	-2.41	-2.68
.37	-1.67	-1.73	-1.80	-1.88	-1.97	-2.08	-2.21	-2.38	-2.65
.38	-1.64	-1.70	-1.78	-1.86	-1.94	-2.06	-2.18	-2.36	-2.62
.39	-1.62	-1.68	-1.75	-1.83	-1.92	-2.03	-2.16	-2.33	-2.60
.40	-1.60	-1.66	-1.72	-1.80	-1.90	-2.00	-2.14	-2.30	-2.58
.41	-1.57	-1.63	-1.70	-1.78	-1.87	-1.98	-2.11	-2.28	-2.55
.42	-1.54	-1.60	-1.67	-1.75	-1.84	-1.95	-2.08	-2.25	-2.52
.43	-1.52	-1.58	-1.65	-1.73	-1.82	-1.93	-2.06	-2.23	-2.50
.44	-1.49	-1.55	-1.62	-1.70	-1.79	-1.90	-2.03	-2.20	-2.47
.45	-1.47	-1.53	-1.60	-1.68	-1.77	-1.88	-2.01	-2.18	-2.45
.46	-1.44	-1.50	-1.57	-1.65	-1.74	-1.85	-1.98	-2.15	-2.42
.47	-1.42	-1.48	-1.54	-1.62	-1.72	-1.82	-1.96	-2.12	-2.48
.48	-1.39	-1.45	-1.52	-1.60	-1.69	-1.80	-1.93	-2.10	-2.37
.49	-1.36	-1.42	-1.50	-1.58	-1.66	-1.78	-1.90	-2.08	-2.34
.50	-1.34	-1.40	-1.47	-1.55	-1.64	-1.75	-1.88	-2.05	-2.32

$P_{SN}(A)$ \ $P_N(A)$	.91	.92	.93	.94	.95	.96	.97	.98	.99
.51	-1.32	-1.38	-1.44	-1.52	-1.62	-1.72	-1.86	-2.02	-2.30
.52	-1.29	-1.35	-1.42	-1.50	-1.59	-1.70	-1.83	-2.00	-2.27
.53	-1.26	-1.32	-1.40	-1.48	-1.56	-1.68	-1.80	-1.98	-2.24
.54	-1.24	-1.30	-1.37	-1.45	-1.54	-1.65	-1.78	-1.95	-2.22
.55	-1.21	-1.27	-1.34	-1.42	-1.51	-1.62	-1.75	-1.92	-2.19
.56	-1.19	-1.25	-1.32	-1.40	-1.49	-1.60	-1.73	-1.90	-2.17
.57	-1.16	-1.22	-1.29	-1.37	-1.46	-1.57	-1.70	-1.87	-2.14
.58	-1.14	-1.20	-1.27	-1.35	-1.44	-1.55	-1.68	-1.85	-2.12
.59	-1.11	-1.17	-1.24	-1.32	-1.41	-1.52	-1.65	-1.82	-2.09
.60	-1.08	-1.14	-1.22	-1.30	-1.38	-1.50	-1.62	-1.80	-2.06
.61	-1.06	-1.12	-1.19	-1.27	-1.36	-1.47	-1.60	-1.77	-2.04
.62	-1.04	-1.10	-1.16	-1.24	-1.34	-1.44	-1.58	-1.74	-2.02
.63	-1.01	-1.07	-1.14	-1.22	-1.31	-1.42	-1.55	-1.72	-1.99
.64	- .98	-1.04	-1.11	-1.19	-1.28	-1.39	-1.52	-1.69	-1.96
.65	- .96	-1.02	-1.08	-1.16	-1.26	-1.36	-1.50	-1.66	-1.94
.66	- .93	- .99	-1.06	-1.14	-1.23	-1.34	-1.47	-1.64	-1.91
.67	- .90	- .96	-1.03	-1.11	-1.20	-1.31	-1.44	-1.61	-1.88
.68	- .87	- .93	-1.00	-1.08	-1.17	-1.28	-1.41	-1.58	-1.85
.69	- .84	- .90	- .96	-1.04	-1.14	-1.24	-1.38	-1.54	-1.82
.70	- .82	- .88	- .94	-1.02	-1.12	-1.22	-1.36	-1.52	-1.80
.71	- .78	- .84	- .92	-1.00	-1.08	-1.20	-1.32	-1.50	-1.76
.72	- .76	- .82	- .89	- .97	-1.06	-1.17	-1.30	-1.47	-1.74
.73	- .73	- .79	- .86	- .94	-1.03	-1.14	-1.27	-1.44	-1.71
.74	- .70	- .76	- .83	- .91	-1.00	-1.11	-1.24	-1.41	-1.68
.75	- .66	- .72	- .80	- .88	- .96	-1.08	-1.20	-1.38	-1.64
.76	- .64	- .70	- .76	- .84	- .94	-1.04	-1.18	-1.34	-1.62
.77	- .60	- .66	- .73	- .81	- .90	-1.01	-1.14	-1.31	-1.58
.78	- .57	- .63	- .70	- .78	- .87	- .98	-1.11	-1.28	-1.55
.79	- .54	- .60	- .66	- .74	- .84	- .94	-1.08	-1.24	-1.52
.80	- .50	- .56	- .63	- .71	- .80	- .91	-1.04	-1.21	-1.48
.81	- .46	- .52	- .59	- .67	- .76	- .87	-1.00	-1.17	-1.44
.82	- .42	- .48	- .56	- .64	- .72	- .84	- .96	-1.14	-1.40
.83	- .39	- .45	- .52	- .60	- .69	- .80	- .93	-1.10	-1.37
.84	- .35	- .41	- .48	- .56	- .65	- .76	- .89	-1.06	-1.33
.85	- .30	- .36	- .43	- .51	- .60	- .71	- .84	-1.01	-1.28
.86	- .26	- .32	- .39	- .47	- .56	- .67	- .80	- .97	-1.24
.87	- .21	- .27	- .34	- .42	- .51	- .62	- .75	- .92	-1.19
.88	- .16	- .22	- .30	- .38	- .46	- .58	- .70	- .88	-1.14
.89	- .11	- .17	- .24	- .32	- .41	- .52	- .65	- .82	-1.09
.90	- .06	- .12	- .19	- .27	- .36	- .47	- .60	- .77	-1.04
.91	0	-.06	- .13	- .21	- .30	- .41	- .54	- .71	- .98
.92	.06	0	- .07	- .15	- .24	- .35	- .48	- .65	- .92
.93	.13	.07	0	- .08	- .17	- .28	- .41	- .58	- .85
.94	.21	.15	.08	0	- .09	- .20	- .33	- .50	- .77
.95	.30	.24	.17	.09	0	- .11	- .24	- .41	- .68
.96	.41	.35	.28	.20	.11	0	- .13	- .30	- .57
.97	.54	.48	.41	.33	.24	.13	0	- .17	- .44
.98	.71	.65	.33	.50	.41	.30	.17	0	- .27
.99	.98	.92	.85	.77	.68	.57	.44	.27	0

In M-alternative forced choice experiments, percentage correct is usually obtained as the measure of performance. The following table converts percentage correct to d' as a function of the number of alternatives. For the computation of d', percentage correct is used as an estimate of the probability of a correct decision.

Since this table is an extension of a table appearing in Quarterly Progress Report No. 10, the University of Michigan, April 1954; the original introduction written by Birdsall and Peterson will be reprinted here.

Optimum Forced Choice Performance (Ref. 3)

It is assumed in this discussion that the information which the observer has is equivalent to knowledge of the values for a given trial of M independent normal variables, of which M-1 have mean zero, one has mean d', and all have unit variance. The normal variable with mean d' is the signal plus noise, while the others are noise alone. The observer does not know which variable is signal plus noise, and all are equally likely candidates.

This case can be considered an approximation to many forced-choice psychological tests, in which the signals are orthogonal, equally likely and have the same energy, and the noise is white Gaussian noise over the bandwidth of the signals. One such set of signals is any set of similar but non-overlapping (in time or space) pulses, another consists of tones of different frequencies.

The optimum choice is the variable which takes on the highest value. Thus, the probability of

correct decision is the probability that a Gaussian random variable with mean d' and unit variance will be simultaneously greater than (M-1) other independent Gaussian variables with zero mean and the unit variance.

For computation it is more convenient to observe that the probability of an incorrect decision is the probability that the greatest of the zero mean variables is greater than the variable with mean d', or (M-1) times the probability that any particular zero mean variable will be the greatest of all. If A(t) stands for the area under the normal distribution from minus infinity to t, and O(t) is the ordinate of the normal density (or frequency) function, then the probability of an incorrect decision is

$$P(\text{Incorrect}) = (M-1)\int_{-\infty}^{\infty} A^{M-2}(t)\, A(t-d')\, O(t)\, dt; \qquad (3.1)$$

The integrand is the probability density that a particular zero mean variable will have value t (i.e., O(t)) times the probability that (M-2)zero mean variables and the one variable with mean d' will be below that value t.

This integration was done numerically by the use of Simpson's approximate integration rule after a change of variable of integration. Letting

$$Z^2 = -2(M-1)\ln A(t) \qquad (3.2)$$

the integral becomes

$$P(\text{Incorrect}) = \int_{0}^{\infty} Z \exp\left(-\frac{Z^2}{2}\right) A\left[A^{-1}\left(\exp\left\{-\frac{Z^2}{2M-2}\right\}-d'\right)\right] dZ \qquad (3.3)$$

Because $A \leq 1$, and because the integral of $Z \exp\left(-\frac{Z^2}{2}\right)$ from 3.2 to infinity is less than .006, the upper limit can be replaced by 3.2 with less than .6% error. Simpsons rule was used with subdivision points at Z = 0, .1, .2, .3, .4, .6, .8, 1.0, 1.2, 1.4, 1.6, 2.0, 2.4, 2.8, 3.2, guaranteeing an error of less than .014 for a total bound on the error of .02.

Using these approximations, computations were performed for M = 2, 3, 4, 8, 16, 32, 256, and 1000. For M = 2, P(Correct) is the probability that the difference of two independent normal variables is greater than d', and hence is the normal curve $P(\text{Correct}) = A(d'/\sqrt{2})$. These values as well as the computed values, are plotted on probability paper in Fig. 4.

The curves of Figure 4 are very nearly straight lines, and hence it is possible to represent the results empirically by the following formula:

$$P(\text{Correct}) = A(a_M d' - b_M) \tag{3.4}$$

where A is the (area) normal distribution function, a_M is determined from the slope of the computed P(Correct) curves and is plotted in Figure 5., and b_M is chosen so that P(Correct) = 1/M when d' = 0. Equation (3.4) is accurate to within 2% for M = 8. For M = 2, P(Correct) has the form of the normal distribution, and hence equation (3.4) is exact, with

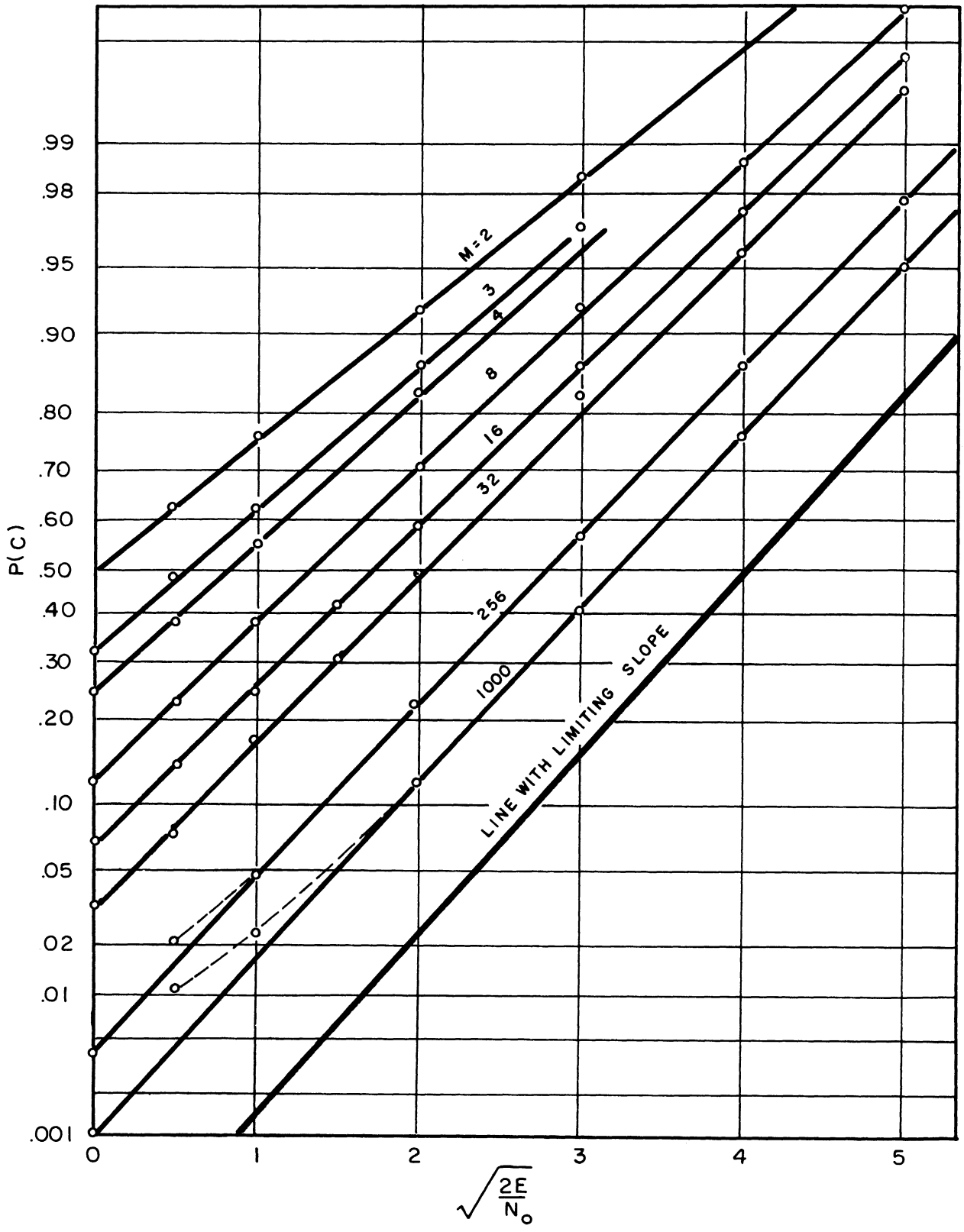

FIG. 4. MAXIMUM PROBABILITY OF A CORRECT FORCED CHOICE AMONG M ORTHOGONAL ALTERNATIVES.

$a_M = 1/\sqrt{2}$ and $b_M = 0$. It can be shown that as M approaches infinity, P(Correct) becomes normal again and a_M approaches 1.

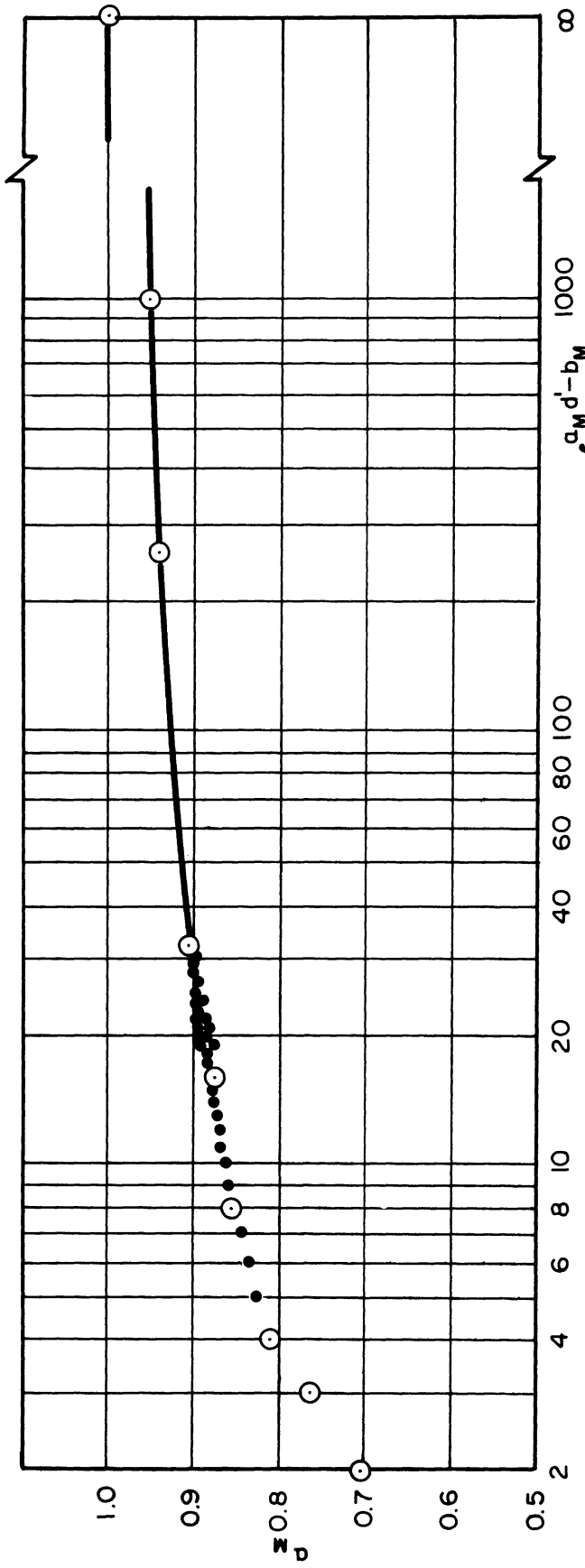

FIG.5 THE CONSTANT a_M FOR THE APPROXIMATION $P(C) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{a_M d' - b_M} e^{-\frac{x^2}{2}} dx$

TABLE II

d' FOR FORCED CHOICE AMONG M ORTHOGANAL ALTERNATIVES

$P_{(c)}$ \ M	2	4	8	16	32	256	1000
.01	-3.28	-1.99	-1.37	-.89	-.51	.37	.80
.02	-2.90	-1.66	-1.05	-.58	-.21	.66	1.08
.03	-2.66	-1.46	- .85	-.39	-.02	.85	1.26
.04	-2.48	-1.30	- .70	-.24	.13	.99	1.39
.05	-2.32	-1.17	- .57	-.12	.25	1.11	1.50
.06	-2.19	-1.06	- .47	-.02	.35	1.21	1.60
.07	-2.08	- .96	- .37	.07	.44	1.30	1.68
.08	-1.98	- .88	- .29	.15	.52	1.37	1.75
.09	-1.90	- .80	- .22	.22	.58	1.44	1.82
.10	-1.81	- .73	- .15	.29	.66	1.50	1.88
.11	-1.74	- .67	- .09	.34	.71	1.56	1.93
.12	-1.66	- .60	- .03	.41	.77	1.62	1.99
.13	-1.60	- .55	.02	.46	.82	1.67	2.03
.14	-1.53	- .49	.08	.51	.88	1.72	2.08
.15	-1.47	- .44	.13	.56	.92	1.77	2.13
.16	-1.40	- .38	.19	.62	.98	1.82	2.18
.17	-1.34	- .33	.23	.66	1.02	1.86	2.22
.18	-1.29	- .29	.27	.70	1.06	1.90	2.26
.19	-1.24	- .25	.32	.74	1.10	1.94	2.29
.20	-1.19	- .20	.36	.78	1.15	1.98	2.33
.21	-1.14	- .16	.40	.82	1.19	2.02	2.37
.22	-1.09	- .12	.44	.86	1.23	2.06	2.41
.23	-1.05	- .08	.48	.90	1.26	2.09	2.44
.24	-1.00	- .04	.52	.94	1.30	2.13	2.47
.25	- .95	.0	.56	.97	1.33	2.16	2.50

$P_{(c)}$ \ M	2	4	8	16	32	256	1000
.26	- .90	.04	.60	1.01	1.37	2.20	2.54
.27	- .86	.08	.63	1.04	1.41	2.24	2.57
.28	- .82	.11	.67	1.08	1.44	2.27	2.60
.29	- .78	.14	.70	1.11	1.47	2.30	2.63
.30	- .74	.18	.73	1.14	1.50	2.33	2.66
.31	- .71	.20	.75	1.16	1.52	2.35	2.68
.32	- .66	.25	.80	1.20	1.56	2.39	2.72
.33	- .62	.28	.83	1.24	1.60	2.42	2.75
.34	- .60	.32	.86	1.27	1.63	2.46	2.78
.35	- .54	.35	.89	1.30	1.66	2.48	2.81
.36	- .51	.38	.92	1.33	1.69	2.51	2.83
.37	- .47	.42	.96	1.36	1.72	2.54	2.86
.38	- .43	.45	.99	1.39	1.75	2.57	2.89
.39	- .40	.48	1.02	1.42	1.78	2.60	2.91
.40	- .36	.51	1.05	1.45	1.81	2.62	2.94
.41	- .32	.54	1.08	1.48	1.83	2.65	2.97
.42	- .28	.57	1.11	1.51	1.87	2.68	3.00
.43	- .25	.60	1.13	1.53	1.89	2.71	3.02
.44	- .21	.63	1.17	1.56	1.92	2.74	3.05
.45	- .18	.66	1.19	1.59	1.95	2.76	3.07
.46	- .14	.69	1.23	1.62	1.98	2.79	3.10
.47	- .11	.72	1.26	1.65	2.01	2.82	3.13
.48	- .07	.75	1.29	1.68	2.04	2.85	3.15
.49	- .04	.78	1.32	1.71	2.06	2.88	3.18
.50	0	.81	1.34	1.74	2.09	2.90	3.20

$P_{(c)}$ \ M	2	4	8	16	32	256	1000
.51	.04	.84	1.37	1.76	2.12	2.93	3.23
.52	.07	.88	1.40	1.79	2.15	2.96	3.26
.53	.11	.90	1.43	1.82	2.18	2.98	3.23
.54	.14	.94	1.46	1.85	2.20	3.01	3.31
.55	.18	.97	1.50	1.88	2.24	3.04	3.34
.56	.21	1.00	1.52	1.90	2.26	3.07	3.36
.57	.25	1.03	1.56	1.94	2.30	3.10	3.39
.58	.28	1.06	1.58	1.96	2.32	3.12	3.41
.59	.32	1.09	1.61	2.00	2.35	3.15	3.44
.60	.36	1.12	1.64	2.02	2.38	3.18	3.47
.61	.40	1.15	1.67	2.05	2.41	3.21	3.50
.62	.43	1.18	1.70	2.08	2.44	3.24	3.52
.63	.47	1.21	1.73	2.11	2.46	3.26	3.55
.64	.51	1.25	1.77	2.14	2.50	3.30	3.58
.65	.54	1.28	1.80	2.17	2.52	3.32	3.60
.66	.60	1.31	1.82	2.20	2.55	3.35	3.63
.67	.62	1.35	1.86	2.23	2.59	3.38	3.66
.68	.66	1.38	1.89	2.27	2.62	3.42	3.69
.69	.71	1.42	1.94	2.31	2.66	3.45	3.73
.70	.74	1.45	1.96	2.33	2.68	3.48	3.75
.71	.78	1.49	1.99	2.36	2.77	3.51	3.78
.72	.82	1.52	2.02	2.39	2.74	3.54	3.81
.73	.86	1.55	2.06	2.42	2.78	3.57	3.84
.74	.90	1.59	2.09	2.46	2.81	3.60	3.87
.75	.95	1.63	2.13	2.50	2.85	3.64	3.90

$P_{(c)}$ \ M	2	4	8	16	32	256	1000
.76	1.00	1.67	2.17	2.53	2.88	3.67	3.94
.77	1.05	1.71	2.21	2.57	2.92	3.71	3.97
.78	1.09	1.75	2.24	2.61	2.96	3.74	4.00
.79	1.14	1.79	2.29	2.64	2.98	3.78	4.04
.80	1.19	1.83	2.33	2.68	3.04	3.82	4.08
.81	1.24	1.88	2.37	2.73	3.08	3.86	4.12
.82	1.29	1.92	2.42	2.77	3.12	3.90	4.15
.83	1.34	1.96	2.46	2.81	3.16	3.94	4.19
.84	1.40	2.01	2.50	2.86	3.20	3.98	4.23
.85	1.47	2.07	2.56	2.91	3.26	4.04	4.28
.86	1.53	2.12	2.61	2.96	3.31	4.08	4.32
.87	1.60	2.18	2.67	3.01	3.36	4.14	4.38
.88	1.66	2.24	2.72	3.06	3.41	4.18	4.42
.89	1.74	2.30	2.78	3.13	3.48	4.24	4.48
.90	1.81	2.36	2.84	3.18	3.53	4.30	4.53
.91	1.90	2.44	2.91	3.25	3.60	4.36	4.60
.92	1.98	2.51	2.98	3.32	3.67	4.43	4.66
.93	2.08	2.59	3.06	3.40	3.74	4.51	4.73
.94	2.19	2.69	3.16	3.49	3.83	4.59	4.81
.95	2.32	2.80	3.26	3.59	3.94	4.69	4.91
.96	2.48	2.93	3.39	3.71	4.06	4.81	5.02
.97	2.66	3.09	3.54	3.86	4.20	4.96	5.16
.98	2.90	3.29	3.74	4.05	4.40	5.14	5.33
.99	3.28	3.62	4.06	4.36	4.70	5.44	5.61

REFERENCES

1. Tanner, W. P., Jr., and Birdsall, T. G., "Definitions of d' and η as Psychophysical Measures," Technical Report No. 80, Electronic Defense Group, The University of Michigan Research Institute, 1956.
2. Peterson, W. W., and Birdsall, T. G., "The Theory of Signal Detectability," Technical Report No. 13, Electronic Defense Group, University of Michigan, 1953.
3. Peterson, W. W., and Birdsall, T. G., Quarterly Progress Report No. 10, University of Michigan, Electronic Defense Group, April 1954.