

THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



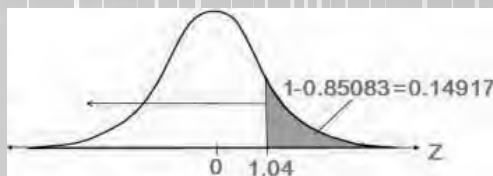
MATHEMATICAL TABLES AND FORMULAE

For Ordinary and Advanced Levels
Secondary Education

$$s = \int_{\alpha}^{\beta} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta$$

$$S_n = \frac{n}{2} [2A_1 + (n-1)d]$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$



$$\frac{d}{dx} \left(e^{f(x)} \right) = e^{f(x)} \frac{df(x)}{dx}$$

THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



**MATHEMATICAL TABLES
AND
FORMULAE**

**For Ordinary and Advanced Levels
Secondary Education**

Published by

National Examinations Council of Tanzania
P.O. Box 2624
Dar es Salaam

© National Examinations Council, 2016

First Edition, 2016

All rights reserved

TABLE OF CONTENTS

PREFACE	iv
ACKNOWLEDGEMENT.....	v
1 INTRODUCTION.....	1
2 MATHEMATICAL TABLES.....	2
Antilogarithms.....	5
Degrees to Radians.....	7
Sine of an Angle	10
Cosine of an Angle	13
Tangent of an Angle	16
Square Root	18
Reciprocal.....	24
Cube Root.....	27
Natural or Naperian Logarithms	33
Binomial Distribution.....	36
Standard Normal Distribution	38
Poisson Distribution	41
3 FORMULAE	45
Algebra.....	45
Sequences and Series	45
Trigonometry.....	45
Statistics	46
Perimeters, Areas and Volumes	46
Matrices and Transformations.....	47
The Earth as a Sphere.....	47
Probability	47
Differentiation	48
Integration	49
Coordinate Geometry	50
Permutations and Combinations.....	51
Sets	51
Complex Numbers.....	51
Hyperbolic Identities.....	52
Vectors.....	52
Differential Equations	52
Numerical Methods.....	52
4 CONSTANTS.....	53

ACKNOWLEDGEMENT

The National Examinations Council of Tanzania wishes to acknowledge the following participants for their tireless efforts and valuable contributions in preparing this booklet:

Writers

Mr. Elikana E. Manyilizu: Mathematics and Chemistry Teacher (Jangwani Secondary School).
 Mr. Hatwai S. Makengo: Mathematics and Education Teacher (Chamazi Day Secondary School).
 Mr. Josephat Justinian: Mathematics Teacher (SOS – Herman Gmeiner School – Zanzibar).
 Ms. Sada Amour Ali: Mathematics Teacher (Bububu Secondary School – Zanzibar).
 Mr. Peter Jonas Mtangi: Mathematics and Physics Teacher (Kibaha Secondary School).
 Mr. Plassid Allin: Mathematics (Loyola High School).
 Mr. Julius A. Kagyabukama: Mathematics Examinations Coordinator (NECTA).
 Ms. Magreth P. Njau: Mathematics Examinations Coordinator (NECTA).
 Mr. Ezekiel S. Kisovu: Mathematics Examinations Coordinator (NECTA).
 Mr. Nakol L. Mbedule: Mathematics Examinations Coordinator (NECTA).

Editors

Dr. Sylvester E. Rugeihyamu: Senior Lecturer of Mathematics (UDSM).
 Dr. James P. Mpele: Lecturer of Mathematics (DUCE).
 Dr. Zubeda Mussa: Lecturer of Mathematics (DUCE).
 Mr. Anthony K. Tresphory: Curriculum Developer in Mathematics (TIE).
 Ms. Angela J. M Kitali: Head Examination Design and Development Department (NECTA).

Programmers

Mr. Ulrick Mkenda: Information and Communication Technology Department (NECTA).
 Mr. Omary Msumba: Information and Communication Technology Department (NECTA).
 Mr. Japhet Guyai: Information and Communication Technology Department (NECTA).

Designer

Mr. David Michael: Printing and Publications Department (NECTA).

The National Examinations Council of Tanzania will be pleased to accept comments from users of this document for the purpose of improving the next edition.



Dr. Charles E. Msonde
EXECUTIVE SECRETARY

PRE ACE

This booklet was prepared to address the shortcomings noted in Mathematical Tables (MT) which were used in National Examinations. It was observed that candidates used Mathematical Tables and Mathematical formulae (M) in National Examinations which were different from one school to another. The documents had different contents produced in different formats and by different authors. Some of these documents had many tables formulae and contained worked examples while others did not have.

The National Examinations Council of Tanzania (NECTA) has prepared this booklet containing MT and M in order to have a common standard document. This document brings uniformity to all candidates in examinations and fairness among candidates. The document aims to help candidates to perform various computations while answering questions.

The booklet was prepared by a team of nominated experts in the field of Mathematics from secondary schools NECTA Tanzania Institute of Education (TIE) University of Dar es Salaam (UDSM) and Dar es Salaam University College of Education (DUCE). They reviewed text and reference books syllabi past papers marking schemes examination formats and mathematical tables that were in use. These documents guided them in preparing the NECTA version of the MT and M .

Despite the fact that the use of calculators is growing rapidly the need of mathematical tables is still inevitable. This booklet is the only authorized tool that will be used in all national examinations in solving mathematical problems. On the other hand the candidates who are allowed to use calculators may use non programmable calculators only.

It is expected that the booklet will be useful to candidates students and other people in contexts where these tables and formulae are applicable.



Dr. Charles E. Msonde
EXECUTIVE SECRETARY

1 INTRODUCTION

The purpose of preparing this booklet is to have an authorized document that will be used uniformly by all candidates in examinations. The document fills the gap that existed in secondary schools whereby different mathematical tables were used.

The booklet contains the following Mathematical Tables: Common Logarithms, Antilogarithms, Sines, Cosines, Tangents, Square Roots, Reciprocals, Cube Roots, Natural (Napierian) Logarithms, Normal Distribution, Poisson Distribution and Binomial Distribution. It contains some formulae and constants from the topics taught in Basic Mathematics, Additional Mathematics, Basic Applied Mathematics and Advanced Mathematics. The few selected formulae and constants in this booklet are the ones which are not easily memorized by candidates but they are needed in solving mathematical problems. Also, it contains selected examples which are given at the end of some tables.

Mathematical Tables such as Reciprocal of Trigonometric Ratios, Inverse of Trigonometric Ratios, Cubes and Hyperbolic Functions are not included in this booklet, because their use may be replaced by the tables which are found in this booklet. For instance, to find a cube of a number, candidates may use the tables of logarithms and antilogarithms. Furthermore, to determine the secant of an angle, candidates may find the cosine of that angle and then find its reciprocal by using cosines and reciprocal tables respectively.

The contents of this booklet, in the following part, are divided into three categories; Mathematical tables, Mathematical formula and Constants in sections 2, 3 and 4 respectively.

2 MATHEMATICAL TABLES

Common Logarithms of Numbers

log ₁₀ x or log x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
1.0	0.0000	0.0043	0.0086	0.0128	0.0170	0.0212	0.0253	0.0294	0.0334	0.0374	4	8	12	17	21	25	29	33	37
1.1	0.0414	0.0453	0.0492	0.0531	0.0569	0.0607	0.0645	0.0682	0.0719	0.0755	4	8	11	15	19	23	26	30	34
1.2	0.0792	0.0828	0.0864	0.0899	0.0934	0.0969	0.1004	0.1038	0.1072	0.1106	3	7	10	14	17	21	24	28	31
1.3	0.1139	0.1173	0.1206	0.1239	0.1271	0.1303	0.1335	0.1367	0.1399	0.1430	3	6	10	13	16	19	23	26	29
1.4	0.1461	0.1492	0.1523	0.1553	0.1584	0.1614	0.1644	0.1673	0.1703	0.1732	3	6	9	12	15	18	21	24	27
1.5	0.1761	0.1790	0.1818	0.1847	0.1875	0.1903	0.1931	0.1959	0.1987	0.2014	3	6	8	11	14	17	20	22	25
1.6	0.2041	0.2068	0.2095	0.2122	0.2148	0.2175	0.2201	0.2227	0.2253	0.2279	3	5	8	11	13	16	18	21	24
1.7	0.2304	0.2330	0.2355	0.2380	0.2405	0.2430	0.2455	0.2480	0.2504	0.2529	2	5	7	10	12	15	17	20	22
1.8	0.2553	0.2577	0.2601	0.2625	0.2648	0.2672	0.2695	0.2718	0.2742	0.2765	2	5	7	9	12	14	16	19	21
1.9	0.2788	0.2810	0.2833	0.2856	0.2878	0.2900	0.2923	0.2945	0.2967	0.2989	2	4	7	9	11	13	16	18	20
2.0	0.3010	0.3032	0.3054	0.3075	0.3096	0.3118	0.3139	0.3160	0.3181	0.3201	2	4	6	8	11	13	15	17	19
2.1	0.3222	0.3243	0.3263	0.3284	0.3304	0.3324	0.3345	0.3365	0.3385	0.3404	2	4	6	8	10	12	14	16	18
2.2	0.3424	0.3444	0.3464	0.3483	0.3502	0.3522	0.3541	0.3560	0.3579	0.3598	2	4	6	8	10	12	14	15	17
2.3	0.3617	0.3636	0.3655	0.3674	0.3692	0.3711	0.3729	0.3747	0.3766	0.3784	2	4	6	7	9	11	13	15	17
2.4	0.3802	0.3820	0.3838	0.3856	0.3874	0.3892	0.3909	0.3927	0.3945	0.3962	2	4	5	7	9	11	12	14	16
2.5	0.3979	0.3997	0.4014	0.4031	0.4048	0.4065	0.4082	0.4099	0.4116	0.4133	2	3	5	7	9	10	12	14	15
2.6	0.4150	0.4166	0.4183	0.4200	0.4216	0.4232	0.4249	0.4265	0.4281	0.4298	2	3	5	7	8	10	11	13	15
2.7	0.4314	0.4330	0.4346	0.4362	0.4378	0.4393	0.4409	0.4425	0.4440	0.4456	2	3	5	6	8	9	11	13	14
2.8	0.4472	0.4487	0.4502	0.4518	0.4533	0.4548	0.4564	0.4579	0.4594	0.4609	2	3	5	6	8	9	11	12	14
2.9	0.4624	0.4639	0.4654	0.4669	0.4683	0.4698	0.4713	0.4728	0.4742	0.4757	1	3	4	6	7	9	10	12	13
3.0	0.4771	0.4786	0.4800	0.4814	0.4829	0.4843	0.4857	0.4871	0.4886	0.4900	1	3	4	6	7	9	10	11	13
3.1	0.4914	0.4928	0.4942	0.4955	0.4969	0.4983	0.4997	0.5011	0.5024	0.5038	1	3	4	6	7	8	10	11	12
3.2	0.5051	0.5065	0.5079	0.5092	0.5105	0.5119	0.5132	0.5145	0.5159	0.5172	1	3	4	5	7	8	9	11	12
3.3	0.5185	0.5198	0.5211	0.5224	0.5237	0.5250	0.5263	0.5276	0.5289	0.5302	1	3	4	5	6	8	9	10	12
3.4	0.5315	0.5328	0.5340	0.5353	0.5366	0.5378	0.5391	0.5403	0.5416	0.5428	1	3	4	5	6	8	9	10	11
3.5	0.5441	0.5453	0.5465	0.5478	0.5490	0.5502	0.5514	0.5527	0.5539	0.5551	1	2	4	5	6	7	9	10	11
3.6	0.5563	0.5575	0.5587	0.5599	0.5611	0.5623	0.5635	0.5647	0.5658	0.5670	1	2	4	5	6	7	8	10	11
3.7	0.5682	0.5694	0.5705	0.5717	0.5729	0.5740	0.5752	0.5763	0.5775	0.5786	1	2	3	5	6	7	8	9	10
3.8	0.5798	0.5809	0.5821	0.5832	0.5843	0.5855	0.5866	0.5877	0.5888	0.5899	1	2	3	5	6	7	8	9	10
3.9	0.5911	0.5922	0.5933	0.5944	0.5955	0.5966	0.5977	0.5988	0.5999	0.6010	1	2	3	4	6	7	8	9	10
4.0	0.6021	0.6031	0.6042	0.6053	0.6064	0.6075	0.6085	0.6096	0.6107	0.6117	1	2	3	4	5	6	8	9	10
4.1	0.6128	0.6138	0.6149	0.6160	0.6170	0.6180	0.6191	0.6201	0.6212	0.6222	1	2	3	4	5	6	7	8	9
4.2	0.6232	0.6243	0.6253	0.6263	0.6274	0.6284	0.6294	0.6304	0.6314	0.6325	1	2	3	4	5	6	7	8	9
4.3	0.6335	0.6345	0.6355	0.6365	0.6375	0.6385	0.6395	0.6405	0.6415	0.6425	1	2	3	4	5	6	7	8	9
4.4	0.6435	0.6444	0.6454	0.6464	0.6474	0.6484	0.6493	0.6503	0.6513	0.6522	1	2	3	4	5	6	7	8	9
4.5	0.6532	0.6542	0.6551	0.6561	0.6571	0.6580	0.6590	0.6599	0.6609	0.6618	1	2	3	4	5	6	7	8	9
4.6	0.6628	0.6637	0.6646	0.6656	0.6665	0.6675	0.6684	0.6693	0.6702	0.6712	1	2	3	4	5	6	7	7	8
4.7	0.6721	0.6730	0.6739	0.6749	0.6758	0.6767	0.6776	0.6785	0.6794	0.6803	1	2	3	4	5	5	6	7	8
4.8	0.6812	0.6821	0.6830	0.6839	0.6848	0.6857	0.6866	0.6875	0.6884	0.6893	1	2	3	4	4	5	6	7	8
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

log ₁₀ x or log x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
4.9	0.6902	0.6911	0.6920	0.6928	0.6937	0.6946	0.6955	0.6964	0.6972	0.6981	1	2	3	4	4	5	6	7	8
5.0	0.6990	0.6998	0.7007	0.7016	0.7024	0.7033	0.7042	0.7050	0.7059	0.7067	1	2	3	3	4	5	6	7	8
5.1	0.7076	0.7084	0.7093	0.7101	0.7110	0.7118	0.7126	0.7135	0.7143	0.7152	1	2	3	3	4	5	6	7	8
5.2	0.7160	0.7168	0.7177	0.7185	0.7193	0.7202	0.7210	0.7218	0.7226	0.7235	1	2	2	3	4	5	6	7	7
5.3	0.7243	0.7251	0.7259	0.7267	0.7275	0.7284	0.7292	0.7300	0.7308	0.7316	1	2	2	3	4	5	6	6	
5.4	0.7324	0.7332	0.7340	0.7348	0.7356	0.7364	0.7372	0.7380	0.7388	0.7396	1	2	2	3	4	5	6	6	7
5.5	0.7404	0.7412	0.7419	0.7427	0.7435	0.7443	0.7451	0.7459	0.7466	0.7474	1	2	2	3	4	5	5	6	7
5.6	0.7482	0.7490	0.7497	0.7505	0.7513	0.7520	0.7528	0.7536	0.7543	0.7551	1	2	2	3	4	5	5	6	7
5.7	0.7559	0.7566	0.7574	0.7582	0.7589	0.7597	0.7604	0.7612	0.7619	0.7627	1	2	2	3	4	5	5	6	7
5.8	0.7634	0.7642	0.7649	0.7657	0.7664	0.7672	0.7679	0.7686	0.7694	0.7701	1	1	2	3	4	4	5	6	7
5.9	0.7709	0.7716	0.7723	0.7731	0.7738	0.7745	0.7752	0.7760	0.7767	0.7774	1	1	2	3	4	4	5	6	7
6.0	0.7782	0.7789	0.7796	0.7803	0.7810	0.7818	0.7825	0.7832	0.7839	0.7846	1	1	2	3	4	4	5	6	6
6.1	0.7853	0.7860	0.7868	0.7875	0.7882	0.7889	0.7896	0.7903	0.7910	0.7917	1	1	2	3	4	4	5	6	6
6.2	0.7924	0.7931	0.7938	0.7945	0.7952	0.7959	0.7966	0.7973	0.7980	0.7987	1	1	2	3	3	4	5	6	6
6.3	0.7993	0.8000	0.8007	0.8014	0.8021	0.8028	0.8035	0.8041	0.8048	0.8055	1	1	2	3	3	4	5	5	6
6.4	0.8062	0.8069	0.8075	0.8082	0.8089	0.8096	0.8102	0.8109	0.8116	0.8122	1	1	2	3	3	4	5	5	6
6.5	0.8129	0.8136	0.8142	0.8149	0.8156	0.8162	0.8169	0.8176	0.8182	0.8189	1	1	2	3	3	4	5	5	6
6.6	0.8195	0.8202	0.8209	0.8215	0.8222	0.8228	0.8235	0.8241	0.8248	0.8254	1	1	2	3	3	4	5	5	6
6.7	0.8261	0.8267	0.8274	0.8280	0.8287	0.8293	0.8299	0.8306	0.8312	0.8319	1	1	2	3	3	4	5	5	6
6.8	0.8325	0.8331	0.8338	0.8344	0.8351	0.8357	0.8363	0.8370	0.8376	0.8382	1	1	2	3	3	4	4	5	6
6.9	0.8388	0.8395	0.8401	0.8407	0.8414	0.8420	0.8426	0.8432	0.8439	0.8445	1	1	2	3	3	4	4	5	6
7.0	0.8451	0.8457	0.8463	0.8470	0.8476	0.8482	0.8488	0.8494	0.8500	0.8506	1	1	2	2	3	4	4	5	6
7.1	0.8513	0.8519	0.8525	0.8531	0.8537	0.8543	0.8549	0.8555	0.8561	0.8567	1	1	2	2	3	4	4	5	5
7.2	0.8573	0.8579	0.8585	0.8591	0.8597	0.8603	0.8609	0.8615	0.8621	0.8627	1	1	2	2	3	4	4	5	5
7.3	0.8633	0.8639	0.8645	0.8651	0.8657	0.8663	0.8669	0.8675	0.8681	0.8686	1	1	2	2	3	4	4	5	5
7.4	0.8692	0.8698	0.8704	0.8710	0.8716	0.8722	0.8727	0.8733	0.8739	0.8745	1	1	2	2	3	3	4	5	5
7.5	0.8751	0.8756	0.8762	0.8768	0.8774	0.8779	0.8785	0.8791	0.8797	0.8802	1	1	2	2	3	3	4	5	5
7.6	0.8808	0.8814	0.8820	0.8825	0.8831	0.8837	0.8842	0.8848	0.8854	0.8859	1	1	2	2	3	3	4	5	5
7.7	0.8865	0.8871	0.8876	0.8882	0.8887	0.8893	0.8899	0.8904	0.8910	0.8915	1	1	2	2	3	3	4	4	5
7.8	0.8921	0.8927	0.8932	0.8938	0.8943	0.8949	0.8954	0.8960	0.8965	0.8971	1	1	2	2	3	3	4	4	5
7.9	0.8976	0.8982	0.8987	0.8993	0.8998	0.9004	0.9009	0.9015	0.9020	0.9025	1	1	2	2	3	3	4	4	5
8.0	0.9031	0.9036	0.9042	0.9047	0.9053	0.9058	0.9063	0.9069	0.9074	0.9079	1	1	2	2	3	3	4	4	5
8.1	0.9085	0.9090	0.9096	0.9101	0.9106	0.9112	0.9117	0.9122	0.9128	0.9133	1	1	2	2	3	3	4	4	5
8.2	0.9138	0.9143	0.9149	0.9154	0.9159	0.9165	0.9170	0.9175	0.9180	0.9186	1	1	2	2	3	3	4	4	5
8.3	0.9191	0.9196	0.9201	0.9206	0.9212	0.9217	0.9222	0.9227	0.9232	0.9238	1	1	2	2	3	3	4	4	5
8.4	0.9243	0.9248	0.9253	0.9258	0.9263	0.9269	0.9274	0.9279	0.9284	0.9289	1	1	2	2	3	3	4	4	5
8.5	0.9294	0.9299	0.9304	0.9309	0.9315	0.9320	0.9325	0.9330	0.9335	0.9340	1	1	2	2	3	3	4	4	5
8.6	0.9345	0.9350	0.9355	0.9360	0.9365	0.9370	0.9375	0.9380	0.9385	0.9390	1	1	2	2	3	3	4	4	5
8.7	0.9395	0.9400	0.9405	0.9410	0.9415	0.9420	0.9425	0.9430	0.9435	0.9440	0	1	1	2	2	3	3	4	4
8.8	0.9445	0.9450	0.9455	0.9460	0.9465	0.9469	0.9474	0.9479	0.9484	0.9489	0	1	1	2	2	3	3	4	4
8.9	0.9494	0.9499	0.9504	0.9509	0.9513	0.9518	0.9523	0.9528	0.9533	0.9538	0	1	1	2	2	3	3	4	4
9.0	0.9542	0.9547	0.9552	0.9557	0.9562	0.9566	0.9571	0.9576	0.9581	0.9586	0	1	1	2	2	3	3	4	4
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

log ₁₀ x or log x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
9.1	0.9590	0.9595	0.9600	0.9605	0.9609	0.9614	0.9619	0.9624	0.9628	0.9633	0	1	1	2	2	3	3	4	4
9.2	0.9638	0.9643	0.9647	0.9652	0.9657	0.9661	0.9666	0.9671	0.9675	0.9680	0	1	1	2	2	3	3	4	4
9.3	0.9685	0.9689	0.9694	0.9699	0.9703	0.9708	0.9713	0.9717	0.9722	0.9727	0	1	1	2	2	3	3	4	4
9.4	0.9731	0.9736	0.9741	0.9745	0.9750	0.9754	0.9759	0.9763	0.9768	0.9773	0	1	1	2	2	3	3	4	4
9.5	0.9777	0.9782	0.9786	0.9791	0.9795	0.9800	0.9805	0.9809	0.9814	0.9818	0	1	1	2	2	3	3	4	4
9.6	0.9823	0.9827	0.9832	0.9836	0.9841	0.9845	0.9850	0.9854	0.9859	0.9863	0	1	1	2	2	3	3	4	4
9.7	0.9868	0.9872	0.9877	0.9881	0.9886	0.9890	0.9894	0.9899	0.9903	0.9908	0	1	1	2	2	3	3	4	4
9.8	0.9912	0.9917	0.9921	0.9926	0.9930	0.9934	0.9939	0.9943	0.9948	0.9952	0	1	1	2	2	3	3	4	4
9.9	0.9956	0.9961	0.9965	0.9969	0.9974	0.9978	0.9983	0.9987	0.9991	0.9996	0	1	1	2	2	3	3	3	4
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Example: $\log_{10} 9.592 = 0.9819$

Antilogarithms

10 ^x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
.00	1.000	1.002	1.005	1.007	1.009	1.012	1.014	1.016	1.019	1.021	0	0	1	1	1	1	2	2	2
.01	1.023	1.026	1.028	1.030	1.033	1.035	1.038	1.040	1.042	1.045	0	0	1	1	1	1	2	2	2
.02	1.047	1.050	1.052	1.054	1.057	1.059	1.062	1.064	1.067	1.069	0	0	1	1	1	1	2	2	2
.03	1.072	1.074	1.077	1.079	1.081	1.084	1.086	1.089	1.091	1.094	0	0	1	1	1	1	2	2	2
.04	1.097	1.099	1.102	1.104	1.107	1.109	1.112	1.114	1.117	1.119	0	1	1	1	1	2	2	2	2
.05	1.122	1.125	1.127	1.130	1.132	1.135	1.138	1.140	1.143	1.146	0	1	1	1	1	2	2	2	2
.06	1.148	1.151	1.154	1.156	1.159	1.161	1.164	1.167	1.170	1.172	0	1	1	1	1	2	2	2	2
.07	1.175	1.178	1.180	1.183	1.186	1.189	1.191	1.194	1.197	1.200	0	1	1	1	1	2	2	2	2
.08	1.202	1.205	1.208	1.211	1.213	1.216	1.219	1.222	1.225	1.227	0	1	1	1	1	2	2	2	3
.09	1.230	1.233	1.236	1.239	1.242	1.245	1.247	1.250	1.253	1.256	0	1	1	1	1	2	2	2	3
.10	1.259	1.262	1.265	1.268	1.271	1.274	1.276	1.279	1.282	1.285	0	1	1	1	1	2	2	2	3
.11	1.288	1.291	1.294	1.297	1.300	1.303	1.306	1.309	1.312	1.315	0	1	1	1	1	2	2	2	3
.12	1.318	1.321	1.324	1.327	1.331	1.334	1.337	1.340	1.343	1.346	0	1	1	1	2	2	2	2	3
.13	1.349	1.352	1.355	1.358	1.361	1.365	1.368	1.371	1.374	1.377	0	1	1	1	2	2	2	3	3
.14	1.380	1.384	1.387	1.390	1.393	1.396	1.400	1.403	1.406	1.409	0	1	1	1	2	2	2	3	3
.15	1.413	1.416	1.419	1.422	1.426	1.429	1.432	1.436	1.439	1.442	0	1	1	1	2	2	2	3	3
.16	1.445	1.449	1.452	1.456	1.459	1.462	1.466	1.469	1.472	1.476	0	1	1	1	2	2	2	3	3
.17	1.479	1.483	1.486	1.489	1.493	1.496	1.500	1.503	1.507	1.510	0	1	1	1	2	2	2	3	3
.18	1.514	1.517	1.521	1.524	1.528	1.531	1.535	1.538	1.542	1.545	0	1	1	1	2	2	2	3	3
.19	1.549	1.552	1.556	1.560	1.563	1.567	1.570	1.574	1.578	1.581	0	1	1	1	2	2	3	3	3
.20	1.585	1.589	1.592	1.596	1.600	1.603	1.607	1.611	1.614	1.618	0	1	1	1	2	2	3	3	3
.21	1.622	1.626	1.629	1.633	1.637	1.641	1.644	1.648	1.652	1.656	0	1	1	2	2	2	3	3	3
.22	1.660	1.663	1.667	1.671	1.675	1.679	1.683	1.687	1.690	1.694	0	1	1	2	2	2	3	3	3
.23	1.698	1.702	1.706	1.710	1.714	1.718	1.722	1.726	1.730	1.734	0	1	1	2	2	2	3	3	4
.24	1.738	1.742	1.746	1.750	1.754	1.758	1.762	1.766	1.770	1.774	0	1	1	2	2	2	3	3	4
.25	1.778	1.782	1.787	1.791	1.795	1.799	1.803	1.807	1.811	1.816	0	1	1	2	2	2	3	3	4
.26	1.820	1.824	1.828	1.832	1.837	1.841	1.845	1.849	1.854	1.858	0	1	1	2	2	3	3	3	4
.27	1.862	1.866	1.871	1.875	1.879	1.884	1.888	1.892	1.897	1.901	0	1	1	2	2	3	3	3	4
.28	1.906	1.910	1.914	1.919	1.923	1.928	1.932	1.936	1.941	1.945	0	1	1	2	2	3	3	4	4
.29	1.950	1.954	1.959	1.963	1.968	1.972	1.977	1.982	1.986	1.991	0	1	1	2	2	3	3	4	4
.30	1.995	2.000	2.005	2.009	2.014	2.018	2.023	2.028	2.032	2.037	0	1	1	2	2	3	3	4	4
.31	2.042	2.046	2.051	2.056	2.061	2.065	2.070	2.075	2.080	2.085	0	1	1	2	2	3	3	4	4
.32	2.089	2.094	2.099	2.104	2.109	2.114	2.118	2.123	2.128	2.133	0	1	1	2	2	3	3	4	4
.33	2.138	2.143	2.148	2.153	2.158	2.163	2.168	2.173	2.178	2.183	0	1	1	2	2	3	3	4	4
.34	2.188	2.193	2.198	2.203	2.208	2.213	2.218	2.223	2.228	2.234	1	1	2	2	3	3	4	4	5
.35	2.239	2.244	2.249	2.254	2.259	2.265	2.270	2.275	2.280	2.286	1	1	2	2	3	3	4	4	5
.36	2.291	2.296	2.301	2.307	2.312	2.317	2.323	2.328	2.334	2.339	1	1	2	2	3	3	4	4	5
.37	2.344	2.350	2.355	2.361	2.366	2.371	2.377	2.382	2.388	2.393	1	1	2	2	3	3	4	4	5
.38	2.399	2.404	2.410	2.416	2.421	2.427	2.432	2.438	2.443	2.449	1	1	2	2	3	3	4	4	5
.39	2.455	2.460	2.466	2.472	2.477	2.483	2.489	2.495	2.500	2.506	1	1	2	2	3	3	4	5	5
.40	2.512	2.518	2.524	2.529	2.535	2.541	2.547	2.553	2.559	2.565	1	1	2	2	3	4	4	5	5
.41	2.570	2.576	2.582	2.588	2.594	2.600	2.606	2.612	2.618	2.624	1	1	2	2	3	4	4	5	5
.42	2.630	2.636	2.642	2.649	2.655	2.661	2.667	2.673	2.679	2.685	1	1	2	2	3	4	4	5	6
.43	2.692	2.698	2.704	2.710	2.716	2.723	2.729	2.735	2.742	2.748	1	1	2	3	3	4	4	5	6
.44	2.754	2.761	2.767	2.773	2.780	2.786	2.793	2.799	2.805	2.812	1	1	2	3	3	4	4	5	6
.45	2.818	2.825	2.831	2.838	2.845	2.851	2.858	2.864	2.871	2.877	1	1	2	3	3	4	5	5	6
.46	2.884	2.891	2.897	2.904	2.911	2.917	2.924	2.931	2.938	2.944	1	1	2	3	3	4	5	5	6
.47	2.951	2.958	2.965	2.972	2.979	2.985	2.992	2.999	3.006	3.013	1	1	2	3	3	4	5	5	6
.48	3.020	3.027	3.034	3.041	3.048	3.055	3.062	3.069	3.076	3.083	1	1	2	3	4	4	5	6	6
.49	3.090	3.097	3.105	3.112	3.119	3.126	3.133	3.141	3.148	3.155	1	1	2	3	4	4	5	6	6
.50	3.162	3.170	3.177	3.184	3.192	3.199	3.206	3.214	3.221	3.229	1	1	2	3	4	4	5	6	7
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

10 ^x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
.51	3.236	3.243	3.251	3.258	3.266	3.273	3.281	3.289	3.296	3.304	1	2	2	3	4	5	5	6	7
.52	3.311	3.319	3.327	3.334	3.342	3.350	3.357	3.365	3.373	3.381	1	2	2	3	4	5	5	6	7
.53	3.388	3.396	3.404	3.412	3.420	3.428	3.436	3.444	3.451	3.459	1	2	2	3	4	5	6	6	7
.54	3.467	3.475	3.483	3.491	3.500	3.508	3.516	3.524	3.532	3.540	1	2	2	3	4	5	6	6	7
.55	3.548	3.556	3.565	3.573	3.581	3.589	3.598	3.606	3.614	3.622	1	2	2	3	4	5	6	7	7
.56	3.631	3.639	3.648	3.656	3.664	3.673	3.681	3.690	3.698	3.707	1	2	3	3	4	5	6	7	8
.57	3.715	3.724	3.733	3.741	3.750	3.758	3.767	3.776	3.784	3.793	1	2	3	3	4	5	6	7	8
.58	3.802	3.811	3.819	3.828	3.837	3.846	3.855	3.864	3.873	3.882	1	2	3	4	4	5	6	7	8
.59	3.891	3.899	3.908	3.917	3.926	3.936	3.945	3.954	3.963	3.972	1	2	3	4	5	5	6	7	8
.60	3.981	3.990	3.999	4.009	4.018	4.027	4.037	4.046	4.055	4.064	1	2	3	4	5	6	6	7	8
.61	4.074	4.083	4.093	4.102	4.112	4.121	4.131	4.140	4.150	4.159	1	2	3	4	5	6	7	8	9
.62	4.169	4.178	4.188	4.198	4.207	4.217	4.227	4.236	4.246	4.256	1	2	3	4	5	6	7	8	9
.63	4.266	4.276	4.286	4.295	4.305	4.315	4.325	4.335	4.345	4.355	1	2	3	4	5	6	7	8	9
.64	4.365	4.375	4.385	4.395	4.406	4.416	4.426	4.436	4.446	4.457	1	2	3	4	5	6	7	8	9
.65	4.467	4.477	4.488	4.498	4.508	4.519	4.529	4.539	4.550	4.560	1	2	3	4	5	6	7	8	9
.66	4.571	4.581	4.592	4.603	4.613	4.624	4.635	4.645	4.656	4.667	1	2	3	4	5	6	7	9	10
.67	4.677	4.688	4.699	4.710	4.721	4.732	4.742	4.753	4.764	4.775	1	2	3	4	5	7	8	9	10
.68	4.786	4.797	4.808	4.820	4.831	4.842	4.853	4.864	4.875	4.887	1	2	3	4	6	7	8	9	10
.69	4.898	4.909	4.920	4.932	4.943	4.955	4.966	4.977	4.989	5.000	1	2	3	5	6	7	8	9	10
.70	5.012	5.023	5.035	5.047	5.058	5.070	5.082	5.093	5.105	5.117	1	2	3	5	6	7	8	9	11
.71	5.129	5.140	5.152	5.164	5.176	5.188	5.200	5.212	5.224	5.236	1	2	4	5	6	7	8	10	11
.72	5.248	5.260	5.272	5.285	5.297	5.309	5.321	5.333	5.346	5.358	1	2	4	5	6	7	9	10	11
.73	5.370	5.383	5.395	5.408	5.420	5.433	5.445	5.458	5.470	5.483	1	2	4	5	6	8	9	10	11
.74	5.495	5.508	5.521	5.534	5.546	5.559	5.572	5.585	5.598	5.611	1	3	4	5	6	8	9	10	12
.75	5.623	5.636	5.649	5.662	5.675	5.689	5.702	5.715	5.728	5.741	1	3	4	5	7	8	9	10	12
.76	5.754	5.768	5.781	5.794	5.808	5.821	5.835	5.848	5.861	5.875	1	3	4	5	7	8	9	11	12
.77	5.888	5.902	5.916	5.929	5.943	5.957	5.970	5.984	5.998	6.012	1	3	4	5	7	8	10	11	12
.78	6.026	6.040	6.053	6.067	6.081	6.095	6.109	6.124	6.138	6.152	1	3	4	6	7	8	10	11	13
.79	6.166	6.180	6.194	6.209	6.223	6.237	6.252	6.266	6.281	6.295	1	3	4	6	7	9	10	11	13
.80	6.310	6.324	6.339	6.353	6.368	6.383	6.397	6.412	6.427	6.442	1	3	4	6	7	9	10	12	13
.81	6.457	6.471	6.486	6.501	6.516	6.531	6.546	6.562	6.577	6.592	2	3	5	6	8	9	11	12	14
.82	6.607	6.622	6.637	6.653	6.668	6.683	6.699	6.714	6.730	6.745	2	3	5	6	8	9	11	12	14
.83	6.761	6.776	6.792	6.808	6.823	6.839	6.855	6.871	6.887	6.902	2	3	5	6	8	9	11	13	14
.84	6.918	6.934	6.950	6.966	6.982	6.998	7.015	7.031	7.047	7.063	2	3	5	6	8	10	11	13	15
.85	7.080	7.096	7.112	7.129	7.145	7.161	7.178	7.195	7.211	7.228	2	3	5	7	8	10	12	13	15
.86	7.244	7.261	7.278	7.295	7.311	7.328	7.345	7.362	7.379	7.396	2	3	5	7	8	10	12	13	15
.87	7.413	7.430	7.447	7.465	7.482	7.499	7.516	7.534	7.551	7.568	2	3	5	7	9	10	12	14	16
.88	7.586	7.603	7.621	7.638	7.656	7.674	7.691	7.709	7.727	7.745	2	4	5	7	9	11	12	14	16
.89	7.763	7.780	7.798	7.816	7.834	7.852	7.871	7.889	7.907	7.925	2	4	5	7	9	11	13	14	16
.90	7.943	7.962	7.980	7.998	8.017	8.035	8.054	8.072	8.091	8.110	2	4	6	7	9	11	13	15	17
.91	8.128	8.147	8.166	8.185	8.204	8.222	8.241	8.260	8.279	8.299	2	4	6	8	9	11	13	15	17
.92	8.318	8.337	8.356	8.375	8.395	8.414	8.433	8.453	8.472	8.492	2	4	6	8	10	12	14	15	17
.93	8.511	8.531	8.551	8.570	8.590	8.610	8.630	8.650	8.670	8.690	2	4	6	8	10	12	14	16	18
.94	8.710	8.730	8.750	8.770	8.790	8.811	8.831	8.851	8.872	8.892	2	4	6	8	10	12	14	16	18
.95	8.913	8.933	8.954	8.974	8.995	9.016	9.037	9.057	9.078	9.099	2	4	6	8	10	12	15	17	19
.96	9.120	9.141	9.162	9.183	9.205	9.226	9.247	9.268	9.290	9.311	2	4	6	8	11	13	15	17	19
.97	9.333	9.354	9.376	9.397	9.419	9.441	9.462	9.484	9.506	9.528	2	4	7	9	11	13	15	17	20
.98	9.550	9.572	9.594	9.616	9.638	9.661	9.683	9.705	9.728	9.750	2	4	7	9	11	13	16	18	20
.99	9.772	9.795	9.818	9.840	9.863	9.886	9.908	9.931	9.954	9.977	2	5	7	9	11	14	16	18	21
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Example: $\text{Anti log } 0.8523 = 10^{0.8523} = 7.117$

Degrees to Radians

<i>Degrees, Minutes to Radians</i>															
<i>x</i>	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
0	0.0000	0.0017	0.0035	0.0052	0.0070	0.0087	0.0105	0.0122	0.0140	0.0157	3	6	9	12	15
1	0.0175	0.0192	0.0209	0.0227	0.0244	0.0262	0.0279	0.0297	0.0314	0.0332	3	6	9	12	15
2	0.0349	0.0367	0.0384	0.0401	0.0419	0.0436	0.0454	0.0471	0.0489	0.0506	3	6	9	12	15
3	0.0524	0.0541	0.0559	0.0576	0.0593	0.0611	0.0628	0.0646	0.0663	0.0681	3	6	9	12	15
4	0.0698	0.0716	0.0733	0.0750	0.0768	0.0785	0.0803	0.0820	0.0838	0.0855	3	6	9	12	15
5	0.0873	0.0890	0.0908	0.0925	0.0942	0.0960	0.0977	0.0995	0.1012	0.1030	3	6	9	12	15
6	0.1047	0.1065	0.1082	0.1100	0.1117	0.1134	0.1152	0.1169	0.1187	0.1204	3	6	9	12	15
7	0.1222	0.1239	0.1257	0.1274	0.1292	0.1309	0.1326	0.1344	0.1361	0.1379	3	6	9	12	15
8	0.1396	0.1414	0.1431	0.1449	0.1466	0.1484	0.1501	0.1518	0.1536	0.1553	3	6	9	12	15
9	0.1571	0.1588	0.1606	0.1623	0.1641	0.1658	0.1676	0.1693	0.1710	0.1728	3	6	9	12	15
10	0.1745	0.1763	0.1780	0.1798	0.1815	0.1833	0.1850	0.1868	0.1885	0.1902	3	6	9	12	15
11	0.1920	0.1937	0.1955	0.1972	0.1990	0.2007	0.2025	0.2042	0.2059	0.2077	3	6	9	12	15
12	0.2094	0.2112	0.2129	0.2147	0.2164	0.2182	0.2199	0.2217	0.2234	0.2251	3	6	9	12	15
13	0.2269	0.2286	0.2304	0.2321	0.2339	0.2356	0.2374	0.2391	0.2409	0.2426	3	6	9	12	15
14	0.2443	0.2461	0.2478	0.2496	0.2513	0.2531	0.2548	0.2566	0.2583	0.2601	3	6	9	12	15
15	0.2618	0.2635	0.2653	0.2670	0.2688	0.2705	0.2723	0.2740	0.2758	0.2775	3	6	9	12	15
16	0.2793	0.2810	0.2827	0.2845	0.2862	0.2880	0.2897	0.2915	0.2932	0.2950	3	6	9	12	15
17	0.2967	0.2985	0.3002	0.3019	0.3037	0.3054	0.3072	0.3089	0.3107	0.3124	3	6	9	12	15
18	0.3142	0.3159	0.3176	0.3194	0.3211	0.3229	0.3246	0.3264	0.3281	0.3299	3	6	9	12	15
19	0.3316	0.3334	0.3351	0.3368	0.3386	0.3403	0.3421	0.3438	0.3456	0.3473	3	6	9	12	15
20	0.3491	0.3508	0.3526	0.3543	0.3560	0.3578	0.3595	0.3613	0.3630	0.3648	3	6	9	12	15
21	0.3665	0.3683	0.3700	0.3718	0.3735	0.3752	0.3770	0.3787	0.3805	0.3822	3	6	9	12	15
22	0.3840	0.3857	0.3875	0.3892	0.3910	0.3927	0.3944	0.3962	0.3979	0.3997	3	6	9	12	15
23	0.4014	0.4032	0.4049	0.4067	0.4084	0.4102	0.4119	0.4136	0.4154	0.4171	3	6	9	12	15
24	0.4189	0.4206	0.4224	0.4241	0.4259	0.4276	0.4294	0.4311	0.4328	0.4346	3	6	9	12	15
25	0.4363	0.4381	0.4398	0.4416	0.4433	0.4451	0.4468	0.4485	0.4503	0.4520	3	6	9	12	15
26	0.4538	0.4555	0.4573	0.4590	0.4608	0.4625	0.4643	0.4660	0.4677	0.4695	3	6	9	12	15
27	0.4712	0.4730	0.4747	0.4765	0.4782	0.4800	0.4817	0.4835	0.4852	0.4869	3	6	9	12	15
28	0.4887	0.4904	0.4922	0.4939	0.4957	0.4974	0.4992	0.5009	0.5027	0.5044	3	6	9	12	15
29	0.5061	0.5079	0.5096	0.5114	0.5131	0.5149	0.5166	0.5184	0.5201	0.5219	3	6	9	12	15
30	0.5236	0.5253	0.5271	0.5288	0.5306	0.5323	0.5341	0.5358	0.5376	0.5393	3	6	9	12	15
31	0.5411	0.5428	0.5445	0.5463	0.5480	0.5498	0.5515	0.5533	0.5550	0.5568	3	6	9	12	15
32	0.5585	0.5603	0.5620	0.5637	0.5655	0.5672	0.5690	0.5707	0.5725	0.5742	3	6	9	12	15
33	0.5760	0.5777	0.5794	0.5812	0.5829	0.5847	0.5864	0.5882	0.5899	0.5917	3	6	9	12	15
34	0.5934	0.5952	0.5969	0.5986	0.6004	0.6021	0.6039	0.6056	0.6074	0.6091	3	6	9	12	15
35	0.6109	0.6126	0.6144	0.6161	0.6178	0.6196	0.6213	0.6231	0.6248	0.6266	3	6	9	12	15
36	0.6283	0.6301	0.6318	0.6336	0.6353	0.6370	0.6388	0.6405	0.6423	0.6440	3	6	9	12	15
<i>x</i>	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

Degrees, Minutes to Radians															
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
37	0.6458	0.6475	0.6493	0.6510	0.6528	0.6545	0.6562	0.6580	0.6597	0.6615	3	6	9	12	15
38	0.6632	0.6650	0.6667	0.6685	0.6702	0.6720	0.6737	0.6754	0.6772	0.6789	3	6	9	12	15
39	0.6807	0.6824	0.6842	0.6859	0.6877	0.6894	0.6912	0.6929	0.6946	0.6964	3	6	9	12	15
40	0.6981	0.6999	0.7016	0.7034	0.7051	0.7069	0.7086	0.7103	0.7121	0.7138	3	6	9	12	15
41	0.7156	0.7173	0.7191	0.7208	0.7226	0.7243	0.7261	0.7278	0.7295	0.7313	3	6	9	12	15
42	0.7330	0.7348	0.7365	0.7383	0.7400	0.7418	0.7435	0.7453	0.7470	0.7487	3	6	9	12	15
43	0.7505	0.7522	0.7540	0.7557	0.7575	0.7592	0.7610	0.7627	0.7645	0.7662	3	6	9	12	15
44	0.7679	0.7697	0.7714	0.7732	0.7749	0.7767	0.7784	0.7802	0.7819	0.7837	3	6	9	12	15
45	0.7854	0.7871	0.7889	0.7906	0.7924	0.7941	0.7959	0.7976	0.7994	0.8011	3	6	9	12	15
46	0.8029	0.8046	0.8063	0.8081	0.8098	0.8116	0.8133	0.8151	0.8168	0.8186	3	6	9	12	15
47	0.8203	0.8221	0.8238	0.8255	0.8273	0.8290	0.8308	0.8325	0.8343	0.8360	3	6	9	12	15
48	0.8378	0.8395	0.8412	0.8430	0.8447	0.8465	0.8482	0.8500	0.8517	0.8535	3	6	9	12	15
49	0.8552	0.8570	0.8587	0.8604	0.8622	0.8639	0.8657	0.8674	0.8692	0.8709	3	6	9	12	15
50	0.8727	0.8744	0.8762	0.8779	0.8796	0.8814	0.8831	0.8849	0.8866	0.8884	3	6	9	12	15
51	0.8901	0.8919	0.8936	0.8954	0.8971	0.8988	0.9006	0.9023	0.9041	0.9058	3	6	9	12	15
52	0.9076	0.9093	0.9111	0.9128	0.9146	0.9163	0.9180	0.9198	0.9215	0.9233	3	6	9	12	15
53	0.9250	0.9268	0.9285	0.9303	0.9320	0.9338	0.9355	0.9372	0.9390	0.9407	3	6	9	12	15
54	0.9425	0.9442	0.9460	0.9477	0.9495	0.9512	0.9529	0.9547	0.9564	0.9582	3	6	9	12	15
55	0.9599	0.9617	0.9634	0.9652	0.9669	0.9687	0.9704	0.9721	0.9739	0.9756	3	6	9	12	15
56	0.9774	0.9791	0.9809	0.9826	0.9844	0.9861	0.9879	0.9896	0.9913	0.9931	3	6	9	12	15
57	0.9948	0.9966	0.9983	1.0001	1.0018	1.0036	1.0053	1.0071	1.0088	1.0105	3	6	9	12	15
58	1.0123	1.0140	1.0158	1.0175	1.0193	1.0210	1.0228	1.0245	1.0263	1.0280	3	6	9	12	15
59	1.0297	1.0315	1.0332	1.0350	1.0367	1.0385	1.0402	1.0420	1.0437	1.0455	3	6	9	12	15
60	1.0472	1.0489	1.0507	1.0524	1.0542	1.0559	1.0577	1.0594	1.0612	1.0629	3	6	9	12	15
61	1.0647	1.0664	1.0681	1.0699	1.0716	1.0734	1.0751	1.0769	1.0786	1.0804	3	6	9	12	15
62	1.0821	1.0838	1.0856	1.0873	1.0891	1.0908	1.0926	1.0943	1.0961	1.0978	3	6	9	12	15
63	1.0996	1.1013	1.1030	1.1048	1.1065	1.1083	1.1100	1.1118	1.1135	1.1153	3	6	9	12	15
64	1.1170	1.1188	1.1205	1.1222	1.1240	1.1257	1.1275	1.1292	1.1310	1.1327	3	6	9	12	15
65	1.1345	1.1362	1.1380	1.1397	1.1414	1.1432	1.1449	1.1467	1.1484	1.1502	3	6	9	12	15
66	1.1519	1.1537	1.1554	1.1572	1.1589	1.1606	1.1624	1.1641	1.1659	1.1676	3	6	9	12	15
67	1.1694	1.1711	1.1729	1.1746	1.1764	1.1781	1.1798	1.1816	1.1833	1.1851	3	6	9	12	15
68	1.1868	1.1886	1.1903	1.1921	1.1938	1.1956	1.1973	1.1990	1.2008	1.2025	3	6	9	12	15
69	1.2043	1.2060	1.2078	1.2095	1.2113	1.2130	1.2147	1.2165	1.2182	1.2200	3	6	9	12	15
70	1.2217	1.2235	1.2252	1.2270	1.2287	1.2305	1.2322	1.2339	1.2357	1.2374	3	6	9	12	15
71	1.2392	1.2409	1.2427	1.2444	1.2462	1.2479	1.2497	1.2514	1.2531	1.2549	3	6	9	12	15
72	1.2566	1.2584	1.2601	1.2619	1.2636	1.2654	1.2671	1.2689	1.2706	1.2723	3	6	9	12	15
73	1.2741	1.2758	1.2776	1.2793	1.2811	1.2828	1.2846	1.2863	1.2881	1.2898	3	6	9	12	15
74	1.2915	1.2933	1.2950	1.2968	1.2985	1.3003	1.3020	1.3038	1.3055	1.3073	3	6	9	12	15
75	1.3090	1.3107	1.3125	1.3142	1.3160	1.3177	1.3195	1.3212	1.3230	1.3247	3	6	9	12	15
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

<i>Degrees, Minutes to Radians</i>															
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
76	1.3265	1.3282	1.3299	1.3317	1.3334	1.3352	1.3369	1.3387	1.3404	1.3422	3	6	9	12	15
77	1.3439	1.3456	1.3474	1.3491	1.3509	1.3526	1.3544	1.3561	1.3579	1.3596	3	6	9	12	15
78	1.3614	1.3631	1.3648	1.3666	1.3683	1.3701	1.3718	1.3736	1.3753	1.3771	3	6	9	12	15
79	1.3788	1.3806	1.3823	1.3840	1.3858	1.3875	1.3893	1.3910	1.3928	1.3945	3	6	9	12	15
80	1.3963	1.3980	1.3998	1.4015	1.4032	1.4050	1.4067	1.4085	1.4102	1.4120	3	6	9	12	15
81	1.4137	1.4155	1.4172	1.4190	1.4207	1.4224	1.4242	1.4259	1.4277	1.4294	3	6	9	12	15
82	1.4312	1.4329	1.4347	1.4364	1.4382	1.4399	1.4416	1.4434	1.4451	1.4469	3	6	9	12	15
83	1.4486	1.4504	1.4521	1.4539	1.4556	1.4573	1.4591	1.4608	1.4626	1.4643	3	6	9	12	15
84	1.4661	1.4678	1.4696	1.4713	1.4731	1.4748	1.4765	1.4783	1.4800	1.4818	3	6	9	12	15
85	1.4835	1.4853	1.4870	1.4888	1.4905	1.4923	1.4940	1.4957	1.4975	1.4992	3	6	9	12	15
86	1.5010	1.5027	1.5045	1.5062	1.5080	1.5097	1.5115	1.5132	1.5149	1.5167	3	6	9	12	15
87	1.5184	1.5202	1.5219	1.5237	1.5254	1.5272	1.5289	1.5307	1.5324	1.5341	3	6	9	12	15
88	1.5359	1.5376	1.5394	1.5411	1.5429	1.5446	1.5464	1.5481	1.5499	1.5516	3	6	9	12	15
89	1.5533	1.5551	1.5568	1.5586	1.5603	1.5621	1.5638	1.5656	1.5673	1.5691	3	6	9	12	15
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

Sine of an Angle

sin x															
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
0	0.0000	0.0017	0.0035	0.0052	0.0070	0.0087	0.0105	0.0122	0.0140	0.0157	3	6	9	12	15
1	0.0175	0.0192	0.0209	0.0227	0.0244	0.0262	0.0279	0.0297	0.0314	0.0332	3	6	9	12	15
2	0.0349	0.0366	0.0384	0.0401	0.0419	0.0436	0.0454	0.0471	0.0488	0.0506	3	6	9	12	15
3	0.0523	0.0541	0.0558	0.0576	0.0593	0.0610	0.0628	0.0645	0.0663	0.0680	3	6	9	12	15
4	0.0698	0.0715	0.0732	0.0750	0.0767	0.0785	0.0802	0.0819	0.0837	0.0854	3	6	9	12	14
5	0.0872	0.0889	0.0906	0.0924	0.0941	0.0958	0.0976	0.0993	0.1011	0.1028	3	6	9	12	14
6	0.1045	0.1063	0.1080	0.1097	0.1115	0.1132	0.1149	0.1167	0.1184	0.1201	3	6	9	12	14
7	0.1219	0.1236	0.1253	0.1271	0.1288	0.1305	0.1323	0.1340	0.1357	0.1374	3	6	9	12	14
8	0.1392	0.1409	0.1426	0.1444	0.1461	0.1478	0.1495	0.1513	0.1530	0.1547	3	6	9	12	14
9	0.1564	0.1582	0.1599	0.1616	0.1633	0.1650	0.1668	0.1685	0.1702	0.1719	3	6	9	12	14
10	0.1736	0.1754	0.1771	0.1788	0.1805	0.1822	0.1840	0.1857	0.1874	0.1891	3	6	9	11	14
11	0.1908	0.1925	0.1942	0.1959	0.1977	0.1994	0.2011	0.2028	0.2045	0.2062	3	6	9	11	14
12	0.2079	0.2096	0.2113	0.2130	0.2147	0.2164	0.2181	0.2198	0.2215	0.2233	3	6	9	11	14
13	0.2250	0.2267	0.2284	0.2300	0.2317	0.2334	0.2351	0.2368	0.2385	0.2402	3	6	8	11	14
14	0.2419	0.2436	0.2453	0.2470	0.2487	0.2504	0.2521	0.2538	0.2554	0.2571	3	6	8	11	14
15	0.2588	0.2605	0.2622	0.2639	0.2656	0.2672	0.2689	0.2706	0.2723	0.2740	3	6	8	11	14
16	0.2756	0.2773	0.2790	0.2807	0.2823	0.2840	0.2857	0.2874	0.2890	0.2907	3	6	8	11	14
17	0.2924	0.2940	0.2957	0.2974	0.2990	0.3007	0.3024	0.3040	0.3057	0.3074	3	6	8	11	14
18	0.3090	0.3107	0.3123	0.3140	0.3156	0.3173	0.3190	0.3206	0.3223	0.3239	3	6	8	11	14
19	0.3256	0.3272	0.3289	0.3305	0.3322	0.3338	0.3355	0.3371	0.3387	0.3404	3	5	8	11	14
20	0.3420	0.3437	0.3453	0.3469	0.3486	0.3502	0.3518	0.3535	0.3551	0.3567	3	5	8	11	14
21	0.3584	0.3600	0.3616	0.3633	0.3649	0.3665	0.3681	0.3697	0.3714	0.3730	3	5	8	11	14
22	0.3746	0.3762	0.3778	0.3795	0.3811	0.3827	0.3843	0.3859	0.3875	0.3891	3	5	8	11	14
23	0.3907	0.3923	0.3939	0.3955	0.3971	0.3987	0.4003	0.4019	0.4035	0.4051	3	5	8	11	14
24	0.4067	0.4083	0.4099	0.4115	0.4131	0.4147	0.4163	0.4179	0.4195	0.4210	3	5	8	11	13
25	0.4226	0.4242	0.4258	0.4274	0.4289	0.4305	0.4321	0.4337	0.4352	0.4368	3	5	8	11	13
26	0.4384	0.4399	0.4415	0.4431	0.4446	0.4462	0.4478	0.4493	0.4509	0.4524	3	5	8	10	13
27	0.4540	0.4555	0.4571	0.4586	0.4602	0.4617	0.4633	0.4648	0.4664	0.4679	3	5	8	10	13
28	0.4695	0.4710	0.4726	0.4741	0.4756	0.4772	0.4787	0.4802	0.4818	0.4833	3	5	8	10	13
29	0.4848	0.4863	0.4879	0.4894	0.4909	0.4924	0.4939	0.4955	0.4970	0.4985	3	5	8	10	13
30	0.5000	0.5015	0.5030	0.5045	0.5060	0.5075	0.5090	0.5105	0.5120	0.5135	3	5	8	10	13
31	0.5150	0.5165	0.5180	0.5195	0.5210	0.5225	0.5240	0.5255	0.5270	0.5284	2	5	7	10	12
32	0.5299	0.5314	0.5329	0.5344	0.5358	0.5373	0.5388	0.5402	0.5417	0.5432	2	5	7	10	12
33	0.5446	0.5461	0.5476	0.5490	0.5505	0.5519	0.5534	0.5548	0.5563	0.5577	2	5	7	10	12
34	0.5592	0.5606	0.5621	0.5635	0.5650	0.5664	0.5678	0.5693	0.5707	0.5721	2	5	7	10	12
35	0.5736	0.5750	0.5764	0.5779	0.5793	0.5807	0.5821	0.5835	0.5850	0.5864	2	5	7	9	12
36	0.5878	0.5892	0.5906	0.5920	0.5934	0.5948	0.5962	0.5976	0.5990	0.6004	2	5	7	9	12
37	0.6018	0.6032	0.6046	0.6060	0.6074	0.6088	0.6101	0.6115	0.6129	0.6143	2	5	7	9	12
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

sin x															
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
38	0.6157	0.6170	0.6184	0.6198	0.6211	0.6225	0.6239	0.6252	0.6266	0.6280	2	5	7	9	11
39	0.6293	0.6307	0.6320	0.6334	0.6347	0.6361	0.6374	0.6388	0.6401	0.6414	2	4	7	9	11
40	0.6428	0.6441	0.6455	0.6468	0.6481	0.6494	0.6508	0.6521	0.6534	0.6547	2	4	7	9	11
41	0.6561	0.6574	0.6587	0.6600	0.6613	0.6626	0.6639	0.6652	0.6665	0.6678	2	4	7	9	11
42	0.6691	0.6704	0.6717	0.6730	0.6743	0.6756	0.6769	0.6782	0.6794	0.6807	2	4	6	9	11
43	0.6820	0.6833	0.6845	0.6858	0.6871	0.6884	0.6896	0.6909	0.6921	0.6934	2	4	6	8	11
44	0.6947	0.6959	0.6972	0.6984	0.6997	0.7009	0.7022	0.7034	0.7046	0.7059	2	4	6	8	10
45	0.7071	0.7083	0.7096	0.7108	0.7120	0.7133	0.7145	0.7157	0.7169	0.7181	2	4	6	8	10
46	0.7193	0.7206	0.7218	0.7230	0.7242	0.7254	0.7266	0.7278	0.7290	0.7302	2	4	6	8	10
47	0.7314	0.7325	0.7337	0.7349	0.7361	0.7373	0.7385	0.7396	0.7408	0.7420	2	4	6	8	10
48	0.7431	0.7443	0.7455	0.7466	0.7478	0.7490	0.7501	0.7513	0.7524	0.7536	2	4	6	8	10
49	0.7547	0.7559	0.7570	0.7581	0.7593	0.7604	0.7615	0.7627	0.7638	0.7649	2	4	6	8	9
50	0.7660	0.7672	0.7683	0.7694	0.7705	0.7716	0.7727	0.7738	0.7749	0.7760	2	4	6	7	9
51	0.7771	0.7782	0.7793	0.7804	0.7815	0.7826	0.7837	0.7848	0.7859	0.7869	2	4	5	7	9
52	0.7880	0.7891	0.7902	0.7912	0.7923	0.7934	0.7944	0.7955	0.7965	0.7976	2	4	5	7	9
53	0.7986	0.7997	0.8007	0.8018	0.8028	0.8039	0.8049	0.8059	0.8070	0.8080	2	3	5	7	9
54	0.8090	0.8100	0.8111	0.8121	0.8131	0.8141	0.8151	0.8161	0.8171	0.8181	2	3	5	7	8
55	0.8192	0.8202	0.8211	0.8221	0.8231	0.8241	0.8251	0.8261	0.8271	0.8281	2	3	5	7	8
56	0.8290	0.8300	0.8310	0.8320	0.8329	0.8339	0.8348	0.8358	0.8368	0.8377	2	3	5	6	8
57	0.8387	0.8396	0.8406	0.8415	0.8425	0.8434	0.8443	0.8453	0.8462	0.8471	2	3	5	6	8
58	0.8480	0.8490	0.8499	0.8508	0.8517	0.8526	0.8536	0.8545	0.8554	0.8563	2	3	5	6	8
59	0.8572	0.8581	0.8590	0.8599	0.8607	0.8616	0.8625	0.8634	0.8643	0.8652	1	3	4	6	7
60	0.8660	0.8669	0.8678	0.8686	0.8695	0.8704	0.8712	0.8721	0.8729	0.8738	1	3	4	6	7
61	0.8746	0.8755	0.8763	0.8771	0.8780	0.8788	0.8796	0.8805	0.8813	0.8821	1	3	4	6	7
62	0.8829	0.8838	0.8846	0.8854	0.8862	0.8870	0.8878	0.8886	0.8894	0.8902	1	3	4	5	7
63	0.8910	0.8918	0.8926	0.8934	0.8942	0.8949	0.8957	0.8965	0.8973	0.8980	1	3	4	5	6
64	0.8988	0.8996	0.9003	0.9011	0.9018	0.9026	0.9033	0.9041	0.9048	0.9056	1	3	4	5	6
65	0.9063	0.9070	0.9078	0.9085	0.9092	0.9100	0.9107	0.9114	0.9121	0.9128	1	2	4	5	6
66	0.9135	0.9143	0.9150	0.9157	0.9164	0.9171	0.9178	0.9184	0.9191	0.9198	1	2	3	5	6
67	0.9205	0.9212	0.9219	0.9225	0.9232	0.9239	0.9245	0.9252	0.9259	0.9265	1	2	3	4	6
68	0.9272	0.9278	0.9285	0.9291	0.9298	0.9304	0.9311	0.9317	0.9323	0.9330	1	2	3	4	5
69	0.9336	0.9342	0.9348	0.9354	0.9361	0.9367	0.9373	0.9379	0.9385	0.9391	1	2	3	4	5
70	0.9397	0.9403	0.9409	0.9415	0.9421	0.9426	0.9432	0.9438	0.9444	0.9449	1	2	3	4	5
71	0.9455	0.9461	0.9466	0.9472	0.9478	0.9483	0.9489	0.9494	0.9500	0.9505	1	2	3	4	5
72	0.9511	0.9516	0.9521	0.9527	0.9532	0.9537	0.9542	0.9548	0.9553	0.9558	1	2	3	3	4
73	0.9563	0.9568	0.9573	0.9578	0.9583	0.9588	0.9593	0.9598	0.9603	0.9608	1	2	2	3	4
74	0.9613	0.9617	0.9622	0.9627	0.9632	0.9636	0.9641	0.9646	0.9650	0.9655	1	2	2	3	4
75	0.9659	0.9664	0.9668	0.9673	0.9677	0.9681	0.9686	0.9690	0.9694	0.9699	1	1	2	3	4
76	0.9703	0.9707	0.9711	0.9715	0.9720	0.9724	0.9728	0.9732	0.9736	0.9740	1	1	2	3	3
77	0.9744	0.9748	0.9751	0.9755	0.9759	0.9763	0.9767	0.9770	0.9774	0.9778	1	1	2	3	3
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

sin x															
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
78	0.9781	0.9785	0.9789	0.9792	0.9796	0.9799	0.9803	0.9806	0.9810	0.9813	1	1	2	2	3
79	0.9816	0.9820	0.9823	0.9826	0.9829	0.9833	0.9836	0.9839	0.9842	0.9845	1	1	2	2	3
80	0.9848	0.9851	0.9854	0.9857	0.9860	0.9863	0.9866	0.9869	0.9871	0.9874	0	1	1	2	2
81	0.9877	0.9880	0.9882	0.9885	0.9888	0.9890	0.9893	0.9895	0.9898	0.9900	0	1	1	2	2
82	0.9903	0.9905	0.9907	0.9910	0.9912	0.9914	0.9917	0.9919	0.9921	0.9923	0	1	1	2	2
83	0.9925	0.9928	0.9930	0.9932	0.9934	0.9936	0.9938	0.9940	0.9942	0.9943	0	1	1	1	2
84	0.9945	0.9947	0.9949	0.9951	0.9952	0.9954	0.9956	0.9957	0.9959	0.9960	0	1	1	1	2
85	0.9962	0.9963	0.9965	0.9966	0.9968	0.9969	0.9971	0.9972	0.9973	0.9974	0	0	1	1	1
86	0.9976	0.9977	0.9978	0.9979	0.9980	0.9981	0.9982	0.9983	0.9984	0.9985	0	0	1	1	1
87	0.9986	0.9987	0.9988	0.9989	0.9990	0.9990	0.9991	0.9992	0.9993	0.9993	0	0	0	1	1
88	0.9994	0.9995	0.9995	0.9996	0.9996	0.9997	0.9997	0.9997	0.9998	0.9998	0	0	0	0	0
89	0.9998	0.9999	0.9999	0.9999	0.9999	1.0000	1.0000	1.0000	1.0000	1.0000	0	0	0	0	0
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

Cosine of an Angle

COS X															
X	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Subtract)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9999	0.9999	0	0	0	0	0
1	0.9998	0.9998	0.9998	0.9997	0.9997	0.9997	0.9996	0.9996	0.9995	0.9995	0	0	0	0	0
2	0.9994	0.9993	0.9993	0.9992	0.9991	0.9990	0.9990	0.9989	0.9988	0.9987	0	0	0	1	1
3	0.9986	0.9985	0.9984	0.9983	0.9982	0.9981	0.9980	0.9979	0.9978	0.9977	0	0	1	1	1
4	0.9976	0.9974	0.9973	0.9972	0.9971	0.9969	0.9968	0.9966	0.9965	0.9963	0	0	1	1	1
5	0.9962	0.9960	0.9959	0.9957	0.9956	0.9954	0.9952	0.9951	0.9949	0.9947	0	1	1	1	2
6	0.9945	0.9943	0.9942	0.9940	0.9938	0.9936	0.9934	0.9932	0.9930	0.9928	0	1	1	1	2
7	0.9925	0.9923	0.9921	0.9919	0.9917	0.9914	0.9912	0.9910	0.9907	0.9905	0	1	1	2	2
8	0.9903	0.9900	0.9898	0.9895	0.9893	0.9890	0.9888	0.9885	0.9882	0.9880	0	1	1	2	2
9	0.9877	0.9874	0.9871	0.9869	0.9866	0.9863	0.9860	0.9857	0.9854	0.9851	0	1	1	2	2
10	0.9848	0.9845	0.9842	0.9839	0.9836	0.9833	0.9829	0.9826	0.9823	0.9820	1	1	2	2	3
11	0.9816	0.9813	0.9810	0.9806	0.9803	0.9799	0.9796	0.9792	0.9789	0.9785	1	1	2	2	3
12	0.9781	0.9778	0.9774	0.9770	0.9767	0.9763	0.9759	0.9755	0.9751	0.9748	1	1	2	3	3
13	0.9744	0.9740	0.9736	0.9732	0.9728	0.9724	0.9720	0.9715	0.9711	0.9707	1	1	2	3	3
14	0.9703	0.9699	0.9694	0.9690	0.9686	0.9681	0.9677	0.9673	0.9668	0.9664	1	1	2	3	4
15	0.9659	0.9655	0.9650	0.9646	0.9641	0.9636	0.9632	0.9627	0.9622	0.9617	1	2	2	3	4
16	0.9613	0.9608	0.9603	0.9598	0.9593	0.9588	0.9583	0.9578	0.9573	0.9568	1	2	2	3	4
17	0.9563	0.9558	0.9553	0.9548	0.9542	0.9537	0.9532	0.9527	0.9521	0.9516	1	2	3	3	4
18	0.9511	0.9505	0.9500	0.9494	0.9489	0.9483	0.9478	0.9472	0.9466	0.9461	1	2	3	4	5
19	0.9455	0.9449	0.9444	0.9438	0.9432	0.9426	0.9421	0.9415	0.9409	0.9403	1	2	3	4	5
20	0.9397	0.9391	0.9385	0.9379	0.9373	0.9367	0.9361	0.9354	0.9348	0.9342	1	2	3	4	5
21	0.9336	0.9330	0.9323	0.9317	0.9311	0.9304	0.9298	0.9291	0.9285	0.9278	1	2	3	4	5
22	0.9272	0.9265	0.9259	0.9252	0.9245	0.9239	0.9232	0.9225	0.9219	0.9212	1	2	3	4	6
23	0.9205	0.9198	0.9191	0.9184	0.9178	0.9171	0.9164	0.9157	0.9150	0.9143	1	2	3	5	6
24	0.9135	0.9128	0.9121	0.9114	0.9107	0.9100	0.9092	0.9085	0.9078	0.9070	1	2	4	5	6
25	0.9063	0.9056	0.9048	0.9041	0.9033	0.9026	0.9018	0.9011	0.9003	0.8996	1	3	4	5	6
26	0.8988	0.8980	0.8973	0.8965	0.8957	0.8949	0.8942	0.8934	0.8926	0.8918	1	3	4	5	6
27	0.8910	0.8902	0.8894	0.8886	0.8878	0.8870	0.8862	0.8854	0.8846	0.8838	1	3	4	5	7
28	0.8829	0.8821	0.8813	0.8805	0.8796	0.8788	0.8780	0.8771	0.8763	0.8755	1	3	4	6	7
29	0.8746	0.8738	0.8729	0.8721	0.8712	0.8704	0.8695	0.8686	0.8678	0.8669	1	3	4	6	7
30	0.8660	0.8652	0.8643	0.8634	0.8625	0.8616	0.8607	0.8599	0.8590	0.8581	1	3	4	6	7
31	0.8572	0.8563	0.8554	0.8545	0.8536	0.8526	0.8517	0.8508	0.8499	0.8490	2	3	5	6	8
32	0.8480	0.8471	0.8462	0.8453	0.8443	0.8434	0.8425	0.8415	0.8406	0.8396	2	3	5	6	8
X	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

COS X															
X	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Subtract)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
33	0.8387	0.8377	0.8368	0.8358	0.8348	0.8339	0.8329	0.8320	0.8310	0.8300	2	3	5	6	8
34	0.8290	0.8281	0.8271	0.8261	0.8251	0.8241	0.8231	0.8221	0.8211	0.8202	2	3	5	7	8
35	0.8192	0.8181	0.8171	0.8161	0.8151	0.8141	0.8131	0.8121	0.8111	0.8100	2	3	5	7	8
36	0.8090	0.8080	0.8070	0.8059	0.8049	0.8039	0.8028	0.8018	0.8007	0.7997	2	3	5	7	9
37	0.7986	0.7976	0.7965	0.7955	0.7944	0.7934	0.7923	0.7912	0.7902	0.7891	2	4	5	7	9
38	0.7880	0.7869	0.7859	0.7848	0.7837	0.7826	0.7815	0.7804	0.7793	0.7782	2	4	5	7	9
39	0.7771	0.7760	0.7749	0.7738	0.7727	0.7716	0.7705	0.7694	0.7683	0.7672	2	4	6	7	9
40	0.7660	0.7649	0.7638	0.7627	0.7615	0.7604	0.7593	0.7581	0.7570	0.7559	2	4	6	8	9
41	0.7547	0.7536	0.7524	0.7513	0.7501	0.7490	0.7478	0.7466	0.7455	0.7443	2	4	6	8	10
42	0.7431	0.7420	0.7408	0.7396	0.7385	0.7373	0.7361	0.7349	0.7337	0.7325	2	4	6	8	10
43	0.7314	0.7302	0.7290	0.7278	0.7266	0.7254	0.7242	0.7230	0.7218	0.7206	2	4	6	8	10
44	0.7193	0.7181	0.7169	0.7157	0.7145	0.7133	0.7120	0.7108	0.7096	0.7083	2	4	6	8	10
45	0.7071	0.7059	0.7046	0.7034	0.7022	0.7009	0.6997	0.6984	0.6972	0.6959	2	4	6	8	10
46	0.6947	0.6934	0.6921	0.6909	0.6896	0.6884	0.6871	0.6858	0.6845	0.6833	2	4	6	9	11
47	0.6820	0.6807	0.6794	0.6782	0.6769	0.6756	0.6743	0.6730	0.6717	0.6704	2	4	6	9	11
48	0.6691	0.6678	0.6665	0.6652	0.6639	0.6626	0.6613	0.6600	0.6587	0.6574	2	4	7	9	11
49	0.6561	0.6547	0.6534	0.6521	0.6508	0.6494	0.6481	0.6468	0.6455	0.6441	2	4	7	9	11
50	0.6428	0.6414	0.6401	0.6388	0.6374	0.6361	0.6347	0.6334	0.6320	0.6307	2	4	7	9	11
51	0.6293	0.6280	0.6266	0.6252	0.6239	0.6225	0.6211	0.6198	0.6184	0.6170	2	5	7	9	11
52	0.6157	0.6143	0.6129	0.6115	0.6101	0.6088	0.6074	0.6060	0.6046	0.6032	2	5	7	9	12
53	0.6018	0.6004	0.5990	0.5976	0.5962	0.5948	0.5934	0.5920	0.5906	0.5892	2	5	7	9	12
54	0.5878	0.5864	0.5850	0.5835	0.5821	0.5807	0.5793	0.5779	0.5764	0.5750	2	5	7	9	12
55	0.5736	0.5721	0.5707	0.5693	0.5678	0.5664	0.5650	0.5635	0.5621	0.5606	2	5	7	10	12
56	0.5592	0.5577	0.5563	0.5548	0.5534	0.5519	0.5505	0.5490	0.5476	0.5461	2	5	7	10	12
57	0.5446	0.5432	0.5417	0.5402	0.5388	0.5373	0.5358	0.5344	0.5329	0.5314	2	5	7	10	12
58	0.5299	0.5284	0.5270	0.5255	0.5240	0.5225	0.5210	0.5195	0.5180	0.5165	2	5	7	10	12
59	0.5150	0.5135	0.5120	0.5105	0.5090	0.5075	0.5060	0.5045	0.5030	0.5015	3	5	8	10	13
60	0.5000	0.4985	0.4970	0.4955	0.4939	0.4924	0.4909	0.4894	0.4879	0.4863	3	5	8	10	13
61	0.4848	0.4833	0.4818	0.4802	0.4787	0.4772	0.4756	0.4741	0.4726	0.4710	3	5	8	10	13
62	0.4695	0.4679	0.4664	0.4648	0.4633	0.4617	0.4602	0.4586	0.4571	0.4555	3	5	8	10	13
63	0.4540	0.4524	0.4509	0.4493	0.4478	0.4462	0.4446	0.4431	0.4415	0.4399	3	5	8	10	13
64	0.4384	0.4368	0.4352	0.4337	0.4321	0.4305	0.4289	0.4274	0.4258	0.4242	3	5	8	11	13
65	0.4226	0.4210	0.4195	0.4179	0.4163	0.4147	0.4131	0.4115	0.4099	0.4083	3	5	8	11	13
66	0.4067	0.4051	0.4035	0.4019	0.4003	0.3987	0.3971	0.3955	0.3939	0.3923	3	5	8	11	14
67	0.3907	0.3891	0.3875	0.3859	0.3843	0.3827	0.3811	0.3795	0.3778	0.3762	3	5	8	11	14
X	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

COS X															
X	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Subtract)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
68	0.3746	0.3730	0.3714	0.3697	0.3681	0.3665	0.3649	0.3633	0.3616	0.3600	3	5	8	11	14
69	0.3584	0.3567	0.3551	0.3535	0.3518	0.3502	0.3486	0.3469	0.3453	0.3437	3	5	8	11	14
70	0.3420	0.3404	0.3387	0.3371	0.3355	0.3338	0.3322	0.3305	0.3289	0.3272	3	5	8	11	14
71	0.3256	0.3239	0.3223	0.3206	0.3190	0.3173	0.3156	0.3140	0.3123	0.3107	3	6	8	11	14
72	0.3090	0.3074	0.3057	0.3040	0.3024	0.3007	0.2990	0.2974	0.2957	0.2940	3	6	8	11	14
73	0.2924	0.2907	0.2890	0.2874	0.2857	0.2840	0.2823	0.2807	0.2790	0.2773	3	6	8	11	14
74	0.2756	0.2740	0.2723	0.2706	0.2689	0.2672	0.2656	0.2639	0.2622	0.2605	3	6	8	11	14
75	0.2588	0.2571	0.2554	0.2538	0.2521	0.2504	0.2487	0.2470	0.2453	0.2436	3	6	8	11	14
76	0.2419	0.2402	0.2385	0.2368	0.2351	0.2334	0.2317	0.2300	0.2284	0.2267	3	6	8	11	14
77	0.2250	0.2233	0.2215	0.2198	0.2181	0.2164	0.2147	0.2130	0.2113	0.2096	3	6	9	11	14
78	0.2079	0.2062	0.2045	0.2028	0.2011	0.1994	0.1977	0.1959	0.1942	0.1925	3	6	9	11	14
79	0.1908	0.1891	0.1874	0.1857	0.1840	0.1822	0.1805	0.1788	0.1771	0.1754	3	6	9	11	14
80	0.1736	0.1719	0.1702	0.1685	0.1668	0.1650	0.1633	0.1616	0.1599	0.1582	3	6	9	12	14
81	0.1564	0.1547	0.1530	0.1513	0.1495	0.1478	0.1461	0.1444	0.1426	0.1409	3	6	9	12	14
82	0.1392	0.1374	0.1357	0.1340	0.1323	0.1305	0.1288	0.1271	0.1253	0.1236	3	6	9	12	14
83	0.1219	0.1201	0.1184	0.1167	0.1149	0.1132	0.1115	0.1097	0.1080	0.1063	3	6	9	12	14
84	0.1045	0.1028	0.1011	0.0993	0.0976	0.0958	0.0941	0.0924	0.0906	0.0889	3	6	9	12	14
85	0.0872	0.0854	0.0837	0.0819	0.0802	0.0785	0.0767	0.0750	0.0732	0.0715	3	6	9	12	14
86	0.0698	0.0680	0.0663	0.0645	0.0628	0.0610	0.0593	0.0576	0.0558	0.0541	3	6	9	12	15
87	0.0523	0.0506	0.0488	0.0471	0.0454	0.0436	0.0419	0.0401	0.0384	0.0366	3	6	9	12	15
88	0.0349	0.0332	0.0314	0.0297	0.0279	0.0262	0.0244	0.0227	0.0209	0.0192	3	6	9	12	15
89	0.0175	0.0157	0.0140	0.0122	0.0105	0.0087	0.0070	0.0052	0.0035	0.0017	3	6	9	12	15
X	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

Tangent of an Angle

tan x															
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
0	0.0000	0.0017	0.0035	0.0052	0.0070	0.0087	0.0105	0.0122	0.0140	0.0157	3	6	9	12	15
1	0.0175	0.0192	0.0209	0.0227	0.0244	0.0262	0.0279	0.0297	0.0314	0.0332	3	6	9	12	15
2	0.0349	0.0367	0.0384	0.0402	0.0419	0.0437	0.0454	0.0472	0.0489	0.0507	3	6	9	12	15
3	0.0524	0.0542	0.0559	0.0577	0.0594	0.0612	0.0629	0.0647	0.0664	0.0682	3	6	9	12	15
4	0.0699	0.0717	0.0734	0.0752	0.0769	0.0787	0.0805	0.0822	0.0840	0.0857	3	6	9	12	15
5	0.0875	0.0892	0.0910	0.0928	0.0945	0.0963	0.0981	0.0998	0.1016	0.1033	3	6	9	12	15
6	0.1051	0.1069	0.1086	0.1104	0.1122	0.1139	0.1157	0.1175	0.1192	0.1210	3	6	9	12	15
7	0.1228	0.1246	0.1263	0.1281	0.1299	0.1317	0.1334	0.1352	0.1370	0.1388	3	6	9	12	15
8	0.1405	0.1423	0.1441	0.1459	0.1477	0.1495	0.1512	0.1530	0.1548	0.1566	3	6	9	12	15
9	0.1584	0.1602	0.1620	0.1638	0.1655	0.1673	0.1691	0.1709	0.1727	0.1745	3	6	9	12	15
10	0.1763	0.1781	0.1799	0.1817	0.1835	0.1853	0.1871	0.1890	0.1908	0.1926	3	6	9	12	15
11	0.1944	0.1962	0.1980	0.1998	0.2016	0.2035	0.2053	0.2071	0.2089	0.2107	3	6	9	12	15
12	0.2126	0.2144	0.2162	0.2180	0.2199	0.2217	0.2235	0.2254	0.2272	0.2290	3	6	9	12	15
13	0.2309	0.2327	0.2345	0.2364	0.2382	0.2401	0.2419	0.2438	0.2456	0.2475	3	6	9	12	15
14	0.2493	0.2512	0.2530	0.2549	0.2568	0.2586	0.2605	0.2623	0.2642	0.2661	3	6	9	12	16
15	0.2679	0.2698	0.2717	0.2736	0.2754	0.2773	0.2792	0.2811	0.2830	0.2849	3	6	9	13	16
16	0.2867	0.2886	0.2905	0.2924	0.2943	0.2962	0.2981	0.3000	0.3019	0.3038	3	6	9	13	16
17	0.3057	0.3076	0.3096	0.3115	0.3134	0.3153	0.3172	0.3191	0.3211	0.3230	3	6	10	13	16
18	0.3249	0.3269	0.3288	0.3307	0.3327	0.3346	0.3365	0.3385	0.3404	0.3424	3	6	10	13	16
19	0.3443	0.3463	0.3482	0.3502	0.3522	0.3541	0.3561	0.3581	0.3600	0.3620	3	7	10	13	16
20	0.3640	0.3659	0.3679	0.3699	0.3719	0.3739	0.3759	0.3779	0.3799	0.3819	3	7	10	13	17
21	0.3839	0.3859	0.3879	0.3899	0.3919	0.3939	0.3959	0.3979	0.4000	0.4020	3	7	10	13	17
22	0.4040	0.4061	0.4081	0.4101	0.4122	0.4142	0.4163	0.4183	0.4204	0.4224	3	7	10	14	17
23	0.4245	0.4265	0.4286	0.4307	0.4327	0.4348	0.4369	0.4390	0.4411	0.4431	3	7	10	14	17
24	0.4452	0.4473	0.4494	0.4515	0.4536	0.4557	0.4578	0.4599	0.4621	0.4642	4	7	11	14	18
25	0.4663	0.4684	0.4706	0.4727	0.4748	0.4770	0.4791	0.4813	0.4834	0.4856	4	7	11	14	18
26	0.4877	0.4899	0.4921	0.4942	0.4964	0.4986	0.5008	0.5029	0.5051	0.5073	4	7	11	15	18
27	0.5095	0.5117	0.5139	0.5161	0.5184	0.5206	0.5228	0.5250	0.5272	0.5295	4	7	11	15	18
28	0.5317	0.5340	0.5362	0.5384	0.5407	0.5430	0.5452	0.5475	0.5498	0.5520	4	8	11	15	19
29	0.5543	0.5566	0.5589	0.5612	0.5635	0.5658	0.5681	0.5704	0.5727	0.5750	4	8	12	15	19
30	0.5774	0.5797	0.5820	0.5844	0.5867	0.5890	0.5914	0.5938	0.5961	0.5985	4	8	12	16	20
31	0.6009	0.6032	0.6056	0.6080	0.6104	0.6128	0.6152	0.6176	0.6200	0.6224	4	8	12	16	20
32	0.6249	0.6273	0.6297	0.6322	0.6346	0.6371	0.6395	0.6420	0.6445	0.6469	4	8	12	16	20
33	0.6494	0.6519	0.6544	0.6569	0.6594	0.6619	0.6644	0.6669	0.6694	0.6720	4	8	13	17	21
34	0.6745	0.6771	0.6796	0.6822	0.6847	0.6873	0.6899	0.6924	0.6950	0.6976	4	9	13	17	21
35	0.7002	0.7028	0.7054	0.7080	0.7107	0.7133	0.7159	0.7186	0.7212	0.7239	4	9	13	18	22
36	0.7265	0.7292	0.7319	0.7346	0.7373	0.7400	0.7427	0.7454	0.7481	0.7508	4	9	13	18	23
37	0.7536	0.7563	0.7590	0.7618	0.7646	0.7673	0.7701	0.7729	0.7757	0.7785	5	9	14	18	23
38	0.7813	0.7841	0.7869	0.7898	0.7926	0.7954	0.7983	0.8012	0.8040	0.8069	5	9	14	19	24
39	0.8098	0.8127	0.8156	0.8185	0.8214	0.8243	0.8273	0.8302	0.8332	0.8361	5	10	15	20	24
40	0.8391	0.8421	0.8451	0.8481	0.8511	0.8541	0.8571	0.8601	0.8632	0.8662	5	10	15	20	25
41	0.8693	0.8724	0.8754	0.8785	0.8816	0.8847	0.8878	0.8910	0.8941	0.8972	5	10	16	21	26
42	0.9004	0.9036	0.9067	0.9099	0.9131	0.9163	0.9195	0.9228	0.9260	0.9293	5	11	16	21	27
43	0.9325	0.9358	0.9391	0.9424	0.9457	0.9490	0.9523	0.9556	0.9590	0.9623	6	11	17	22	28
44	0.9657	0.9691	0.9725	0.9759	0.9793	0.9827	0.9861	0.9896	0.9930	0.9965	6	11	17	23	29
45	1.0000	1.0035	1.0070	1.0105	1.0141	1.0176	1.0212	1.0247	1.0283	1.0319	6	12	18	24	30
46	1.0355	1.0392	1.0428	1.0464	1.0501	1.0538	1.0575	1.0612	1.0649	1.0686	6	12	18	25	31
47	1.0724	1.0761	1.0799	1.0837	1.0875	1.0913	1.0951	1.0990	1.1028	1.1067	6	13	19	25	32
48	1.1106	1.1145	1.1184	1.1224	1.1263	1.1303	1.1343	1.1383	1.1423	1.1463	7	13	20	26	33
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

tan x															
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Differences (Add)				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1'	2'	3'	4'	5'
49	1.1504	1.1544	1.1585	1.1626	1.1667	1.1708	1.1750	1.1792	1.1833	1.1875	7	14	21	28	34
50	1.1918	1.1960	1.2002	1.2045	1.2088	1.2131	1.2174	1.2218	1.2261	1.2305	7	14	22	29	36
51	1.2349	1.2393	1.2437	1.2482	1.2527	1.2572	1.2617	1.2662	1.2708	1.2753	7	15	22	30	38
52	1.2799	1.2846	1.2892	1.2938	1.2985	1.3032	1.3079	1.3127	1.3175	1.3222	8	16	24	31	39
53	1.3270	1.3319	1.3367	1.3416	1.3465	1.3514	1.3564	1.3613	1.3663	1.3713	8	16	25	33	41
54	1.3764	1.3814	1.3865	1.3916	1.3968	1.4019	1.4071	1.4124	1.4176	1.4229	9	17	26	34	43
55	1.4281	1.4335	1.4388	1.4442	1.4496	1.4550	1.4605	1.4659	1.4715	1.4770	9	18	27	36	45
56	1.4826	1.4882	1.4938	1.4994	1.5051	1.5108	1.5166	1.5224	1.5282	1.5340	10	19	29	38	48
57	1.5399	1.5458	1.5517	1.5577	1.5637	1.5697	1.5757	1.5818	1.5880	1.5941	10	20	30	40	50
58	1.6003	1.6066	1.6128	1.6191	1.6255	1.6319	1.6383	1.6447	1.6512	1.6577	11	21	32	43	53
59	1.6643	1.6709	1.6775	1.6842	1.6909	1.6977	1.7045	1.7113	1.7182	1.7251	11	23	34	45	56
60	1.7321	1.7391	1.7461	1.7532	1.7603	1.7675	1.7747	1.7820	1.7893	1.7966	12	24	36	48	60
61	1.8040	1.8115	1.8190	1.8265	1.8341	1.8418	1.8495	1.8572	1.8650	1.8728	13	26	38	51	64
62	1.8807	1.8887	1.8967	1.9047	1.9128	1.9210	1.9292	1.9375	1.9458	1.9542	14	27	41	55	68
63	1.9626	1.9711	1.9797	1.9883	1.9970	2.0057	2.0145	2.0233	2.0323	2.0413	15	29	44	58	73
64	2.0503	2.0594	2.0686	2.0778	2.0872	2.0965	2.1060	2.1155	2.1251	2.1348	16	31	47	63	78
65	2.1445	2.1543	2.1642	2.1742	2.1842	2.1943	2.2045	2.2148	2.2251	2.2355	17	34	51	68	85
66	2.2460	2.2566	2.2673	2.2781	2.2889	2.2998	2.3109	2.3220	2.3332	2.3445	18	37	55	73	91
67	2.3559	2.3673	2.3789	2.3906	2.4023	2.4142	2.4262	2.4383	2.4504	2.4627	20	40	59	79	99
68	2.4751	2.4876	2.5002	2.5129	2.5257	2.5386	2.5517	2.5649	2.5782	2.5916	22	43	65	87	108
69	2.6051	2.6187	2.6325	2.6464	2.6605	2.6746	2.6889	2.7034	2.7179	2.7326	24	47	71	95	119
70	2.7475	2.7625	2.7776	2.7929	2.8083	2.8239	2.8397	2.8556	2.8716	2.8878	26	52	78	104	131
71	2.9042	2.9208	2.9375	2.9544	2.9714	2.9887	3.0061	3.0237	3.0415	3.0595	29	58	87	115	144
72	3.0777	3.0961	3.1146	3.1334	3.1524	3.1716	3.1910	3.2106	3.2305	3.2506	32	64	96	129	161
73	3.2709	3.2914	3.3122	3.3332	3.3544	3.3759	3.3977	3.4197	3.4420	3.4646	36	72	108	144	180
74	3.4874	3.5105	3.5339	3.5576	3.5816	3.6059	3.6305	3.6554	3.6806	3.7062	41	81	122	163	204
75	3.7321	3.7583	3.7848	3.8118	3.8391	3.8667	3.8947	3.9232	3.9520	3.9812	46	92	139	185	232
76	4.0108	4.0408	4.0713	4.1022	4.1335	4.1653	4.1976	4.2303	4.2635	4.2972	Mean Differences ceases to be sufficiently accurate				
77	4.3315	4.3662	4.4015	4.4373	4.4737	4.5107	4.5483	4.5864	4.6252	4.6646					
78	4.7046	4.7453	4.7867	4.8288	4.8716	4.9152	4.9594	5.0045	5.0504	5.0970					
79	5.1446	5.1929	5.2422	5.2924	5.3435	5.3955	5.4486	5.5026	5.5578	5.6140					
80	5.6713	5.7297	5.7894	5.8502	5.9124	5.9758	6.0405	6.1066	6.1742	6.2432					
81	6.3138	6.3859	6.4596	6.5350	6.6122	6.6912	6.7720	6.8548	6.9395	7.0264					
82	7.1154	7.2066	7.3002	7.3962	7.4947	7.5958	7.6996	7.8062	7.9158	8.0285					
83	8.1443	8.2636	8.3863	8.5126	8.6427	8.7769	8.9152	9.0579	9.2052	9.3572					
84	9.5144	9.6768	9.8448	10.019	10.199	10.385	10.579	10.780	10.988	11.205					
85	11.430	11.664	11.909	12.163	12.429	12.706	12.996	13.300	13.617	13.951					
86	14.301	14.669	15.056	15.464	15.895	16.350	16.832	17.343	17.886	18.464					
87	19.081	19.740	20.446	21.205	22.022	22.904	23.859	24.898	26.031	27.271					
88	28.636	30.145	31.821	33.694	35.801	38.188	40.917	44.066	47.740	52.081					
89	57.290	63.657	71.615	81.847	95.489	114.59	143.24	190.98	286.48	572.96					
x	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	1'	2'	3'	4'	5'
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°					

Square Root

$\sqrt{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
1.0	1.000	1.005	1.010	1.015	1.020	1.025	1.030	1.034	1.039	1.044	0	1	1	2	2	3	3	4	4
1.1	1.049	1.054	1.058	1.063	1.068	1.072	1.077	1.082	1.086	1.091	0	1	1	2	2	3	3	4	4
1.2	1.095	1.100	1.105	1.109	1.114	1.118	1.122	1.127	1.131	1.136	0	1	1	2	2	3	3	4	4
1.3	1.140	1.145	1.149	1.153	1.158	1.162	1.166	1.170	1.175	1.179	0	1	1	2	2	3	3	3	4
1.4	1.183	1.187	1.192	1.196	1.200	1.204	1.208	1.212	1.217	1.221	0	1	1	2	2	2	3	3	4
1.5	1.225	1.229	1.233	1.237	1.241	1.245	1.249	1.253	1.257	1.261	0	1	1	2	2	2	3	3	4
1.6	1.265	1.269	1.273	1.277	1.281	1.285	1.288	1.292	1.296	1.300	0	1	1	2	2	2	3	3	3
1.7	1.304	1.308	1.311	1.315	1.319	1.323	1.327	1.330	1.334	1.338	0	1	1	2	2	2	3	3	3
1.8	1.342	1.345	1.349	1.353	1.356	1.360	1.364	1.367	1.371	1.375	0	1	1	1	2	2	3	3	3
1.9	1.378	1.382	1.386	1.389	1.393	1.396	1.400	1.404	1.407	1.411	0	1	1	1	2	2	3	3	3
2.0	1.414	1.418	1.421	1.425	1.428	1.432	1.435	1.439	1.442	1.446	0	1	1	1	2	2	2	3	3
2.1	1.449	1.453	1.456	1.459	1.463	1.466	1.470	1.473	1.476	1.480	0	1	1	1	2	2	2	3	3
2.2	1.483	1.487	1.490	1.493	1.497	1.500	1.503	1.507	1.510	1.513	0	1	1	1	2	2	2	3	3
2.3	1.517	1.520	1.523	1.526	1.530	1.533	1.536	1.539	1.543	1.546	0	1	1	1	2	2	2	3	3
2.4	1.549	1.552	1.556	1.559	1.562	1.565	1.568	1.572	1.575	1.578	0	1	1	1	2	2	2	3	3
2.5	1.581	1.584	1.587	1.591	1.594	1.597	1.600	1.603	1.606	1.609	0	1	1	1	2	2	2	3	3
2.6	1.612	1.616	1.619	1.622	1.625	1.628	1.631	1.634	1.637	1.640	0	1	1	1	2	2	2	2	3
2.7	1.643	1.646	1.649	1.652	1.655	1.658	1.661	1.664	1.667	1.670	0	1	1	1	2	2	2	2	3
2.8	1.673	1.676	1.679	1.682	1.685	1.688	1.691	1.694	1.697	1.700	0	1	1	1	1	2	2	2	3
2.9	1.703	1.706	1.709	1.712	1.715	1.718	1.720	1.723	1.726	1.729	0	1	1	1	1	2	2	2	3
3.0	1.732	1.735	1.738	1.741	1.744	1.746	1.749	1.752	1.755	1.758	0	1	1	1	1	2	2	2	3
3.1	1.761	1.764	1.766	1.769	1.772	1.775	1.778	1.780	1.783	1.786	0	1	1	1	1	2	2	2	3
3.2	1.789	1.792	1.794	1.797	1.800	1.803	1.806	1.808	1.811	1.814	0	1	1	1	1	2	2	2	2
3.3	1.817	1.819	1.822	1.825	1.828	1.830	1.833	1.836	1.838	1.841	0	1	1	1	1	2	2	2	2
3.4	1.844	1.847	1.849	1.852	1.855	1.857	1.860	1.863	1.865	1.868	0	1	1	1	1	2	2	2	2
3.5	1.871	1.873	1.876	1.879	1.881	1.884	1.887	1.889	1.892	1.895	0	1	1	1	1	2	2	2	2
3.6	1.897	1.900	1.903	1.905	1.908	1.910	1.913	1.916	1.918	1.921	0	1	1	1	1	2	2	2	2
3.7	1.924	1.926	1.929	1.931	1.934	1.936	1.939	1.942	1.944	1.947	0	1	1	1	1	2	2	2	2
3.8	1.949	1.952	1.954	1.957	1.960	1.962	1.965	1.967	1.970	1.972	0	1	1	1	1	2	2	2	2
3.9	1.975	1.977	1.980	1.982	1.985	1.987	1.990	1.992	1.995	1.997	0	1	1	1	1	2	2	2	2
4.0	2.000	2.002	2.005	2.007	2.010	2.012	2.015	2.017	2.020	2.022	0	0	1	1	1	1	2	2	2
4.1	2.025	2.027	2.030	2.032	2.035	2.037	2.040	2.042	2.045	2.047	0	0	1	1	1	1	2	2	2
4.2	2.049	2.052	2.054	2.057	2.059	2.062	2.064	2.066	2.069	2.071	0	0	1	1	1	1	2	2	2
4.3	2.074	2.076	2.078	2.081	2.083	2.086	2.088	2.090	2.093	2.095	0	0	1	1	1	1	2	2	2
4.4	2.098	2.100	2.102	2.105	2.107	2.110	2.112	2.114	2.117	2.119	0	0	1	1	1	1	2	2	2
4.5	2.121	2.124	2.126	2.128	2.131	2.133	2.135	2.138	2.140	2.142	0	0	1	1	1	1	2	2	2
4.6	2.145	2.147	2.149	2.152	2.154	2.156	2.159	2.161	2.163	2.166	0	0	1	1	1	1	2	2	2
4.7	2.168	2.170	2.173	2.175	2.177	2.179	2.182	2.184	2.186	2.189	0	0	1	1	1	1	2	2	2
4.8	2.191	2.193	2.195	2.198	2.200	2.202	2.205	2.207	2.209	2.211	0	0	1	1	1	1	2	2	2
4.9	2.214	2.216	2.218	2.220	2.223	2.225	2.227	2.229	2.232	2.234	0	0	1	1	1	1	2	2	2
5.0	2.236	2.238	2.241	2.243	2.245	2.247	2.249	2.252	2.254	2.256	0	0	1	1	1	1	2	2	2
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
5.1	2.258	2.261	2.263	2.265	2.267	2.269	2.272	2.274	2.276	2.278	0	0	1	1	1	1	2	2	2
5.2	2.280	2.283	2.285	2.287	2.289	2.291	2.293	2.296	2.298	2.300	0	0	1	1	1	1	2	2	2
5.3	2.302	2.304	2.307	2.309	2.311	2.313	2.315	2.317	2.319	2.322	0	0	1	1	1	1	2	2	2
5.4	2.324	2.326	2.328	2.330	2.332	2.335	2.337	2.339	2.341	2.343	0	0	1	1	1	1	1	2	2
5.5	2.345	2.347	2.349	2.352	2.354	2.356	2.358	2.360	2.362	2.364	0	0	1	1	1	1	1	2	2
5.6	2.366	2.369	2.371	2.373	2.375	2.377	2.379	2.381	2.383	2.385	0	0	1	1	1	1	1	2	2
5.7	2.387	2.390	2.392	2.394	2.396	2.398	2.400	2.402	2.404	2.406	0	0	1	1	1	1	1	2	2
5.8	2.408	2.410	2.412	2.415	2.417	2.419	2.421	2.423	2.425	2.427	0	0	1	1	1	1	1	2	2
5.9	2.429	2.431	2.433	2.435	2.437	2.439	2.441	2.443	2.445	2.447	0	0	1	1	1	1	1	2	2
6.0	2.449	2.452	2.454	2.456	2.458	2.460	2.462	2.464	2.466	2.468	0	0	1	1	1	1	1	2	2
6.1	2.470	2.472	2.474	2.476	2.478	2.480	2.482	2.484	2.486	2.488	0	0	1	1	1	1	1	2	2
6.2	2.490	2.492	2.494	2.496	2.498	2.500	2.502	2.504	2.506	2.508	0	0	1	1	1	1	1	2	2
6.3	2.510	2.512	2.514	2.516	2.518	2.520	2.522	2.524	2.526	2.528	0	0	1	1	1	1	1	2	2
6.4	2.530	2.532	2.534	2.536	2.538	2.540	2.542	2.544	2.546	2.548	0	0	1	1	1	1	1	2	2
6.5	2.550	2.551	2.553	2.555	2.557	2.559	2.561	2.563	2.565	2.567	0	0	1	1	1	1	1	2	2
6.6	2.569	2.571	2.573	2.575	2.577	2.579	2.581	2.583	2.585	2.587	0	0	1	1	1	1	1	2	2
6.7	2.588	2.590	2.592	2.594	2.596	2.598	2.600	2.602	2.604	2.606	0	0	1	1	1	1	1	2	2
6.8	2.608	2.610	2.612	2.613	2.615	2.617	2.619	2.621	2.623	2.625	0	0	1	1	1	1	1	2	2
6.9	2.627	2.629	2.631	2.632	2.634	2.636	2.638	2.640	2.642	2.644	0	0	1	1	1	1	1	2	2
7.0	2.646	2.648	2.650	2.651	2.653	2.655	2.657	2.659	2.661	2.663	0	0	1	1	1	1	1	2	2
7.1	2.665	2.666	2.668	2.670	2.672	2.674	2.676	2.678	2.680	2.681	0	0	1	1	1	1	1	1	2
7.2	2.683	2.685	2.687	2.689	2.691	2.693	2.694	2.696	2.698	2.700	0	0	1	1	1	1	1	1	2
7.3	2.702	2.704	2.706	2.707	2.709	2.711	2.713	2.715	2.717	2.718	0	0	1	1	1	1	1	1	2
7.4	2.720	2.722	2.724	2.726	2.728	2.729	2.731	2.733	2.735	2.737	0	0	1	1	1	1	1	1	2
7.5	2.739	2.740	2.742	2.744	2.746	2.748	2.750	2.751	2.753	2.755	0	0	1	1	1	1	1	1	2
7.6	2.757	2.759	2.760	2.762	2.764	2.766	2.768	2.769	2.771	2.773	0	0	1	1	1	1	1	1	2
7.7	2.775	2.777	2.778	2.780	2.782	2.784	2.786	2.787	2.789	2.791	0	0	1	1	1	1	1	1	2
7.8	2.793	2.795	2.796	2.798	2.800	2.802	2.804	2.805	2.807	2.809	0	0	1	1	1	1	1	1	2
7.9	2.811	2.812	2.814	2.816	2.818	2.820	2.821	2.823	2.825	2.827	0	0	1	1	1	1	1	1	2
8.0	2.828	2.830	2.832	2.834	2.835	2.837	2.839	2.841	2.843	2.844	0	0	1	1	1	1	1	1	2
8.1	2.846	2.848	2.850	2.851	2.853	2.855	2.857	2.858	2.860	2.862	0	0	1	1	1	1	1	1	2
8.2	2.864	2.865	2.867	2.869	2.871	2.872	2.874	2.876	2.877	2.879	0	0	1	1	1	1	1	1	2
8.3	2.881	2.883	2.884	2.886	2.888	2.890	2.891	2.893	2.895	2.897	0	0	1	1	1	1	1	1	2
8.4	2.898	2.900	2.902	2.903	2.905	2.907	2.909	2.910	2.912	2.914	0	0	1	1	1	1	1	1	2
8.5	2.915	2.917	2.919	2.921	2.922	2.924	2.926	2.927	2.929	2.931	0	0	1	1	1	1	1	1	2
8.6	2.933	2.934	2.936	2.938	2.939	2.941	2.943	2.944	2.946	2.948	0	0	1	1	1	1	1	1	2
8.7	2.950	2.951	2.953	2.955	2.956	2.958	2.960	2.961	2.963	2.965	0	0	1	1	1	1	1	1	2
8.8	2.966	2.968	2.970	2.972	2.973	2.975	2.977	2.978	2.980	2.982	0	0	1	1	1	1	1	1	2
8.9	2.983	2.985	2.987	2.988	2.990	2.992	2.993	2.995	2.997	2.998	0	0	1	1	1	1	1	1	2
9.0	3.000	3.002	3.003	3.005	3.007	3.008	3.010	3.012	3.013	3.015	0	0	0	1	1	1	1	1	1
9.1	3.017	3.018	3.020	3.022	3.023	3.025	3.027	3.028	3.030	3.032	0	0	0	1	1	1	1	1	1
9.2	3.033	3.035	3.036	3.038	3.040	3.041	3.043	3.045	3.046	3.048	0	0	0	1	1	1	1	1	1
9.3	3.050	3.051	3.053	3.055	3.056	3.058	3.059	3.061	3.063	3.064	0	0	0	1	1	1	1	1	1
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
9.4	3.066	3.068	3.069	3.071	3.072	3.074	3.076	3.077	3.079	3.081	0	0	0	1	1	1	1	1	1
9.5	3.082	3.084	3.085	3.087	3.089	3.090	3.092	3.094	3.095	3.097	0	0	0	1	1	1	1	1	1
9.6	3.098	3.100	3.102	3.103	3.105	3.106	3.108	3.110	3.111	3.113	0	0	0	1	1	1	1	1	1
9.7	3.114	3.116	3.118	3.119	3.121	3.122	3.124	3.126	3.127	3.129	0	0	0	1	1	1	1	1	1
9.8	3.130	3.132	3.134	3.135	3.137	3.138	3.140	3.142	3.143	3.145	0	0	0	1	1	1	1	1	1
9.9	3.146	3.148	3.150	3.151	3.153	3.154	3.156	3.158	3.159	3.161	0	0	0	1	1	1	1	1	1
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Square Root

$\sqrt{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
10	3.162	3.178	3.194	3.209	3.225	3.240	3.256	3.271	3.286	3.302	2	3	5	6	8	9	11	12	14
11	3.317	3.332	3.347	3.362	3.376	3.391	3.406	3.421	3.435	3.450	1	3	4	6	7	9	10	12	13
12	3.464	3.479	3.493	3.507	3.521	3.536	3.550	3.564	3.578	3.592	1	3	4	6	7	8	10	11	13
13	3.606	3.619	3.633	3.647	3.661	3.674	3.688	3.701	3.715	3.728	1	3	4	5	7	8	10	11	12
14	3.742	3.755	3.768	3.782	3.795	3.808	3.821	3.834	3.847	3.860	1	3	4	5	7	8	9	11	12
15	3.873	3.886	3.899	3.912	3.924	3.937	3.950	3.962	3.975	3.987	1	3	4	5	6	8	9	10	11
16	4.000	4.012	4.025	4.037	4.050	4.062	4.074	4.087	4.099	4.111	1	2	4	5	6	7	9	10	11
17	4.123	4.135	4.147	4.159	4.171	4.183	4.195	4.207	4.219	4.231	1	2	4	5	6	7	8	10	11
18	4.243	4.254	4.266	4.278	4.290	4.301	4.313	4.324	4.336	4.347	1	2	3	5	6	7	8	9	10
19	4.359	4.370	4.382	4.393	4.405	4.416	4.427	4.438	4.450	4.461	1	2	3	5	6	7	8	9	10
20	4.472	4.483	4.494	4.506	4.517	4.528	4.539	4.550	4.561	4.572	1	2	3	4	6	7	8	9	10
21	4.583	4.593	4.604	4.615	4.626	4.637	4.648	4.658	4.669	4.680	1	2	3	4	5	6	8	9	10
22	4.690	4.701	4.712	4.722	4.733	4.743	4.754	4.764	4.775	4.785	1	2	3	4	5	6	7	8	9
23	4.796	4.806	4.817	4.827	4.837	4.848	4.858	4.868	4.879	4.889	1	2	3	4	5	6	7	8	9
24	4.899	4.909	4.919	4.930	4.940	4.950	4.960	4.970	4.980	4.990	1	2	3	4	5	6	7	8	9
25	5.000	5.010	5.020	5.030	5.040	5.050	5.060	5.070	5.079	5.089	1	2	3	4	5	6	7	8	9
26	5.099	5.109	5.119	5.128	5.138	5.148	5.158	5.167	5.177	5.187	1	2	3	4	5	6	7	8	9
27	5.196	5.206	5.215	5.225	5.235	5.244	5.254	5.263	5.273	5.282	1	2	3	4	5	6	7	8	9
28	5.292	5.301	5.310	5.320	5.329	5.339	5.348	5.357	5.367	5.376	1	2	3	4	5	6	7	7	8
29	5.385	5.394	5.404	5.413	5.422	5.431	5.441	5.450	5.459	5.468	1	2	3	4	5	6	6	7	8
30	5.477	5.486	5.495	5.505	5.514	5.523	5.532	5.541	5.550	5.559	1	2	3	4	5	5	6	7	8
31	5.568	5.577	5.586	5.595	5.604	5.612	5.621	5.630	5.639	5.648	1	2	3	4	4	5	6	7	8
32	5.657	5.666	5.675	5.683	5.692	5.701	5.710	5.718	5.727	5.736	1	2	3	4	4	5	6	7	8
33	5.745	5.753	5.762	5.771	5.779	5.788	5.797	5.805	5.814	5.822	1	2	3	3	4	5	6	7	8
34	5.831	5.840	5.848	5.857	5.865	5.874	5.882	5.891	5.899	5.908	1	2	3	3	4	5	6	7	8
35	5.916	5.925	5.933	5.941	5.950	5.958	5.967	5.975	5.983	5.992	1	2	3	3	4	5	6	7	8
36	6.000	6.008	6.017	6.025	6.033	6.042	6.050	6.058	6.066	6.075	1	2	2	3	4	5	6	7	7
37	6.083	6.091	6.099	6.107	6.116	6.124	6.132	6.140	6.148	6.156	1	2	2	3	4	5	6	7	7
38	6.164	6.173	6.181	6.189	6.197	6.205	6.213	6.221	6.229	6.237	1	2	2	3	4	5	6	6	7
39	6.245	6.253	6.261	6.269	6.277	6.285	6.293	6.301	6.309	6.317	1	2	2	3	4	5	6	6	7
40	6.325	6.332	6.340	6.348	6.356	6.364	6.372	6.380	6.387	6.395	1	2	2	3	4	5	6	6	7
41	6.403	6.411	6.419	6.427	6.434	6.442	6.450	6.458	6.465	6.473	1	2	2	3	4	5	5	6	7
42	6.481	6.488	6.496	6.504	6.512	6.519	6.527	6.535	6.542	6.550	1	2	2	3	4	5	5	6	7
43	6.557	6.565	6.573	6.580	6.588	6.595	6.603	6.611	6.618	6.626	1	2	2	3	4	5	5	6	7
44	6.633	6.641	6.648	6.656	6.663	6.671	6.678	6.686	6.693	6.701	1	1	2	3	4	4	5	6	7
45	6.708	6.716	6.723	6.731	6.738	6.745	6.753	6.760	6.768	6.775	1	1	2	3	4	4	5	6	7
46	6.782	6.790	6.797	6.804	6.812	6.819	6.826	6.834	6.841	6.848	1	1	2	3	4	4	5	6	7
47	6.856	6.863	6.870	6.877	6.885	6.892	6.899	6.907	6.914	6.921	1	1	2	3	4	4	5	6	7
48	6.928	6.935	6.943	6.950	6.957	6.964	6.971	6.979	6.986	6.993	1	1	2	3	4	4	5	6	6
49	7.000	7.007	7.014	7.021	7.029	7.036	7.043	7.050	7.057	7.064	1	1	2	3	4	4	5	6	6
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
50	7.071	7.078	7.085	7.092	7.099	7.106	7.113	7.120	7.127	7.134	1	1	2	3	4	4	5	6	6
51	7.141	7.148	7.155	7.162	7.169	7.176	7.183	7.190	7.197	7.204	1	1	2	3	3	4	5	6	6
52	7.211	7.218	7.225	7.232	7.239	7.246	7.253	7.259	7.266	7.273	1	1	2	3	3	4	5	6	6
53	7.280	7.287	7.294	7.301	7.308	7.314	7.321	7.328	7.335	7.342	1	1	2	3	3	4	5	5	6
54	7.348	7.355	7.362	7.369	7.376	7.382	7.389	7.396	7.403	7.409	1	1	2	3	3	4	5	5	6
55	7.416	7.423	7.430	7.436	7.443	7.450	7.457	7.463	7.470	7.477	1	1	2	3	3	4	5	5	6
56	7.483	7.490	7.497	7.503	7.510	7.517	7.523	7.530	7.537	7.543	1	1	2	3	3	4	5	5	6
57	7.550	7.556	7.563	7.570	7.576	7.583	7.589	7.596	7.603	7.609	1	1	2	3	3	4	5	5	6
58	7.616	7.622	7.629	7.635	7.642	7.649	7.655	7.662	7.668	7.675	1	1	2	3	3	4	5	5	6
59	7.681	7.688	7.694	7.701	7.707	7.714	7.720	7.727	7.733	7.740	1	1	2	3	3	4	5	5	6
60	7.746	7.752	7.759	7.765	7.772	7.778	7.785	7.791	7.797	7.804	1	1	2	3	3	4	5	5	6
61	7.810	7.817	7.823	7.829	7.836	7.842	7.849	7.855	7.861	7.868	1	1	2	3	3	4	4	5	6
62	7.874	7.880	7.887	7.893	7.899	7.906	7.912	7.918	7.925	7.931	1	1	2	3	3	4	4	5	6
63	7.937	7.944	7.950	7.956	7.962	7.969	7.975	7.981	7.987	7.994	1	1	2	3	3	4	4	5	6
64	8.000	8.006	8.012	8.019	8.025	8.031	8.037	8.044	8.050	8.056	1	1	2	2	3	4	4	5	6
65	8.062	8.068	8.075	8.081	8.087	8.093	8.099	8.106	8.112	8.118	1	1	2	2	3	4	4	5	6
66	8.124	8.130	8.136	8.142	8.149	8.155	8.161	8.167	8.173	8.179	1	1	2	2	3	4	4	5	6
67	8.185	8.191	8.198	8.204	8.210	8.216	8.222	8.228	8.234	8.240	1	1	2	2	3	4	4	5	5
68	8.246	8.252	8.258	8.264	8.270	8.276	8.283	8.289	8.295	8.301	1	1	2	2	3	4	4	5	5
69	8.307	8.313	8.319	8.325	8.331	8.337	8.343	8.349	8.355	8.361	1	1	2	2	3	4	4	5	5
70	8.367	8.373	8.379	8.385	8.390	8.396	8.402	8.408	8.414	8.420	1	1	2	2	3	4	4	5	5
71	8.426	8.432	8.438	8.444	8.450	8.456	8.462	8.468	8.473	8.479	1	1	2	2	3	4	4	5	5
72	8.485	8.491	8.497	8.503	8.509	8.515	8.521	8.526	8.532	8.538	1	1	2	2	3	4	4	5	5
73	8.544	8.550	8.556	8.562	8.567	8.573	8.579	8.585	8.591	8.597	1	1	2	2	3	3	4	5	5
74	8.602	8.608	8.614	8.620	8.626	8.631	8.637	8.643	8.649	8.654	1	1	2	2	3	3	4	5	5
75	8.660	8.666	8.672	8.678	8.683	8.689	8.695	8.701	8.706	8.712	1	1	2	2	3	3	4	5	5
76	8.718	8.724	8.729	8.735	8.741	8.746	8.752	8.758	8.764	8.769	1	1	2	2	3	3	4	5	5
77	8.775	8.781	8.786	8.792	8.798	8.803	8.809	8.815	8.820	8.826	1	1	2	2	3	3	4	5	5
78	8.832	8.837	8.843	8.849	8.854	8.860	8.866	8.871	8.877	8.883	1	1	2	2	3	3	4	5	5
79	8.888	8.894	8.899	8.905	8.911	8.916	8.922	8.927	8.933	8.939	1	1	2	2	3	3	4	4	5
80	8.944	8.950	8.955	8.961	8.967	8.972	8.978	8.983	8.989	8.994	1	1	2	2	3	3	4	4	5
81	9.000	9.006	9.011	9.017	9.022	9.028	9.033	9.039	9.044	9.050	1	1	2	2	3	3	4	4	5
82	9.055	9.061	9.066	9.072	9.077	9.083	9.088	9.094	9.099	9.105	1	1	2	2	3	3	4	4	5
83	9.110	9.116	9.121	9.127	9.132	9.138	9.143	9.149	9.154	9.160	1	1	2	2	3	3	4	4	5
84	9.165	9.171	9.176	9.182	9.187	9.192	9.198	9.203	9.209	9.214	1	1	2	2	3	3	4	4	5
85	9.220	9.225	9.230	9.236	9.241	9.247	9.252	9.257	9.263	9.268	1	1	2	2	3	3	4	4	5
86	9.274	9.279	9.284	9.290	9.295	9.301	9.306	9.311	9.317	9.322	1	1	2	2	3	3	4	4	5
87	9.327	9.333	9.338	9.343	9.349	9.354	9.359	9.365	9.370	9.375	1	1	2	2	3	3	4	4	5
88	9.381	9.386	9.391	9.397	9.402	9.407	9.413	9.418	9.423	9.429	1	1	2	2	3	3	4	4	5
89	9.434	9.439	9.445	9.450	9.455	9.460	9.466	9.471	9.476	9.482	1	1	2	2	3	3	4	4	5
90	9.487	9.492	9.497	9.503	9.508	9.513	9.518	9.524	9.529	9.534	1	1	2	2	3	3	4	4	5
91	9.539	9.545	9.550	9.555	9.560	9.566	9.571	9.576	9.581	9.586	1	1	2	2	3	3	4	4	5
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
92	9.592	9.597	9.602	9.607	9.612	9.618	9.623	9.628	9.633	9.638	1	1	2	2	3	3	4	4	5
93	9.644	9.649	9.654	9.659	9.664	9.670	9.675	9.680	9.685	9.690	1	1	2	2	3	3	4	4	5
94	9.695	9.701	9.706	9.711	9.716	9.721	9.726	9.731	9.737	9.742	1	1	2	2	3	3	4	4	5
95	9.747	9.752	9.757	9.762	9.767	9.772	9.778	9.783	9.788	9.793	1	1	2	2	3	3	4	4	5
96	9.798	9.803	9.808	9.813	9.818	9.823	9.829	9.834	9.839	9.844	1	1	2	2	3	3	4	4	5
97	9.849	9.854	9.859	9.864	9.869	9.874	9.879	9.884	9.889	9.894	1	1	2	2	3	3	4	4	5
98	9.899	9.905	9.910	9.915	9.920	9.925	9.930	9.935	9.940	9.945	1	1	2	2	3	3	4	4	5
99	9.950	9.955	9.960	9.965	9.970	9.975	9.980	9.985	9.990	9.995	1	1	2	2	3	3	4	4	5
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Reciprocal

$\frac{1}{x}$											Mean Differences (Subtract)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
1.0	1.0000	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	9	18	27	37	46	55	64	73	82
1.1	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621	0.8547	0.8475	0.8403	8	15	23	30	38	46	53	61	68
1.2	0.8333	0.8264	0.8197	0.8130	0.8065	0.8000	0.7937	0.7874	0.7813	0.7752	6	13	19	26	32	39	45	51	58
1.3	0.7692	0.7634	0.7576	0.7519	0.7463	0.7407	0.7353	0.7299	0.7246	0.7194	6	11	17	22	28	33	39	44	49
1.4	0.7143	0.7092	0.7042	0.6993	0.6944	0.6897	0.6849	0.6803	0.6757	0.6711	5	10	14	19	24	29	33	38	43
1.5	0.6667	0.6623	0.6579	0.6536	0.6494	0.6452	0.6410	0.6369	0.6329	0.6289	4	8	13	17	21	25	29	33	38
1.6	0.6250	0.6211	0.6173	0.6135	0.6098	0.6061	0.6024	0.5988	0.5952	0.5917	4	7	11	15	18	22	26	29	33
1.7	0.5882	0.5848	0.5814	0.5780	0.5747	0.5714	0.5682	0.5650	0.5618	0.5587	3	7	10	13	16	20	23	26	29
1.8	0.5556	0.5525	0.5495	0.5464	0.5435	0.5405	0.5376	0.5348	0.5319	0.5291	3	6	9	12	15	18	21	23	26
1.9	0.5263	0.5236	0.5208	0.5181	0.5155	0.5128	0.5102	0.5076	0.5051	0.5025	3	5	8	11	13	16	18	21	24
2.0	0.5000	0.4975	0.4950	0.4926	0.4902	0.4878	0.4854	0.4831	0.4808	0.4785	2	5	7	10	12	14	17	19	21
2.1	0.4762	0.4739	0.4717	0.4695	0.4673	0.4651	0.4630	0.4608	0.4587	0.4566	2	4	7	9	11	13	15	17	19
2.2	0.4545	0.4525	0.4505	0.4484	0.4464	0.4444	0.4425	0.4405	0.4386	0.4367	2	4	6	8	10	12	14	16	18
2.3	0.4348	0.4329	0.4310	0.4292	0.4274	0.4255	0.4237	0.4219	0.4202	0.4184	2	4	5	7	9	11	13	15	16
2.4	0.4167	0.4149	0.4132	0.4115	0.4098	0.4082	0.4065	0.4049	0.4032	0.4016	2	3	5	7	8	10	12	13	15
2.5	0.4000	0.3984	0.3968	0.3953	0.3937	0.3922	0.3906	0.3891	0.3876	0.3861	2	3	5	6	8	9	11	12	14
2.6	0.3846	0.3831	0.3817	0.3802	0.3788	0.3774	0.3759	0.3745	0.3731	0.3717	1	3	4	6	7	9	10	11	13
2.7	0.3704	0.3690	0.3676	0.3663	0.3650	0.3636	0.3623	0.3610	0.3597	0.3584	1	3	4	5	7	8	9	11	12
2.8	0.3571	0.3559	0.3546	0.3534	0.3521	0.3509	0.3497	0.3484	0.3472	0.3460	1	2	4	5	6	7	9	10	11
2.9	0.3448	0.3436	0.3425	0.3413	0.3401	0.3390	0.3378	0.3367	0.3356	0.3344	1	2	3	5	6	7	8	9	10
3.0	0.3333	0.3322	0.3311	0.3300	0.3289	0.3279	0.3268	0.3257	0.3247	0.3236	1	2	3	4	5	6	8	9	10
3.1	0.3226	0.3215	0.3205	0.3195	0.3185	0.3175	0.3165	0.3155	0.3145	0.3135	1	2	3	4	5	6	7	8	9
3.2	0.3125	0.3115	0.3106	0.3096	0.3086	0.3077	0.3067	0.3058	0.3049	0.3040	1	2	3	4	5	6	7	8	9
3.3	0.3030	0.3021	0.3012	0.3003	0.2994	0.2985	0.2976	0.2967	0.2959	0.2950	1	2	3	4	4	5	6	7	8
3.4	0.2941	0.2933	0.2924	0.2915	0.2907	0.2899	0.2890	0.2882	0.2874	0.2865	1	2	3	3	4	5	6	7	8
3.5	0.2857	0.2849	0.2841	0.2833	0.2825	0.2817	0.2809	0.2801	0.2793	0.2786	1	2	2	3	4	5	6	6	7
3.6	0.2778	0.2770	0.2762	0.2755	0.2747	0.2740	0.2732	0.2725	0.2717	0.2710	1	2	2	3	4	5	5	6	7
3.7	0.2703	0.2695	0.2688	0.2681	0.2674	0.2667	0.2660	0.2653	0.2646	0.2639	1	1	2	3	4	4	5	6	6
3.8	0.2632	0.2625	0.2618	0.2611	0.2604	0.2597	0.2591	0.2584	0.2577	0.2571	1	1	2	3	3	4	5	5	6
3.9	0.2564	0.2558	0.2551	0.2545	0.2538	0.2532	0.2525	0.2519	0.2513	0.2506	1	1	2	3	3	4	4	5	6
4.0	0.2500	0.2494	0.2488	0.2481	0.2475	0.2469	0.2463	0.2457	0.2451	0.2445	1	1	2	2	3	4	4	5	5
4.1	0.2439	0.2433	0.2427	0.2421	0.2415	0.2410	0.2404	0.2398	0.2392	0.2387	1	1	2	2	3	3	4	5	5
4.2	0.2381	0.2375	0.2370	0.2364	0.2358	0.2353	0.2347	0.2342	0.2336	0.2331	1	1	2	2	3	3	4	4	5
4.3	0.2326	0.2320	0.2315	0.2309	0.2304	0.2299	0.2294	0.2288	0.2283	0.2278	1	1	2	2	3	3	4	4	5
4.4	0.2273	0.2268	0.2262	0.2257	0.2252	0.2247	0.2242	0.2237	0.2232	0.2227	1	1	2	2	3	3	4	4	5
4.5	0.2222	0.2217	0.2212	0.2208	0.2203	0.2198	0.2193	0.2188	0.2183	0.2179	0	1	1	2	2	3	3	4	4
4.6	0.2174	0.2169	0.2165	0.2160	0.2155	0.2151	0.2146	0.2141	0.2137	0.2132	0	1	1	2	2	3	3	4	4
4.7	0.2128	0.2123	0.2119	0.2114	0.2110	0.2105	0.2101	0.2096	0.2092	0.2088	0	1	1	2	2	3	3	4	4
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\frac{1}{x}$											Mean Differences (Subtract)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
4.8	0.2083	0.2079	0.2075	0.2070	0.2066	0.2062	0.2058	0.2053	0.2049	0.2045	0	1	1	2	2	3	3	3	4
4.9	0.2041	0.2037	0.2033	0.2028	0.2024	0.2020	0.2016	0.2012	0.2008	0.2004	0	1	1	2	2	2	3	3	4
5.0	0.2000	0.1996	0.1992	0.1988	0.1984	0.1980	0.1976	0.1972	0.1969	0.1965	0	1	1	2	2	2	3	3	4
5.1	0.1961	0.1957	0.1953	0.1949	0.1946	0.1942	0.1938	0.1934	0.1931	0.1927	0	1	1	2	2	2	3	3	3
5.2	0.1923	0.1919	0.1916	0.1912	0.1908	0.1905	0.1901	0.1898	0.1894	0.1890	0	1	1	1	2	2	3	3	3
5.3	0.1887	0.1883	0.1880	0.1876	0.1873	0.1869	0.1866	0.1862	0.1859	0.1855	0	1	1	1	2	2	2	3	3
5.4	0.1852	0.1848	0.1845	0.1842	0.1838	0.1835	0.1832	0.1828	0.1825	0.1821	0	1	1	1	2	2	2	3	3
5.5	0.1818	0.1815	0.1812	0.1808	0.1805	0.1802	0.1799	0.1795	0.1792	0.1789	0	1	1	1	2	2	2	3	3
5.6	0.1786	0.1783	0.1779	0.1776	0.1773	0.1770	0.1767	0.1764	0.1761	0.1757	0	1	1	1	2	2	2	3	3
5.7	0.1754	0.1751	0.1748	0.1745	0.1742	0.1739	0.1736	0.1733	0.1730	0.1727	0	1	1	1	2	2	2	2	3
5.8	0.1724	0.1721	0.1718	0.1715	0.1712	0.1709	0.1706	0.1704	0.1701	0.1698	0	1	1	1	1	2	2	2	3
5.9	0.1695	0.1692	0.1689	0.1686	0.1684	0.1681	0.1678	0.1675	0.1672	0.1669	0	1	1	1	1	2	2	2	3
6.0	0.1667	0.1664	0.1661	0.1658	0.1656	0.1653	0.1650	0.1647	0.1645	0.1642	0	1	1	1	1	2	2	2	2
6.1	0.1639	0.1637	0.1634	0.1631	0.1629	0.1626	0.1623	0.1621	0.1618	0.1616	0	1	1	1	1	2	2	2	2
6.2	0.1613	0.1610	0.1608	0.1605	0.1603	0.1600	0.1597	0.1595	0.1592	0.1590	0	1	1	1	1	2	2	2	2
6.3	0.1587	0.1585	0.1582	0.1580	0.1577	0.1575	0.1572	0.1570	0.1567	0.1565	0	0	1	1	1	1	2	2	2
6.4	0.1563	0.1560	0.1558	0.1555	0.1553	0.1550	0.1548	0.1546	0.1543	0.1541	0	0	1	1	1	1	2	2	2
6.5	0.1538	0.1536	0.1534	0.1531	0.1529	0.1527	0.1524	0.1522	0.1520	0.1517	0	0	1	1	1	1	2	2	2
6.6	0.1515	0.1513	0.1511	0.1508	0.1506	0.1504	0.1502	0.1499	0.1497	0.1495	0	0	1	1	1	1	2	2	2
6.7	0.1493	0.1490	0.1488	0.1486	0.1484	0.1481	0.1479	0.1477	0.1475	0.1473	0	0	1	1	1	1	2	2	2
6.8	0.1471	0.1468	0.1466	0.1464	0.1462	0.1460	0.1458	0.1456	0.1453	0.1451	0	0	1	1	1	1	1	2	2
6.9	0.1449	0.1447	0.1445	0.1443	0.1441	0.1439	0.1437	0.1435	0.1433	0.1431	0	0	1	1	1	1	1	2	2
7.0	0.1429	0.1427	0.1425	0.1422	0.1420	0.1418	0.1416	0.1414	0.1412	0.1410	0	0	1	1	1	1	1	2	2
7.1	0.1408	0.1406	0.1404	0.1403	0.1401	0.1399	0.1397	0.1395	0.1393	0.1391	0	0	1	1	1	1	1	2	2
7.2	0.1389	0.1387	0.1385	0.1383	0.1381	0.1379	0.1377	0.1376	0.1374	0.1372	0	0	1	1	1	1	1	2	2
7.3	0.1370	0.1368	0.1366	0.1364	0.1362	0.1361	0.1359	0.1357	0.1355	0.1353	0	0	1	1	1	1	1	1	2
7.4	0.1351	0.1350	0.1348	0.1346	0.1344	0.1342	0.1340	0.1339	0.1337	0.1335	0	0	1	1	1	1	1	1	2
7.5	0.1333	0.1332	0.1330	0.1328	0.1326	0.1325	0.1323	0.1321	0.1319	0.1318	0	0	1	1	1	1	1	1	2
7.6	0.1316	0.1314	0.1312	0.1311	0.1309	0.1307	0.1305	0.1304	0.1302	0.1300	0	0	1	1	1	1	1	1	2
7.7	0.1299	0.1297	0.1295	0.1294	0.1292	0.1290	0.1289	0.1287	0.1285	0.1284	0	0	0	1	1	1	1	1	1
7.8	0.1282	0.1280	0.1279	0.1277	0.1276	0.1274	0.1272	0.1271	0.1269	0.1267	0	0	0	1	1	1	1	1	1
7.9	0.1266	0.1264	0.1263	0.1261	0.1259	0.1258	0.1256	0.1255	0.1253	0.1252	0	0	0	1	1	1	1	1	1
8.0	0.1250	0.1248	0.1247	0.1245	0.1244	0.1242	0.1241	0.1239	0.1238	0.1236	0	0	0	1	1	1	1	1	1
8.1	0.1235	0.1233	0.1232	0.1230	0.1229	0.1227	0.1225	0.1224	0.1222	0.1221	0	0	0	1	1	1	1	1	1
8.2	0.1220	0.1218	0.1217	0.1215	0.1214	0.1212	0.1211	0.1209	0.1208	0.1206	0	0	0	1	1	1	1	1	1
8.3	0.1205	0.1203	0.1202	0.1200	0.1199	0.1198	0.1196	0.1195	0.1193	0.1192	0	0	0	1	1	1	1	1	1
8.4	0.1190	0.1189	0.1188	0.1186	0.1185	0.1183	0.1182	0.1181	0.1179	0.1178	0	0	0	1	1	1	1	1	1
8.5	0.1176	0.1175	0.1174	0.1172	0.1171	0.1170	0.1168	0.1167	0.1166	0.1164	0	0	0	1	1	1	1	1	1
8.6	0.1163	0.1161	0.1160	0.1159	0.1157	0.1156	0.1155	0.1153	0.1152	0.1151	0	0	0	1	1	1	1	1	1
8.7	0.1149	0.1148	0.1147	0.1145	0.1144	0.1143	0.1142	0.1140	0.1139	0.1138	0	0	0	1	1	1	1	1	1
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\frac{1}{x}$											Mean Differences (Subtract)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
8.8	0.1136	0.1135	0.1134	0.1133	0.1131	0.1130	0.1129	0.1127	0.1126	0.1125	0	0	0	1	1	1	1	1	1
8.9	0.1124	0.1122	0.1121	0.1120	0.1119	0.1117	0.1116	0.1115	0.1114	0.1112	0	0	0	0	1	1	1	1	1
9.0	0.1111	0.1110	0.1109	0.1107	0.1106	0.1105	0.1104	0.1103	0.1101	0.1100	0	0	0	0	1	1	1	1	1
9.1	0.1099	0.1098	0.1096	0.1095	0.1094	0.1093	0.1092	0.1091	0.1089	0.1088	0	0	0	0	1	1	1	1	1
9.2	0.1087	0.1086	0.1085	0.1083	0.1082	0.1081	0.1080	0.1079	0.1078	0.1076	0	0	0	0	1	1	1	1	1
9.3	0.1075	0.1074	0.1073	0.1072	0.1071	0.1070	0.1068	0.1067	0.1066	0.1065	0	0	0	0	1	1	1	1	1
9.4	0.1064	0.1063	0.1062	0.1060	0.1059	0.1058	0.1057	0.1056	0.1055	0.1054	0	0	0	0	1	1	1	1	1
9.5	0.1053	0.1052	0.1050	0.1049	0.1048	0.1047	0.1046	0.1045	0.1044	0.1043	0	0	0	0	1	1	1	1	1
9.6	0.1042	0.1041	0.1040	0.1038	0.1037	0.1036	0.1035	0.1034	0.1033	0.1032	0	0	0	0	1	1	1	1	1
9.7	0.1031	0.1030	0.1029	0.1028	0.1027	0.1026	0.1025	0.1024	0.1022	0.1021	0	0	0	0	1	1	1	1	1
9.8	0.1020	0.1019	0.1018	0.1017	0.1016	0.1015	0.1014	0.1013	0.1012	0.1011	0	0	0	0	1	1	1	1	1
9.9	0.1010	0.1009	0.1008	0.1007	0.1006	0.1005	0.1004	0.1003	0.1002	0.1001	0	0	0	0	1	1	1	1	1
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Cube Root

$\sqrt[3]{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
1.0	1.0000	1.0033	1.0066	1.0099	1.0132	1.0164	1.0196	1.0228	1.0260	1.0291	3	6	10	13	16	19	23	26	29
1.1	1.0323	1.0354	1.0385	1.0416	1.0446	1.0477	1.0507	1.0537	1.0567	1.0597	3	6	9	12	15	18	21	24	27
1.2	1.0627	1.0656	1.0685	1.0714	1.0743	1.0772	1.0801	1.0829	1.0858	1.0886	3	6	9	12	14	17	20	23	26
1.3	1.0914	1.0942	1.0970	1.0997	1.1025	1.1052	1.1079	1.1106	1.1133	1.1160	3	5	8	11	14	16	19	22	25
1.4	1.1187	1.1213	1.1240	1.1266	1.1292	1.1319	1.1344	1.1370	1.1396	1.1422	3	5	8	10	13	16	18	21	23
1.5	1.1447	1.1473	1.1498	1.1523	1.1548	1.1573	1.1598	1.1623	1.1647	1.1672	2	5	7	10	12	15	17	20	22
1.6	1.1696	1.1720	1.1745	1.1769	1.1793	1.1817	1.1840	1.1864	1.1888	1.1911	2	5	7	10	12	14	17	19	21
1.7	1.1935	1.1958	1.1981	1.2005	1.2028	1.2051	1.2074	1.2096	1.2119	1.2142	2	5	7	9	11	14	16	18	21
1.8	1.2164	1.2187	1.2209	1.2232	1.2254	1.2276	1.2298	1.2320	1.2342	1.2364	2	4	7	9	11	13	15	18	20
1.9	1.2386	1.2407	1.2429	1.2450	1.2472	1.2493	1.2515	1.2536	1.2557	1.2578	2	4	6	9	11	13	15	17	19
2.0	1.2599	1.2620	1.2641	1.2662	1.2683	1.2703	1.2724	1.2745	1.2765	1.2785	2	4	6	8	10	12	14	17	19
2.1	1.2806	1.2826	1.2846	1.2866	1.2887	1.2907	1.2927	1.2947	1.2966	1.2986	2	4	6	8	10	12	14	16	18
2.2	1.3006	1.3026	1.3045	1.3065	1.3084	1.3104	1.3123	1.3142	1.3162	1.3181	2	4	6	8	10	12	14	16	17
2.3	1.3200	1.3219	1.3238	1.3257	1.3276	1.3295	1.3314	1.3333	1.3351	1.3370	2	4	6	8	9	11	13	15	17
2.4	1.3389	1.3407	1.3426	1.3444	1.3463	1.3481	1.3499	1.3518	1.3536	1.3554	2	4	6	7	9	11	13	15	17
2.5	1.3572	1.3590	1.3608	1.3626	1.3644	1.3662	1.3680	1.3698	1.3715	1.3733	2	4	5	7	9	11	13	14	16
2.6	1.3751	1.3768	1.3786	1.3803	1.3821	1.3838	1.3856	1.3873	1.3890	1.3908	2	3	5	7	9	10	12	14	16
2.7	1.3925	1.3942	1.3959	1.3976	1.3993	1.4010	1.4027	1.4044	1.4061	1.4078	2	3	5	7	8	10	12	14	15
2.8	1.4095	1.4111	1.4128	1.4145	1.4161	1.4178	1.4195	1.4211	1.4228	1.4244	2	3	5	7	8	10	12	13	15
2.9	1.4260	1.4277	1.4293	1.4309	1.4326	1.4342	1.4358	1.4374	1.4390	1.4406	2	3	5	6	8	10	11	13	15
3.0	1.4422	1.4439	1.4454	1.4470	1.4486	1.4502	1.4518	1.4534	1.4550	1.4565	2	3	5	6	8	10	11	13	14
3.1	1.4581	1.4597	1.4612	1.4628	1.4643	1.4659	1.4674	1.4690	1.4705	1.4721	2	3	5	6	8	9	11	12	14
3.2	1.4736	1.4751	1.4767	1.4782	1.4797	1.4812	1.4828	1.4843	1.4858	1.4873	2	3	5	6	8	9	11	12	14
3.3	1.4888	1.4903	1.4918	1.4933	1.4948	1.4963	1.4978	1.4993	1.5007	1.5022	1	3	4	6	7	9	10	12	13
3.4	1.5037	1.5052	1.5066	1.5081	1.5096	1.5110	1.5125	1.5139	1.5154	1.5168	1	3	4	6	7	9	10	12	13
3.5	1.5183	1.5197	1.5212	1.5226	1.5241	1.5255	1.5269	1.5283	1.5298	1.5312	1	3	4	6	7	9	10	11	13
3.6	1.5326	1.5340	1.5355	1.5369	1.5383	1.5397	1.5411	1.5425	1.5439	1.5453	1	3	4	6	7	8	10	11	13
3.7	1.5467	1.5481	1.5495	1.5508	1.5522	1.5536	1.5550	1.5564	1.5577	1.5591	1	3	4	6	7	8	10	11	12
3.8	1.5605	1.5619	1.5632	1.5646	1.5659	1.5673	1.5687	1.5700	1.5714	1.5727	1	3	4	5	7	8	10	11	12
3.9	1.5741	1.5754	1.5767	1.5781	1.5794	1.5808	1.5821	1.5834	1.5848	1.5861	1	3	4	5	7	8	9	11	12
4.0	1.5874	1.5887	1.5900	1.5914	1.5927	1.5940	1.5953	1.5966	1.5979	1.5992	1	3	4	5	7	8	9	10	12
4.1	1.6005	1.6018	1.6031	1.6044	1.6057	1.6070	1.6083	1.6096	1.6109	1.6121	1	3	4	5	6	8	9	10	12
4.2	1.6134	1.6147	1.6160	1.6173	1.6185	1.6198	1.6211	1.6223	1.6236	1.6249	1	3	4	5	6	8	9	10	11
4.3	1.6261	1.6274	1.6287	1.6299	1.6312	1.6324	1.6337	1.6349	1.6362	1.6374	1	3	4	5	6	8	9	10	11
4.4	1.6386	1.6399	1.6411	1.6424	1.6436	1.6448	1.6461	1.6473	1.6485	1.6497	1	2	4	5	6	7	9	10	11
4.5	1.6510	1.6522	1.6534	1.6546	1.6558	1.6571	1.6583	1.6595	1.6607	1.6619	1	2	4	5	6	7	8	10	11
4.6	1.6631	1.6643	1.6655	1.6667	1.6679	1.6691	1.6703	1.6715	1.6727	1.6739	1	2	4	5	6	7	8	10	11
4.7	1.6751	1.6763	1.6774	1.6786	1.6798	1.6810	1.6822	1.6833	1.6845	1.6857	1	2	4	5	6	7	8	9	11
4.8	1.6869	1.6880	1.6892	1.6904	1.6915	1.6927	1.6939	1.6950	1.6962	1.6973	1	2	3	5	6	7	8	9	10
4.9	1.6985	1.6997	1.7008	1.7020	1.7031	1.7043	1.7054	1.7065	1.7077	1.7088	1	2	3	5	6	7	8	9	10
5.0	1.7100	1.7111	1.7123	1.7134	1.7145	1.7157	1.7168	1.7179	1.7190	1.7202	1	2	3	5	6	7	8	9	10
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt[3]{x}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
5.1	1.7213	1.7224	1.7235	1.7247	1.7258	1.7269	1.7280	1.7291	1.7303	1.7314	1	2	3	4	6	7	8	9	10
5.2	1.7325	1.7336	1.7347	1.7358	1.7369	1.7380	1.7391	1.7402	1.7413	1.7424	1	2	3	4	6	7	8	9	10
5.3	1.7435	1.7446	1.7457	1.7468	1.7479	1.7490	1.7501	1.7512	1.7522	1.7533	1	2	3	4	5	7	8	9	10
5.4	1.7544	1.7555	1.7566	1.7577	1.7587	1.7598	1.7609	1.7620	1.7630	1.7641	1	2	3	4	5	6	8	9	10
5.5	1.7652	1.7662	1.7673	1.7684	1.7694	1.7705	1.7716	1.7726	1.7737	1.7748	1	2	3	4	5	6	7	9	10
5.6	1.7758	1.7769	1.7779	1.7790	1.7800	1.7811	1.7821	1.7832	1.7842	1.7853	1	2	3	4	5	6	7	8	9
5.7	1.7863	1.7874	1.7884	1.7894	1.7905	1.7915	1.7926	1.7936	1.7946	1.7957	1	2	3	4	5	6	7	8	9
5.8	1.7967	1.7977	1.7988	1.7998	1.8008	1.8018	1.8029	1.8039	1.8049	1.8059	1	2	3	4	5	6	7	8	9
5.9	1.8070	1.8080	1.8090	1.8100	1.8110	1.8121	1.8131	1.8141	1.8151	1.8161	1	2	3	4	5	6	7	8	9
6.0	1.8171	1.8181	1.8191	1.8201	1.8211	1.8222	1.8232	1.8242	1.8252	1.8262	1	2	3	4	5	6	7	8	9
6.1	1.8272	1.8282	1.8292	1.8302	1.8311	1.8321	1.8331	1.8341	1.8351	1.8361	1	2	3	4	5	6	7	8	9
6.2	1.8371	1.8381	1.8391	1.8400	1.8410	1.8420	1.8430	1.8440	1.8450	1.8459	1	2	3	4	5	6	7	8	9
6.3	1.8469	1.8479	1.8489	1.8498	1.8508	1.8518	1.8528	1.8537	1.8547	1.8557	1	2	3	4	5	6	7	8	9
6.4	1.8566	1.8576	1.8586	1.8595	1.8605	1.8615	1.8624	1.8634	1.8643	1.8653	1	2	3	4	5	6	7	8	9
6.5	1.8663	1.8672	1.8682	1.8691	1.8701	1.8710	1.8720	1.8729	1.8739	1.8748	1	2	3	4	5	6	7	8	9
6.6	1.8758	1.8767	1.8777	1.8786	1.8796	1.8805	1.8814	1.8824	1.8833	1.8843	1	2	3	4	5	6	7	8	8
6.7	1.8852	1.8861	1.8871	1.8880	1.8889	1.8899	1.8908	1.8917	1.8927	1.8936	1	2	3	4	5	6	7	7	8
6.8	1.8945	1.8955	1.8964	1.8973	1.8982	1.8992	1.9001	1.9010	1.9019	1.9029	1	2	3	4	5	6	6	7	8
6.9	1.9038	1.9047	1.9056	1.9065	1.9074	1.9084	1.9093	1.9102	1.9111	1.9120	1	2	3	4	5	5	6	7	8
7.0	1.9129	1.9138	1.9148	1.9157	1.9166	1.9175	1.9184	1.9193	1.9202	1.9211	1	2	3	4	5	5	6	7	8
7.1	1.9220	1.9229	1.9238	1.9247	1.9256	1.9265	1.9274	1.9283	1.9292	1.9301	1	2	3	4	4	5	6	7	8
7.2	1.9310	1.9319	1.9328	1.9337	1.9345	1.9354	1.9363	1.9372	1.9381	1.9390	1	2	3	4	4	5	6	7	8
7.3	1.9399	1.9408	1.9416	1.9425	1.9434	1.9443	1.9452	1.9461	1.9469	1.9478	1	2	3	4	4	5	6	7	8
7.4	1.9487	1.9496	1.9504	1.9513	1.9522	1.9531	1.9539	1.9548	1.9557	1.9566	1	2	3	3	4	5	6	7	8
7.5	1.9574	1.9583	1.9592	1.9600	1.9609	1.9618	1.9626	1.9635	1.9644	1.9652	1	2	3	3	4	5	6	7	8
7.6	1.9661	1.9670	1.9678	1.9687	1.9695	1.9704	1.9713	1.9721	1.9730	1.9738	1	2	3	3	4	5	6	7	8
7.7	1.9747	1.9755	1.9764	1.9772	1.9781	1.9789	1.9798	1.9806	1.9815	1.9823	1	2	3	3	4	5	6	7	8
7.8	1.9832	1.9840	1.9849	1.9857	1.9866	1.9874	1.9883	1.9891	1.9899	1.9908	1	2	3	3	4	5	6	7	8
7.9	1.9916	1.9925	1.9933	1.9941	1.9950	1.9958	1.9967	1.9975	1.9983	1.9992	1	2	3	3	4	5	6	7	8
8.0	2.0000	2.0008	2.0017	2.0025	2.0033	2.0042	2.0050	2.0058	2.0066	2.0075	1	2	2	3	4	5	6	7	7
8.1	2.0083	2.0091	2.0100	2.0108	2.0116	2.0124	2.0132	2.0141	2.0149	2.0157	1	2	2	3	4	5	6	7	7
8.2	2.0165	2.0173	2.0182	2.0190	2.0198	2.0206	2.0214	2.0223	2.0231	2.0239	1	2	2	3	4	5	6	7	7
8.3	2.0247	2.0255	2.0263	2.0271	2.0279	2.0288	2.0296	2.0304	2.0312	2.0320	1	2	2	3	4	5	6	6	7
8.4	2.0328	2.0336	2.0344	2.0352	2.0360	2.0368	2.0376	2.0384	2.0392	2.0400	1	2	2	3	4	5	6	6	7
8.5	2.0408	2.0416	2.0424	2.0432	2.0440	2.0448	2.0456	2.0464	2.0472	2.0480	1	2	2	3	4	5	6	6	7
8.6	2.0488	2.0496	2.0504	2.0512	2.0520	2.0528	2.0536	2.0543	2.0551	2.0559	1	2	2	3	4	5	6	6	7
8.7	2.0567	2.0575	2.0583	2.0591	2.0599	2.0606	2.0614	2.0622	2.0630	2.0638	1	2	2	3	4	5	5	6	7
8.8	2.0646	2.0653	2.0661	2.0669	2.0677	2.0685	2.0692	2.0700	2.0708	2.0716	1	2	2	3	4	5	5	6	7
8.9	2.0724	2.0731	2.0739	2.0747	2.0755	2.0762	2.0770	2.0778	2.0785	2.0793	1	2	2	3	4	5	5	6	7
9.0	2.0801	2.0809	2.0816	2.0824	2.0832	2.0839	2.0847	2.0855	2.0862	2.0870	1	2	2	3	4	5	5	6	7
9.1	2.0878	2.0885	2.0893	2.0901	2.0908	2.0916	2.0923	2.0931	2.0939	2.0946	1	2	2	3	4	5	5	6	7
9.2	2.0954	2.0961	2.0969	2.0977	2.0984	2.0992	2.0999	2.1007	2.1014	2.1022	1	2	2	3	4	5	5	6	7
9.3	2.1029	2.1037	2.1045	2.1052	2.1060	2.1067	2.1075	2.1082	2.1090	2.1097	1	2	2	3	4	5	5	6	7
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt[3]{X}$											Mean Differences (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
9.4	2.1105	2.1112	2.1120	2.1127	2.1134	2.1142	2.1149	2.1157	2.1164	2.1172	1	1	2	3	4	4	5	6	7
9.5	2.1179	2.1187	2.1194	2.1201	2.1209	2.1216	2.1224	2.1231	2.1238	2.1246	1	1	2	3	4	4	5	6	7
9.6	2.1253	2.1261	2.1268	2.1275	2.1283	2.1290	2.1297	2.1305	2.1312	2.1319	1	1	2	3	4	4	5	6	7
9.7	2.1327	2.1334	2.1341	2.1349	2.1356	2.1363	2.1371	2.1378	2.1385	2.1392	1	1	2	3	4	4	5	6	7
9.8	2.1400	2.1407	2.1414	2.1422	2.1429	2.1436	2.1443	2.1451	2.1458	2.1465	1	1	2	3	4	4	5	6	7
9.9	2.1472	2.1480	2.1487	2.1494	2.1501	2.1508	2.1516	2.1523	2.1530	2.1537	1	1	2	3	4	4	5	6	6
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Cube Root

$\sqrt[3]{x}$											Mean Difference (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
10	2.1544	2.1616	2.1687	2.1758	2.1828	2.1898	2.1967	2.2036	2.2104	2.2172	7	14	21	28	35	42	49	56	63
11	2.2240	2.2307	2.2374	2.2440	2.2506	2.2572	2.2637	2.2702	2.2766	2.2831	7	13	20	26	33	39	46	52	59
12	2.2894	2.2958	2.3021	2.3084	2.3146	2.3208	2.3270	2.3331	2.3392	2.3453	6	12	19	25	31	37	43	50	56
13	2.3513	2.3573	2.3633	2.3693	2.3752	2.3811	2.3870	2.3928	2.3986	2.4044	6	12	18	24	29	35	41	47	53
14	2.4101	2.4159	2.4216	2.4272	2.4329	2.4385	2.4441	2.4497	2.4552	2.4607	6	11	17	22	28	34	39	45	50
15	2.4662	2.4717	2.4771	2.4825	2.4879	2.4933	2.4987	2.5040	2.5093	2.5146	5	11	16	21	27	32	38	43	48
16	2.5198	2.5251	2.5303	2.5355	2.5407	2.5458	2.5510	2.5561	2.5612	2.5662	5	10	15	21	26	31	36	41	46
17	2.5713	2.5763	2.5813	2.5863	2.5913	2.5962	2.6012	2.6061	2.6110	2.6159	5	10	15	20	25	30	35	40	45
18	2.6207	2.6256	2.6304	2.6352	2.6400	2.6448	2.6495	2.6543	2.6590	2.6637	5	10	14	19	24	29	33	38	43
19	2.6684	2.6731	2.6777	2.6824	2.6870	2.6916	2.6962	2.7008	2.7053	2.7099	5	9	14	18	23	28	32	37	41
20	2.7144	2.7189	2.7234	2.7279	2.7324	2.7369	2.7413	2.7457	2.7501	2.7545	4	9	13	18	22	27	31	36	40
21	2.7589	2.7633	2.7677	2.7720	2.7763	2.7806	2.7850	2.7892	2.7935	2.7978	4	9	13	17	22	26	30	35	39
22	2.8020	2.8063	2.8105	2.8147	2.8189	2.8231	2.8273	2.8314	2.8356	2.8397	4	8	13	17	21	25	29	33	38
23	2.8439	2.8480	2.8521	2.8562	2.8603	2.8643	2.8684	2.8724	2.8765	2.8805	4	8	12	16	20	24	28	33	37
24	2.8845	2.8885	2.8925	2.8965	2.9004	2.9044	2.9083	2.9123	2.9162	2.9201	4	8	12	16	20	24	28	32	36
25	2.9240	2.9279	2.9318	2.9357	2.9395	2.9434	2.9472	2.9511	2.9549	2.9587	4	8	12	15	19	23	27	31	35
26	2.9625	2.9663	2.9701	2.9738	2.9776	2.9814	2.9851	2.9888	2.9926	2.9963	4	8	11	15	19	23	26	30	34
27	3.0000	3.0037	3.0074	3.0111	3.0147	3.0184	3.0221	3.0257	3.0293	3.0330	4	7	11	15	18	22	26	29	33
28	3.0366	3.0402	3.0438	3.0474	3.0510	3.0546	3.0581	3.0617	3.0652	3.0688	4	7	11	14	18	21	25	29	32
29	3.0723	3.0758	3.0794	3.0829	3.0864	3.0899	3.0934	3.0968	3.1003	3.1038	3	7	10	14	17	21	24	28	31
30	3.1072	3.1107	3.1141	3.1176	3.1210	3.1244	3.1278	3.1312	3.1346	3.1380	3	7	10	14	17	20	24	27	31
31	3.1414	3.1448	3.1481	3.1515	3.1548	3.1582	3.1615	3.1648	3.1682	3.1715	3	7	10	13	17	20	23	27	30
32	3.1748	3.1781	3.1814	3.1847	3.1880	3.1913	3.1945	3.1978	3.2010	3.2043	3	7	10	13	16	20	23	26	29
33	3.2075	3.2108	3.2140	3.2172	3.2204	3.2237	3.2269	3.2301	3.2332	3.2364	3	6	10	13	16	19	22	26	29
34	3.2396	3.2428	3.2460	3.2491	3.2523	3.2554	3.2586	3.2617	3.2648	3.2679	3	6	9	13	16	19	22	25	28
35	3.2711	3.2742	3.2773	3.2804	3.2835	3.2866	3.2897	3.2927	3.2958	3.2989	3	6	9	12	15	19	22	25	28
36	3.3019	3.3050	3.3080	3.3111	3.3141	3.3171	3.3202	3.3232	3.3262	3.3292	3	6	9	12	15	18	21	24	27
37	3.3322	3.3352	3.3382	3.3412	3.3442	3.3472	3.3501	3.3531	3.3561	3.3590	3	6	9	12	15	18	21	24	27
38	3.3620	3.3649	3.3679	3.3708	3.3737	3.3767	3.3796	3.3825	3.3854	3.3883	3	6	9	12	15	18	20	23	26
39	3.3912	3.3941	3.3970	3.3999	3.4028	3.4056	3.4085	3.4114	3.4142	3.4171	3	6	9	12	14	17	20	23	26
40	3.4200	3.4228	3.4256	3.4285	3.4313	3.4341	3.4370	3.4398	3.4426	3.4454	3	6	8	11	14	17	20	23	25
41	3.4482	3.4510	3.4538	3.4566	3.4594	3.4622	3.4650	3.4677	3.4705	3.4733	3	6	8	11	14	17	19	22	25
42	3.4760	3.4788	3.4815	3.4843	3.4870	3.4898	3.4925	3.4952	3.4980	3.5007	3	5	8	11	14	16	19	22	25
43	3.5034	3.5061	3.5088	3.5115	3.5142	3.5169	3.5196	3.5223	3.5250	3.5277	3	5	8	11	13	16	19	22	24
44	3.5303	3.5330	3.5357	3.5384	3.5410	3.5437	3.5463	3.5490	3.5516	3.5543	3	5	8	11	13	16	19	21	24
45	3.5569	3.5595	3.5622	3.5648	3.5674	3.5700	3.5726	3.5752	3.5778	3.5804	3	5	8	10	13	16	18	21	24
46	3.5830	3.5856	3.5882	3.5908	3.5934	3.5960	3.5986	3.6011	3.6037	3.6063	3	5	8	10	13	15	18	21	23
47	3.6088	3.6114	3.6139	3.6165	3.6190	3.6216	3.6241	3.6267	3.6292	3.6317	3	5	8	10	13	15	18	20	23
48	3.6342	3.6368	3.6393	3.6418	3.6443	3.6468	3.6493	3.6518	3.6543	3.6568	3	5	8	10	13	15	18	20	23
49	3.6593	3.6618	3.6643	3.6668	3.6692	3.6717	3.6742	3.6766	3.6791	3.6816	2	5	7	10	12	15	17	20	22
50	3.6840	3.6865	3.6889	3.6914	3.6938	3.6963	3.6987	3.7011	3.7036	3.7060	2	5	7	10	12	15	17	20	22
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt[3]{x}$											Mean Difference (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
51	3.7084	3.7109	3.7133	3.7157	3.7181	3.7205	3.7229	3.7253	3.7277	3.7301	2	5	7	10	12	14	17	19	22
52	3.7325	3.7349	3.7373	3.7397	3.7421	3.7444	3.7468	3.7492	3.7516	3.7539	2	5	7	10	12	14	17	19	21
53	3.7563	3.7586	3.7610	3.7634	3.7657	3.7681	3.7704	3.7728	3.7751	3.7774	2	5	7	9	12	14	16	19	21
54	3.7798	3.7821	3.7844	3.7867	3.7891	3.7914	3.7937	3.7960	3.7983	3.8006	2	5	7	9	12	14	16	19	21
55	3.8030	3.8053	3.8076	3.8099	3.8121	3.8144	3.8167	3.8190	3.8213	3.8236	2	5	7	9	11	14	16	18	21
56	3.8259	3.8281	3.8304	3.8327	3.8349	3.8372	3.8395	3.8417	3.8440	3.8462	2	5	7	9	11	14	16	18	20
57	3.8485	3.8508	3.8530	3.8552	3.8575	3.8597	3.8620	3.8642	3.8664	3.8687	2	4	7	9	11	13	16	18	20
58	3.8709	3.8731	3.8753	3.8775	3.8798	3.8820	3.8842	3.8864	3.8886	3.8908	2	4	7	9	11	13	15	18	20
59	3.8930	3.8952	3.8974	3.8996	3.9018	3.9040	3.9061	3.9083	3.9105	3.9127	2	4	7	9	11	13	15	17	20
60	3.9149	3.9170	3.9192	3.9214	3.9235	3.9257	3.9279	3.9300	3.9322	3.9343	2	4	6	9	11	13	15	17	19
61	3.9365	3.9386	3.9408	3.9429	3.9451	3.9472	3.9494	3.9515	3.9536	3.9558	2	4	6	9	11	13	15	17	19
62	3.9579	3.9600	3.9621	3.9643	3.9664	3.9685	3.9706	3.9727	3.9748	3.9770	2	4	6	8	11	13	15	17	19
63	3.9791	3.9812	3.9833	3.9854	3.9875	3.9896	3.9916	3.9937	3.9958	3.9979	2	4	6	8	10	13	15	17	19
64	4.0000	4.0021	4.0042	4.0062	4.0083	4.0104	4.0125	4.0145	4.0166	4.0187	2	4	6	8	10	12	15	17	19
65	4.0207	4.0228	4.0248	4.0269	4.0290	4.0310	4.0331	4.0351	4.0372	4.0392	2	4	6	8	10	12	14	16	18
66	4.0412	4.0433	4.0453	4.0474	4.0494	4.0514	4.0534	4.0555	4.0575	4.0595	2	4	6	8	10	12	14	16	18
67	4.0615	4.0636	4.0656	4.0676	4.0696	4.0716	4.0736	4.0756	4.0776	4.0797	2	4	6	8	10	12	14	16	18
68	4.0817	4.0837	4.0857	4.0876	4.0896	4.0916	4.0936	4.0956	4.0976	4.0996	2	4	6	8	10	12	14	16	18
69	4.1016	4.1035	4.1055	4.1075	4.1095	4.1114	4.1134	4.1154	4.1174	4.1193	2	4	6	8	10	12	14	16	18
70	4.1213	4.1232	4.1252	4.1272	4.1291	4.1311	4.1330	4.1350	4.1369	4.1389	2	4	6	8	10	12	14	16	18
71	4.1408	4.1428	4.1447	4.1466	4.1486	4.1505	4.1524	4.1544	4.1563	4.1582	2	4	6	8	10	12	14	15	17
72	4.1602	4.1621	4.1640	4.1659	4.1679	4.1698	4.1717	4.1736	4.1755	4.1774	2	4	6	8	10	12	13	15	17
73	4.1793	4.1812	4.1832	4.1851	4.1870	4.1889	4.1908	4.1927	4.1946	4.1964	2	4	6	8	10	11	13	15	17
74	4.1983	4.2002	4.2021	4.2040	4.2059	4.2078	4.2097	4.2115	4.2134	4.2153	2	4	6	8	9	11	13	15	17
75	4.2172	4.2190	4.2209	4.2228	4.2246	4.2265	4.2284	4.2302	4.2321	4.2340	2	4	6	7	9	11	13	15	17
76	4.2358	4.2377	4.2395	4.2414	4.2432	4.2451	4.2469	4.2488	4.2506	4.2525	2	4	6	7	9	11	13	15	17
77	4.2543	4.2562	4.2580	4.2598	4.2617	4.2635	4.2653	4.2672	4.2690	4.2708	2	4	6	7	9	11	13	15	17
78	4.2727	4.2745	4.2763	4.2781	4.2799	4.2818	4.2836	4.2854	4.2872	4.2890	2	4	5	7	9	11	13	15	16
79	4.2908	4.2927	4.2945	4.2963	4.2981	4.2999	4.3017	4.3035	4.3053	4.3071	2	4	5	7	9	11	13	14	16
80	4.3089	4.3107	4.3125	4.3142	4.3160	4.3178	4.3196	4.3214	4.3232	4.3250	2	4	5	7	9	11	13	14	16
81	4.3267	4.3285	4.3303	4.3321	4.3339	4.3356	4.3374	4.3392	4.3409	4.3427	2	4	5	7	9	11	12	14	16
82	4.3445	4.3462	4.3480	4.3498	4.3515	4.3533	4.3551	4.3568	4.3586	4.3603	2	4	5	7	9	11	12	14	16
83	4.3621	4.3638	4.3656	4.3673	4.3691	4.3708	4.3726	4.3743	4.3760	4.3778	2	3	5	7	9	10	12	14	16
84	4.3795	4.3813	4.3830	4.3847	4.3865	4.3882	4.3899	4.3917	4.3934	4.3951	2	3	5	7	9	10	12	14	16
85	4.3968	4.3986	4.4003	4.4020	4.4037	4.4054	4.4072	4.4089	4.4106	4.4123	2	3	5	7	9	10	12	14	15
86	4.4140	4.4157	4.4174	4.4191	4.4208	4.4225	4.4242	4.4259	4.4276	4.4293	2	3	5	7	9	10	12	14	15
87	4.4310	4.4327	4.4344	4.4361	4.4378	4.4395	4.4412	4.4429	4.4446	4.4463	2	3	5	7	8	10	12	14	15
88	4.4480	4.4496	4.4513	4.4530	4.4547	4.4564	4.4580	4.4597	4.4614	4.4631	2	3	5	7	8	10	12	13	15
89	4.4647	4.4664	4.4681	4.4698	4.4714	4.4731	4.4748	4.4764	4.4781	4.4797	2	3	5	7	8	10	12	13	15
90	4.4814	4.4831	4.4847	4.4864	4.4880	4.4897	4.4913	4.4930	4.4946	4.4963	2	3	5	7	8	10	12	13	15
91	4.4979	4.4996	4.5012	4.5029	4.5045	4.5062	4.5078	4.5094	4.5111	4.5127	2	3	5	7	8	10	11	13	15
92	4.5144	4.5160	4.5176	4.5193	4.5209	4.5225	4.5241	4.5258	4.5274	4.5290	2	3	5	7	8	10	11	13	15
93	4.5307	4.5323	4.5339	4.5355	4.5371	4.5388	4.5404	4.5420	4.5436	4.5452	2	3	5	6	8	10	11	13	15
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

$\sqrt[3]{x}$											Mean Difference (Add)								
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
94	4.5468	4.5484	4.5501	4.5517	4.5533	4.5549	4.5565	4.5581	4.5597	4.5613	2	3	5	6	8	10	11	13	14
95	4.5629	4.5645	4.5661	4.5677	4.5693	4.5709	4.5725	4.5741	4.5757	4.5773	2	3	5	6	8	10	11	13	14
96	4.5789	4.5804	4.5820	4.5836	4.5852	4.5868	4.5884	4.5900	4.5915	4.5931	2	3	5	6	8	10	11	13	14
97	4.5947	4.5963	4.5979	4.5994	4.6010	4.6026	4.6042	4.6057	4.6073	4.6089	2	3	5	6	8	9	11	13	14
98	4.6104	4.6120	4.6136	4.6151	4.6167	4.6183	4.6198	4.6214	4.6229	4.6245	2	3	5	6	8	9	11	13	14
99	4.6261	4.6276	4.6292	4.6307	4.6323	4.6338	4.6354	4.6369	4.6385	4.6400	2	3	5	6	8	9	11	12	14
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Natural or Naperian Logarithms

ln x or log _e x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
1.0	0.0000	0.0100	0.0198	0.0296	0.0392	0.0488	0.0583	0.0677	0.0770	0.0862	10	19	29	38	48	57	67	76	86
1.1	0.0953	0.1044	0.1133	0.1222	0.1310	0.1398	0.1484	0.1570	0.1655	0.1740	9	17	26	35	44	52	61	70	78
1.2	0.1823	0.1906	0.1989	0.2070	0.2151	0.2231	0.2311	0.2390	0.2469	0.2546	8	16	24	32	40	48	56	64	72
1.3	0.2624	0.2700	0.2776	0.2852	0.2927	0.3001	0.3075	0.3148	0.3221	0.3293	7	15	22	30	37	45	52	59	67
1.4	0.3365	0.3436	0.3507	0.3577	0.3646	0.3716	0.3784	0.3853	0.3920	0.3988	7	14	21	28	35	41	48	55	62
1.5	0.4055	0.4121	0.4187	0.4253	0.4318	0.4383	0.4447	0.4511	0.4574	0.4637	6	13	19	26	32	39	45	52	58
1.6	0.4700	0.4762	0.4824	0.4886	0.4947	0.5008	0.5068	0.5128	0.5188	0.5247	6	12	18	24	30	36	42	49	55
1.7	0.5306	0.5365	0.5423	0.5481	0.5539	0.5596	0.5653	0.5710	0.5766	0.5822	6	11	17	23	29	34	40	46	51
1.8	0.5878	0.5933	0.5988	0.6043	0.6098	0.6152	0.6206	0.6259	0.6313	0.6366	5	11	16	22	27	32	38	43	49
1.9	0.6419	0.6471	0.6523	0.6575	0.6627	0.6678	0.6729	0.6780	0.6831	0.6881	5	10	15	21	26	31	36	41	46
2.0	0.6931	0.6981	0.7031	0.7080	0.7129	0.7178	0.7227	0.7275	0.7324	0.7372	5	10	15	20	24	29	34	39	44
2.1	0.7419	0.7467	0.7514	0.7561	0.7608	0.7655	0.7701	0.7747	0.7793	0.7839	5	9	14	19	23	28	33	37	42
2.2	0.7885	0.7930	0.7975	0.8020	0.8065	0.8109	0.8154	0.8198	0.8242	0.8286	4	9	13	18	22	27	31	36	40
2.3	0.8329	0.8372	0.8416	0.8459	0.8502	0.8544	0.8587	0.8629	0.8671	0.8713	4	9	13	17	21	26	30	34	38
2.4	0.8755	0.8796	0.8838	0.8879	0.8920	0.8961	0.9002	0.9042	0.9083	0.9123	4	8	12	16	20	25	29	33	37
2.5	0.9163	0.9203	0.9243	0.9282	0.9322	0.9361	0.9400	0.9439	0.9478	0.9517	4	8	12	16	20	24	27	31	35
2.6	0.9555	0.9594	0.9632	0.9670	0.9708	0.9746	0.9783	0.9821	0.9858	0.9895	4	8	11	15	19	23	26	30	34
2.7	0.9933	0.9969	1.0006	1.0043	1.0080	1.0116	1.0152	1.0188	1.0225	1.0260	4	7	11	15	18	22	25	29	33
2.8	1.0296	1.0332	1.0367	1.0403	1.0438	1.0473	1.0508	1.0543	1.0578	1.0613	4	7	11	14	18	21	25	28	32
2.9	1.0647	1.0682	1.0716	1.0750	1.0784	1.0818	1.0852	1.0886	1.0919	1.0953	3	7	10	14	17	20	24	27	31
3.0	1.0986	1.1019	1.1053	1.1086	1.1119	1.1151	1.1184	1.1217	1.1249	1.1282	3	7	10	13	16	20	23	26	30
3.1	1.1314	1.1346	1.1378	1.1410	1.1442	1.1474	1.1506	1.1537	1.1569	1.1600	3	6	10	13	16	19	22	25	29
3.2	1.1632	1.1663	1.1694	1.1725	1.1756	1.1787	1.1817	1.1848	1.1878	1.1909	3	6	9	12	15	18	22	25	28
3.3	1.1939	1.1969	1.2000	1.2030	1.2060	1.2090	1.2119	1.2149	1.2179	1.2208	3	6	9	12	15	18	21	24	27
3.4	1.2238	1.2267	1.2296	1.2326	1.2355	1.2384	1.2413	1.2442	1.2470	1.2499	3	6	9	12	15	17	20	23	26
3.5	1.2528	1.2556	1.2585	1.2613	1.2641	1.2669	1.2698	1.2726	1.2754	1.2782	3	6	8	11	14	17	20	23	25
3.6	1.2809	1.2837	1.2865	1.2892	1.2920	1.2947	1.2975	1.3002	1.3029	1.3056	3	5	8	11	14	16	19	22	25
3.7	1.3083	1.3110	1.3137	1.3164	1.3191	1.3218	1.3244	1.3271	1.3297	1.3324	3	5	8	11	13	16	19	21	24
3.8	1.3350	1.3376	1.3403	1.3429	1.3455	1.3481	1.3507	1.3533	1.3558	1.3584	3	5	8	10	13	16	18	21	23
3.9	1.3610	1.3635	1.3661	1.3686	1.3712	1.3737	1.3762	1.3788	1.3813	1.3838	3	5	8	10	13	15	18	20	23
4.0	1.3863	1.3888	1.3913	1.3938	1.3962	1.3987	1.4012	1.4036	1.4061	1.4085	2	5	7	10	12	15	17	20	22
4.1	1.4110	1.4134	1.4159	1.4183	1.4207	1.4231	1.4255	1.4279	1.4303	1.4327	2	5	7	10	12	14	17	19	22
4.2	1.4351	1.4375	1.4398	1.4422	1.4446	1.4469	1.4493	1.4516	1.4540	1.4563	2	5	7	9	12	14	16	19	21
4.3	1.4586	1.4609	1.4633	1.4656	1.4679	1.4702	1.4725	1.4748	1.4770	1.4793	2	5	7	9	12	14	16	18	21
4.4	1.4816	1.4839	1.4861	1.4884	1.4907	1.4929	1.4951	1.4974	1.4996	1.5019	2	4	7	9	11	13	16	18	20
4.5	1.5041	1.5063	1.5085	1.5107	1.5129	1.5151	1.5173	1.5195	1.5217	1.5239	2	4	7	9	11	13	15	18	20
4.6	1.5261	1.5282	1.5304	1.5326	1.5347	1.5369	1.5390	1.5412	1.5433	1.5454	2	4	6	9	11	13	15	17	19
4.7	1.5476	1.5497	1.5518	1.5539	1.5560	1.5581	1.5602	1.5623	1.5644	1.5665	2	4	6	8	11	13	15	17	19
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

ln x or log _e x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
4.8	1.5686	1.5707	1.5728	1.5748	1.5769	1.5790	1.5810	1.5831	1.5851	1.5872	2	4	6	8	10	12	14	16	19
4.9	1.5892	1.5913	1.5933	1.5953	1.5974	1.5994	1.6014	1.6034	1.6054	1.6074	2	4	6	8	10	12	14	16	18
5.0	1.6094	1.6114	1.6134	1.6154	1.6174	1.6194	1.6214	1.6233	1.6253	1.6273	2	4	6	8	10	12	14	16	18
5.1	1.6292	1.6312	1.6332	1.6351	1.6371	1.6390	1.6409	1.6429	1.6448	1.6467	2	4	6	8	10	12	14	16	17
5.2	1.6487	1.6506	1.6525	1.6544	1.6563	1.6582	1.6601	1.6620	1.6639	1.6658	2	4	6	8	10	11	13	15	17
5.3	1.6677	1.6696	1.6715	1.6734	1.6752	1.6771	1.6790	1.6808	1.6827	1.6845	2	4	6	7	9	11	13	15	17
5.4	1.6864	1.6882	1.6901	1.6919	1.6938	1.6956	1.6974	1.6993	1.7011	1.7029	2	4	6	7	9	11	13	15	17
5.5	1.7047	1.7066	1.7084	1.7102	1.7120	1.7138	1.7156	1.7174	1.7192	1.7210	2	4	5	7	9	11	13	14	16
5.6	1.7228	1.7246	1.7263	1.7281	1.7299	1.7317	1.7334	1.7352	1.7370	1.7387	2	4	5	7	9	11	12	14	16
5.7	1.7405	1.7422	1.7440	1.7457	1.7475	1.7492	1.7509	1.7527	1.7544	1.7561	2	3	5	7	9	10	12	14	16
5.8	1.7579	1.7596	1.7613	1.7630	1.7647	1.7664	1.7681	1.7699	1.7716	1.7733	2	3	5	7	9	10	12	14	15
5.9	1.7750	1.7766	1.7783	1.7800	1.7817	1.7834	1.7851	1.7867	1.7884	1.7901	2	3	5	7	8	10	12	13	15
6.0	1.7918	1.7934	1.7951	1.7967	1.7984	1.8001	1.8017	1.8034	1.8050	1.8066	2	3	5	7	8	10	12	13	15
6.1	1.8083	1.8099	1.8116	1.8132	1.8148	1.8165	1.8181	1.8197	1.8213	1.8229	2	3	5	7	8	10	11	13	15
6.2	1.8245	1.8262	1.8278	1.8294	1.8310	1.8326	1.8342	1.8358	1.8374	1.8390	2	3	5	6	8	10	11	13	14
6.3	1.8405	1.8421	1.8437	1.8453	1.8469	1.8485	1.8500	1.8516	1.8532	1.8547	2	3	5	6	8	9	11	13	14
6.4	1.8563	1.8579	1.8594	1.8610	1.8625	1.8641	1.8656	1.8672	1.8687	1.8703	2	3	5	6	8	9	11	12	14
6.5	1.8718	1.8733	1.8749	1.8764	1.8779	1.8795	1.8810	1.8825	1.8840	1.8856	2	3	5	6	8	9	11	12	14
6.6	1.8871	1.8886	1.8901	1.8916	1.8931	1.8946	1.8961	1.8976	1.8991	1.9006	2	3	5	6	8	9	11	12	14
6.7	1.9021	1.9036	1.9051	1.9066	1.9081	1.9095	1.9110	1.9125	1.9140	1.9155	1	3	4	6	7	9	10	12	13
6.8	1.9169	1.9184	1.9199	1.9213	1.9228	1.9242	1.9257	1.9272	1.9286	1.9301	1	3	4	6	7	9	10	12	13
6.9	1.9315	1.9330	1.9344	1.9359	1.9373	1.9387	1.9402	1.9416	1.9430	1.9445	1	3	4	6	7	9	10	12	13
7.0	1.9459	1.9473	1.9488	1.9502	1.9516	1.9530	1.9544	1.9559	1.9573	1.9587	1	3	4	6	7	9	10	11	13
7.1	1.9601	1.9615	1.9629	1.9643	1.9657	1.9671	1.9685	1.9699	1.9713	1.9727	1	3	4	6	7	8	10	11	13
7.2	1.9741	1.9755	1.9769	1.9782	1.9796	1.9810	1.9824	1.9838	1.9851	1.9865	1	3	4	6	7	8	10	11	12
7.3	1.9879	1.9892	1.9906	1.9920	1.9933	1.9947	1.9961	1.9974	1.9988	2.0001	1	3	4	5	7	8	10	11	12
7.4	2.0015	2.0028	2.0042	2.0055	2.0069	2.0082	2.0096	2.0109	2.0122	2.0136	1	3	4	5	7	8	9	11	12
7.5	2.0149	2.0162	2.0176	2.0189	2.0202	2.0215	2.0229	2.0242	2.0255	2.0268	1	3	4	5	7	8	9	11	12
7.6	2.0281	2.0295	2.0308	2.0321	2.0334	2.0347	2.0360	2.0373	2.0386	2.0399	1	3	4	5	7	8	9	10	12
7.7	2.0412	2.0425	2.0438	2.0451	2.0464	2.0477	2.0490	2.0503	2.0516	2.0528	1	3	4	5	6	8	9	10	12
7.8	2.0541	2.0554	2.0567	2.0580	2.0592	2.0605	2.0618	2.0631	2.0643	2.0656	1	3	4	5	6	8	9	10	11
7.9	2.0669	2.0681	2.0694	2.0707	2.0719	2.0732	2.0744	2.0757	2.0769	2.0782	1	3	4	5	6	8	9	10	11
8.0	2.0794	2.0807	2.0819	2.0832	2.0844	2.0857	2.0869	2.0882	2.0894	2.0906	1	2	4	5	6	7	9	10	11
8.1	2.0919	2.0931	2.0943	2.0956	2.0968	2.0980	2.0992	2.1005	2.1017	2.1029	1	2	4	5	6	7	9	10	11
8.2	2.1041	2.1054	2.1066	2.1078	2.1090	2.1102	2.1114	2.1126	2.1138	2.1150	1	2	4	5	6	7	8	10	11
8.3	2.1163	2.1175	2.1187	2.1199	2.1211	2.1223	2.1235	2.1247	2.1258	2.1270	1	2	4	5	6	7	8	10	11
8.4	2.1282	2.1294	2.1306	2.1318	2.1330	2.1342	2.1353	2.1365	2.1377	2.1389	1	2	4	5	6	7	8	9	11
8.5	2.1401	2.1412	2.1424	2.1436	2.1448	2.1459	2.1471	2.1483	2.1494	2.1506	1	2	4	5	6	7	8	9	11
8.6	2.1518	2.1529	2.1541	2.1552	2.1564	2.1576	2.1587	2.1599	2.1610	2.1622	1	2	3	5	6	7	8	9	10
8.7	2.1633	2.1645	2.1656	2.1668	2.1679	2.1691	2.1702	2.1713	2.1725	2.1736	1	2	3	5	6	7	8	9	10
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

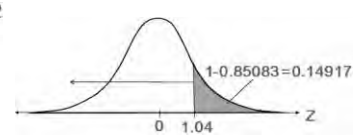
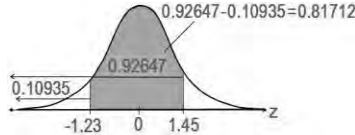
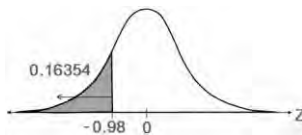
$\ln x$ or $\log_e x$																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
8.8	2.1748	2.1759	2.1770	2.1782	2.1793	2.1804	2.1815	2.1827	2.1838	2.1849	1	2	3	4	5	6	7	8	9
8.9	2.1861	2.1872	2.1883	2.1894	2.1905	2.1917	2.1928	2.1939	2.1950	2.1961	1	2	3	4	5	6	7	8	9
9.0	2.1972	2.1983	2.1994	2.2006	2.2017	2.2028	2.2039	2.2050	2.2061	2.2072	1	2	3	4	5	6	7	8	9
9.1	2.2083	2.2094	2.2105	2.2116	2.2127	2.2138	2.2148	2.2159	2.2170	2.2181	1	2	3	4	5	6	7	8	9
9.2	2.2192	2.2203	2.2214	2.2225	2.2235	2.2246	2.2257	2.2268	2.2279	2.2289	1	2	3	4	5	6	7	8	9
9.3	2.2300	2.2311	2.2322	2.2332	2.2343	2.2354	2.2364	2.2375	2.2386	2.2396	1	2	3	4	5	6	7	8	9
9.4	2.2407	2.2418	2.2428	2.2439	2.2450	2.2460	2.2471	2.2481	2.2492	2.2502	1	2	3	4	5	6	7	8	9
9.5	2.2513	2.2523	2.2534	2.2544	2.2555	2.2565	2.2576	2.2586	2.2597	2.2607	1	2	3	4	5	6	7	8	9
9.6	2.2618	2.2628	2.2638	2.2649	2.2659	2.2670	2.2680	2.2690	2.2701	2.2711	1	2	3	4	5	6	7	8	9
9.7	2.2721	2.2732	2.2742	2.2752	2.2762	2.2773	2.2783	2.2793	2.2803	2.2814	1	2	3	4	5	6	7	8	9
9.8	2.2824	2.2834	2.2844	2.2854	2.2865	2.2875	2.2885	2.2895	2.2905	2.2915	1	2	3	4	5	6	7	8	9
9.9	2.2925	2.2935	2.2946	2.2956	2.2966	2.2976	2.2986	2.2996	2.3006	2.3016	1	2	3	4	5	6	7	8	9
x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Binomial Distribution

$P(X = x) = B(n, x) = \sum_{x=0}^n \binom{n}{x} p^x (1-p)^{n-x}$													
	x	0.01	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	n - x
n = 1	0	0.9900	0.9500	0.9000	0.8500	0.8000	0.7500	0.7000	0.6500	0.6000	0.5500	0.5000	1
	1	0.0100	0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0
n = 2	0	0.9801	0.9025	0.8100	0.7225	0.6400	0.5625	0.4900	0.4225	0.3600	0.3025	0.2500	2
	1	0.0198	0.0950	0.1800	0.2550	0.3200	0.3750	0.4200	0.4550	0.4800	0.4950	0.5000	1
	2	0.0001	0.0025	0.0100	0.0225	0.0400	0.0625	0.0900	0.1225	0.1600	0.2025	0.2500	0
n = 3	0	0.9703	0.8574	0.7290	0.6141	0.5120	0.4219	0.3430	0.2746	0.2160	0.1664	0.1250	3
	1	0.0294	0.1354	0.2430	0.3251	0.3840	0.4219	0.4410	0.4436	0.4320	0.4084	0.3750	2
	2	0.0003	0.0071	0.0270	0.0574	0.0960	0.1406	0.1890	0.2389	0.2880	0.3341	0.3750	1
	3	0.0000	0.0001	0.0010	0.0034	0.0080	0.0156	0.0270	0.0429	0.0640	0.0911	0.1250	0
n = 4	0	0.9606	0.8145	0.6561	0.5220	0.4096	0.3164	0.2401	0.1785	0.1296	0.0915	0.0625	4
	1	0.0388	0.1715	0.2916	0.3685	0.4096	0.4219	0.4116	0.3845	0.3456	0.2995	0.2500	3
	2	0.0006	0.0135	0.0486	0.0975	0.1536	0.2109	0.2646	0.3105	0.3456	0.3675	0.3750	2
	3	0.0000	0.0005	0.0036	0.0115	0.0256	0.0469	0.0756	0.1115	0.1536	0.2005	0.2500	1
	4	0.0000	0.0000	0.0001	0.0005	0.0016	0.0039	0.0081	0.0150	0.0256	0.0410	0.0625	0
n = 5	0	0.9510	0.7738	0.5905	0.4437	0.3277	0.2373	0.1681	0.1160	0.0778	0.0503	0.0313	5
	1	0.0480	0.2036	0.3281	0.3915	0.4096	0.3955	0.3602	0.3124	0.2592	0.2059	0.1563	4
	2	0.0010	0.0214	0.0729	0.1382	0.2048	0.2637	0.3087	0.3364	0.3456	0.3369	0.3125	3
	3	0.0000	0.0011	0.0081	0.0244	0.0512	0.0879	0.1323	0.1811	0.2304	0.2757	0.3125	2
	4	0.0000	0.0000	0.0005	0.0022	0.0064	0.0146	0.0284	0.0488	0.0768	0.1128	0.1563	1
	5	0.0000	0.0000	0.0000	0.0001	0.0003	0.0010	0.0024	0.0053	0.0102	0.0185	0.0313	0
n = 6	0	0.9415	0.7351	0.5314	0.3771	0.2621	0.1780	0.1176	0.0754	0.0467	0.0277	0.0156	6
	1	0.0571	0.2321	0.3543	0.3993	0.3932	0.3560	0.3025	0.2437	0.1866	0.1359	0.0938	5
	2	0.0014	0.0305	0.0984	0.1762	0.2458	0.2966	0.3241	0.3280	0.3110	0.2780	0.2344	4
	3	0.0000	0.0021	0.0146	0.0415	0.0819	0.1318	0.1852	0.2355	0.2765	0.3032	0.3125	3
	4	0.0000	0.0001	0.0012	0.0055	0.0154	0.0330	0.0595	0.0951	0.1382	0.1860	0.2344	2
	5	0.0000	0.0000	0.0001	0.0004	0.0015	0.0044	0.0102	0.0205	0.0369	0.0609	0.0938	1
	6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0007	0.0018	0.0041	0.0083	0.0156	0
n = 7	0	0.9321	0.6983	0.4783	0.3206	0.2097	0.1335	0.0824	0.0490	0.0280	0.0152	0.0078	7
	1	0.0659	0.2573	0.3720	0.3960	0.3670	0.3115	0.2471	0.1848	0.1306	0.0872	0.0547	6
	2	0.0020	0.0406	0.1240	0.2097	0.2753	0.3115	0.3177	0.2985	0.2613	0.2140	0.1641	5
	3	0.0000	0.0036	0.0230	0.0617	0.1147	0.1730	0.2269	0.2679	0.2903	0.2918	0.2734	4
	4	0.0000	0.0002	0.0026	0.0109	0.0287	0.0577	0.0972	0.1442	0.1935	0.2388	0.2734	3
	5	0.0000	0.0000	0.0002	0.0012	0.0043	0.0115	0.0250	0.0466	0.0774	0.1172	0.1641	2
	6	0.0000	0.0000	0.0000	0.0001	0.0004	0.0013	0.0036	0.0084	0.0172	0.0320	0.0547	1
	7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0006	0.0016	0.0037	0.0078	0
n = 8	0	0.9227	0.6634	0.4305	0.2725	0.1678	0.1001	0.0576	0.0319	0.0168	0.0084	0.0039	8
	1	0.0746	0.2793	0.3826	0.3847	0.3355	0.2670	0.1977	0.1373	0.0896	0.0548	0.0313	7
	x	0.01	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	n - x

$P(X = x) = B(n, x) = \sum_{x=r}^n \binom{n}{x} p^x (1-p)^{n-x}$													
	x	0.01	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	n - x
	2	0.0026	0.0515	0.1488	0.2376	0.2936	0.3115	0.2965	0.2587	0.2090	0.1569	0.1094	6
	3	0.0001	0.0054	0.0331	0.0839	0.1468	0.2076	0.2541	0.2786	0.2787	0.2568	0.2188	5
	4	0.0000	0.0004	0.0046	0.0185	0.0459	0.0865	0.1361	0.1875	0.2322	0.2627	0.2734	4
	5	0.0000	0.0000	0.0004	0.0026	0.0092	0.0231	0.0467	0.0808	0.1239	0.1719	0.2188	3
	6	0.0000	0.0000	0.0000	0.0002	0.0011	0.0038	0.0100	0.0217	0.0413	0.0703	0.1094	2
	7	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0012	0.0033	0.0079	0.0164	0.0313	1
	8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0007	0.0017	0.0039	0
n = 9	0	0.9135	0.6302	0.3874	0.2316	0.1342	0.0751	0.0404	0.0207	0.0101	0.0046	0.0020	9
	1	0.0830	0.2985	0.3874	0.3679	0.3020	0.2253	0.1556	0.1004	0.0605	0.0339	0.0176	8
	2	0.0034	0.0629	0.1722	0.2597	0.3020	0.3003	0.2668	0.2162	0.1612	0.1110	0.0703	7
	3	0.0001	0.0077	0.0446	0.1069	0.1762	0.2336	0.2668	0.2716	0.2508	0.2119	0.1641	6
	4	0.0000	0.0006	0.0074	0.0283	0.0661	0.1168	0.1715	0.2194	0.2508	0.2600	0.2461	5
	5	0.0000	0.0000	0.0008	0.0050	0.0165	0.0389	0.0735	0.1181	0.1672	0.2128	0.2461	4
	6	0.0000	0.0000	0.0001	0.0006	0.0028	0.0087	0.0210	0.0424	0.0743	0.1160	0.1641	3
	7	0.0000	0.0000	0.0000	0.0000	0.0003	0.0012	0.0039	0.0098	0.0212	0.0407	0.0703	2
	8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0013	0.0035	0.0083	0.0176	1
	9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0008	0.0020	0
n = 10	0	0.9044	0.5987	0.3487	0.1969	0.1074	0.0563	0.0282	0.0135	0.0060	0.0025	0.0010	10
	1	0.0914	0.3151	0.3874	0.3474	0.2684	0.1877	0.1211	0.0725	0.0403	0.0207	0.0098	9
	2	0.0042	0.0746	0.1937	0.2759	0.3020	0.2816	0.2335	0.1757	0.1209	0.0763	0.0439	8
	3	0.0001	0.0105	0.0574	0.1298	0.2013	0.2503	0.2668	0.2522	0.2150	0.1665	0.1172	7
	4	0.0000	0.0010	0.0112	0.0401	0.0881	0.1460	0.2001	0.2377	0.2508	0.2384	0.2051	6
	5	0.0000	0.0001	0.0015	0.0085	0.0264	0.0584	0.1029	0.1536	0.2007	0.2340	0.2461	5
	6	0.0000	0.0000	0.0001	0.0012	0.0055	0.0162	0.0368	0.0689	0.1115	0.1596	0.2051	4
	7	0.0000	0.0000	0.0000	0.0001	0.0008	0.0031	0.0090	0.0212	0.0425	0.0746	0.1172	3
	8	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0014	0.0043	0.0106	0.0229	0.0439	2
	9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0005	0.0016	0.0042	0.0098	1
	10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0010	0
	x	0.01	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	n - x

Standard Normal Distribution



$P(Z \leq z) = \Phi(z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^z e^{-\frac{1}{2}z^2} dz$										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.9	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003
-3.8	0.00007	0.00007	0.00007	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005	0.00005
-3.7	0.00011	0.00010	0.00010	0.00010	0.00009	0.00009	0.00008	0.00008	0.00008	0.00008
-3.6	0.00016	0.00015	0.00015	0.00014	0.00014	0.00013	0.00013	0.00012	0.00012	0.00011
-3.5	0.00023	0.00022	0.00022	0.00021	0.00020	0.00019	0.00019	0.00018	0.00017	0.00017
-3.4	0.00034	0.00032	0.00031	0.00030	0.00029	0.00028	0.00027	0.00026	0.00025	0.00024
-3.3	0.00048	0.00047	0.00045	0.00043	0.00042	0.00040	0.00039	0.00038	0.00036	0.00035
-3.2	0.00069	0.00066	0.00064	0.00062	0.00060	0.00058	0.00056	0.00054	0.00052	0.00050
-3.1	0.00097	0.00094	0.00090	0.00087	0.00084	0.00082	0.00079	0.00076	0.00074	0.00071
-3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100
-2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139
-2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193
-2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264
-2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357
-2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480
-2.4	0.00820	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639
-2.3	0.01072	0.01044	0.01017	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842
-2.2	0.01390	0.01355	0.01321	0.01287	0.01255	0.01222	0.01191	0.01160	0.01130	0.01101
-2.1	0.01786	0.01743	0.01700	0.01659	0.01618	0.01578	0.01539	0.01500	0.01463	0.01426
-2.0	0.02275	0.02222	0.02169	0.02118	0.02068	0.02018	0.01970	0.01923	0.01876	0.01831
-1.9	0.02872	0.02807	0.02743	0.02680	0.02619	0.02559	0.02500	0.02442	0.02385	0.02330
-1.8	0.03593	0.03515	0.03438	0.03362	0.03288	0.03216	0.03144	0.03074	0.03005	0.02938
-1.7	0.04457	0.04363	0.04272	0.04182	0.04093	0.04006	0.03920	0.03836	0.03754	0.03673
-1.6	0.05480	0.05370	0.05262	0.05155	0.05050	0.04947	0.04846	0.04746	0.04648	0.04551
-1.5	0.06681	0.06552	0.06426	0.06301	0.06178	0.06057	0.05938	0.05821	0.05705	0.05592
-1.4	0.08076	0.07927	0.07780	0.07636	0.07493	0.07353	0.07215	0.07078	0.06944	0.06811
-1.3	0.09680	0.09510	0.09342	0.09176	0.09012	0.08851	0.08691	0.08534	0.08379	0.08226
-1.2	0.11507	0.11314	0.11123	0.10935	0.10749	0.10565	0.10383	0.10204	0.10027	0.09853
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

$P(Z \leq z) = \Phi(z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^z e^{-\frac{1}{2}z^2} dz$										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-1.1	0.13567	0.13350	0.13136	0.12924	0.12714	0.12507	0.12302	0.12100	0.11900	0.11702
-1.0	0.15866	0.15625	0.15386	0.15151	0.14917	0.14686	0.14457	0.14231	0.14007	0.13786
-0.9	0.18406	0.18141	0.17879	0.17619	0.17361	0.17106	0.16853	0.16602	0.16354	0.16109
-0.8	0.21186	0.20897	0.20611	0.20327	0.20045	0.19766	0.19489	0.19215	0.18943	0.18673
-0.7	0.24196	0.23885	0.23576	0.23270	0.22965	0.22663	0.22363	0.22065	0.21770	0.21476
-0.6	0.27425	0.27093	0.26763	0.26435	0.26109	0.25785	0.25463	0.25143	0.24825	0.24510
-0.5	0.30854	0.30503	0.30153	0.29806	0.29460	0.29116	0.28774	0.28434	0.28096	0.27760
-0.4	0.34458	0.34090	0.33724	0.33360	0.32997	0.32636	0.32276	0.31918	0.31561	0.31207
-0.3	0.38209	0.37828	0.37448	0.37070	0.36693	0.36317	0.35942	0.35569	0.35197	0.34827
-0.2	0.42074	0.41683	0.41294	0.40905	0.40517	0.40129	0.39743	0.39358	0.38974	0.38591
-0.1	0.46017	0.45620	0.45224	0.44828	0.44433	0.44038	0.43644	0.43251	0.42858	0.42465
-0.0	0.50000	0.49601	0.49202	0.48803	0.48405	0.48006	0.47608	0.47210	0.46812	0.46414
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.1	0.53983	0.54380	0.54776	0.55172	0.55567	0.55962	0.56356	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.62930	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71226	0.71566	0.71904	0.72240
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.7	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214
1.1	0.86433	0.86650	0.86864	0.87076	0.87286	0.87493	0.87698	0.87900	0.88100	0.88298
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.3	0.90320	0.90490	0.90658	0.90824	0.90988	0.91149	0.91309	0.91466	0.91621	0.91774
1.4	0.91924	0.92073	0.92220	0.92364	0.92507	0.92647	0.92785	0.92922	0.93056	0.93189
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.6	0.94520	0.94630	0.94738	0.94845	0.94950	0.95053	0.95154	0.95254	0.95352	0.95449
1.7	0.95543	0.95637	0.95728	0.95818	0.95907	0.95994	0.96080	0.96164	0.96246	0.96327
1.8	0.96407	0.96485	0.96562	0.96638	0.96712	0.96784	0.96856	0.96926	0.96995	0.97062
1.9	0.97128	0.97193	0.97257	0.97320	0.97381	0.97441	0.97500	0.97558	0.97615	0.97670
2.0	0.97725	0.97778	0.97831	0.97882	0.97932	0.97982	0.98030	0.98077	0.98124	0.98169
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

$P(Z \leq z) = \Phi(z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^z e^{-\frac{1}{2}z^2} dz$										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.1	0.98214	0.98257	0.98300	0.98341	0.98382	0.98422	0.98461	0.98500	0.98537	0.98574
2.2	0.98610	0.98645	0.98679	0.98713	0.98745	0.98778	0.98809	0.98840	0.98870	0.98899
2.3	0.98928	0.98956	0.98983	0.99010	0.99036	0.99061	0.99086	0.99111	0.99134	0.99158
2.4	0.99180	0.99202	0.99224	0.99245	0.99266	0.99286	0.99305	0.99324	0.99343	0.99361
2.5	0.99379	0.99396	0.99413	0.99430	0.99446	0.99461	0.99477	0.99492	0.99506	0.99520
2.6	0.99534	0.99547	0.99560	0.99573	0.99585	0.99598	0.99609	0.99621	0.99632	0.99643
2.7	0.99653	0.99664	0.99674	0.99683	0.99693	0.99702	0.99711	0.99720	0.99728	0.99736
2.8	0.99744	0.99752	0.99760	0.99767	0.99774	0.99781	0.99788	0.99795	0.99801	0.99807
2.9	0.99813	0.99819	0.99825	0.99831	0.99836	0.99841	0.99846	0.99851	0.99856	0.99861
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99896	0.99900
3.1	0.99903	0.99906	0.99910	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929
3.2	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
3.4	0.99966	0.99968	0.99969	0.99970	0.99971	0.99972	0.99973	0.99974	0.99975	0.99976
3.5	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983
3.6	0.99984	0.99985	0.99985	0.99986	0.99986	0.99987	0.99987	0.99988	0.99988	0.99989
3.7	0.99989	0.99990	0.99990	0.99990	0.99991	0.99991	0.99992	0.99992	0.99992	0.99992
3.8	0.99993	0.99993	0.99993	0.99994	0.99994	0.99994	0.99994	0.99995	0.99995	0.99995
3.9	0.99995	0.99995	0.99996	0.99996	0.99996	0.99996	0.99996	0.99996	0.99997	0.99997
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

Poisson Distribution

$P(X = x) = P_x(\lambda) = \sum_{x=r}^n \frac{e^{-\lambda} \lambda^x}{x!}$											
	λ										
X	0	1	2	3	4	5	6	7	8	9	10
0.1	0.9048	0.0905	0.0045	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.2	0.8187	0.1637	0.0164	0.0011	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.3	0.7408	0.2222	0.0333	0.0033	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.4	0.6703	0.2681	0.0536	0.0072	0.0007	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
0.5	0.6065	0.3033	0.0758	0.0126	0.0016	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
0.6	0.5488	0.3293	0.0988	0.0198	0.0030	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000
0.7	0.4966	0.3476	0.1217	0.0284	0.0050	0.0007	0.0001	0.0000	0.0000	0.0000	0.0000
0.8	0.4493	0.3595	0.1438	0.0383	0.0077	0.0012	0.0002	0.0000	0.0000	0.0000	0.0000
0.9	0.4066	0.3659	0.1647	0.0494	0.0111	0.0020	0.0003	0.0000	0.0000	0.0000	0.0000
1.0	0.3679	0.3679	0.1839	0.0613	0.0153	0.0031	0.0005	0.0001	0.0000	0.0000	0.0000
1.1	0.3329	0.3662	0.2014	0.0738	0.0203	0.0045	0.0008	0.0001	0.0000	0.0000	0.0000
1.2	0.3012	0.3614	0.2169	0.0867	0.0260	0.0062	0.0012	0.0002	0.0000	0.0000	0.0000
1.3	0.2725	0.3543	0.2303	0.0998	0.0324	0.0084	0.0018	0.0003	0.0001	0.0000	0.0000
1.4	0.2466	0.3452	0.2417	0.1128	0.0395	0.0111	0.0026	0.0005	0.0001	0.0000	0.0000
1.5	0.2231	0.3347	0.2510	0.1255	0.0471	0.0141	0.0035	0.0008	0.0001	0.0000	0.0000
1.6	0.2019	0.3230	0.2584	0.1378	0.0551	0.0176	0.0047	0.0011	0.0002	0.0000	0.0000
1.7	0.1827	0.3106	0.2640	0.1496	0.0636	0.0216	0.0061	0.0015	0.0003	0.0001	0.0000
1.8	0.1653	0.2975	0.2678	0.1607	0.0723	0.0260	0.0078	0.0020	0.0005	0.0001	0.0000
1.9	0.1496	0.2842	0.2700	0.1710	0.0812	0.0309	0.0098	0.0027	0.0006	0.0001	0.0000
2.0	0.1353	0.2707	0.2707	0.1804	0.0902	0.0361	0.0120	0.0034	0.0009	0.0002	0.0000
2.1	0.1225	0.2572	0.2700	0.1890	0.0992	0.0417	0.0146	0.0044	0.0011	0.0003	0.0001
2.2	0.1108	0.2438	0.2681	0.1966	0.1082	0.0476	0.0174	0.0055	0.0015	0.0004	0.0001
2.3	0.1003	0.2306	0.2652	0.2033	0.1169	0.0538	0.0206	0.0068	0.0019	0.0005	0.0001
2.4	0.0907	0.2177	0.2613	0.2090	0.1254	0.0602	0.0241	0.0083	0.0025	0.0007	0.0002
2.5	0.0821	0.2052	0.2565	0.2138	0.1336	0.0668	0.0278	0.0099	0.0031	0.0009	0.0002
2.6	0.0743	0.1931	0.2510	0.2176	0.1414	0.0735	0.0319	0.0118	0.0038	0.0011	0.0003
2.7	0.0672	0.1815	0.2450	0.2205	0.1488	0.0804	0.0362	0.0139	0.0047	0.0014	0.0004
2.8	0.0608	0.1703	0.2384	0.2225	0.1557	0.0872	0.0407	0.0163	0.0057	0.0018	0.0005
2.9	0.0550	0.1596	0.2314	0.2237	0.1622	0.0940	0.0455	0.0188	0.0068	0.0022	0.0006
3.0	0.0498	0.1494	0.2240	0.2240	0.1680	0.1008	0.0504	0.0216	0.0081	0.0027	0.0008
X	0	1	2	3	4	5	6	7	8	9	10

$P(X = x) = P_x(\lambda) = \sum_{x=r}^n \frac{e^{-\lambda} \lambda^x}{x!}$											
	λ										
X	0	1	2	3	4	5	6	7	8	9	10
3.1	0.0450	0.1397	0.2165	0.2237	0.1733	0.1075	0.0555	0.0246	0.0095	0.0033	0.0010
3.2	0.0408	0.1304	0.2087	0.2226	0.1781	0.1140	0.0608	0.0278	0.0111	0.0040	0.0013
3.3	0.0369	0.1217	0.2008	0.2209	0.1823	0.1203	0.0662	0.0312	0.0129	0.0047	0.0016
3.4	0.0334	0.1135	0.1929	0.2186	0.1858	0.1264	0.0716	0.0348	0.0148	0.0056	0.0019
3.5	0.0302	0.1057	0.1850	0.2158	0.1888	0.1322	0.0771	0.0385	0.0169	0.0066	0.0023
3.6	0.0273	0.0984	0.1771	0.2125	0.1912	0.1377	0.0826	0.0425	0.0191	0.0076	0.0028
3.7	0.0247	0.0915	0.1692	0.2087	0.1931	0.1429	0.0881	0.0466	0.0215	0.0089	0.0033
3.8	0.0224	0.0850	0.1615	0.2046	0.1944	0.1477	0.0936	0.0508	0.0241	0.0102	0.0039
3.9	0.0202	0.0789	0.1539	0.2001	0.1951	0.1522	0.0989	0.0551	0.0269	0.0116	0.0045
4.0	0.0183	0.0733	0.1465	0.1954	0.1954	0.1563	0.1042	0.0595	0.0298	0.0132	0.0053
4.1	0.0166	0.0679	0.1393	0.1904	0.1951	0.1600	0.1093	0.0640	0.0328	0.0150	0.0061
4.2	0.0150	0.0630	0.1323	0.1852	0.1944	0.1633	0.1143	0.0686	0.0360	0.0168	0.0071
4.3	0.0136	0.0583	0.1254	0.1798	0.1933	0.1662	0.1191	0.0732	0.0393	0.0188	0.0081
4.4	0.0123	0.0540	0.1188	0.1743	0.1917	0.1687	0.1237	0.0778	0.0428	0.0209	0.0092
4.5	0.0111	0.0500	0.1125	0.1687	0.1898	0.1708	0.1281	0.0824	0.0463	0.0232	0.0104
4.6	0.0101	0.0462	0.1063	0.1631	0.1875	0.1725	0.1323	0.0869	0.0500	0.0255	0.0118
4.7	0.0091	0.0427	0.1005	0.1574	0.1849	0.1738	0.1362	0.0914	0.0537	0.0281	0.0132
4.8	0.0082	0.0395	0.0948	0.1517	0.1820	0.1747	0.1398	0.0959	0.0575	0.0307	0.0147
4.9	0.0074	0.0365	0.0894	0.1460	0.1789	0.1753	0.1432	0.1002	0.0614	0.0334	0.0164
5.0	0.0067	0.0337	0.0842	0.1404	0.1755	0.1755	0.1462	0.1044	0.0653	0.0363	0.0181
5.1	0.0061	0.0311	0.0793	0.1348	0.1719	0.1753	0.1490	0.1086	0.0692	0.0392	0.0200
5.2	0.0055	0.0287	0.0746	0.1293	0.1681	0.1748	0.1515	0.1125	0.0731	0.0423	0.0220
5.3	0.0050	0.0265	0.0701	0.1239	0.1641	0.1740	0.1537	0.1163	0.0771	0.0454	0.0241
5.4	0.0045	0.0244	0.0659	0.1185	0.1600	0.1728	0.1555	0.1200	0.0810	0.0486	0.0262
5.5	0.0041	0.0225	0.0618	0.1133	0.1558	0.1714	0.1571	0.1234	0.0849	0.0519	0.0285
5.6	0.0037	0.0207	0.0580	0.1082	0.1515	0.1697	0.1584	0.1267	0.0887	0.0552	0.0309
5.7	0.0033	0.0191	0.0544	0.1033	0.1472	0.1678	0.1594	0.1298	0.0925	0.0586	0.0334
5.8	0.0030	0.0176	0.0509	0.0985	0.1428	0.1656	0.1601	0.1326	0.0962	0.0620	0.0359
5.9	0.0027	0.0162	0.0477	0.0938	0.1383	0.1632	0.1605	0.1353	0.0998	0.0654	0.0386
6.0	0.0025	0.0149	0.0446	0.0892	0.1339	0.1606	0.1606	0.1377	0.1033	0.0688	0.0413
6.1	0.0022	0.0137	0.0417	0.0848	0.1294	0.1579	0.1605	0.1399	0.1066	0.0723	0.0441
6.2	0.0020	0.0126	0.0390	0.0806	0.1249	0.1549	0.1601	0.1418	0.1099	0.0757	0.0469
X	0	1	2	3	4	5	6	7	8	9	10

$P(X = x) = P_x(\lambda) = \sum_{x=r}^n \frac{e^{-\lambda} \lambda^x}{x!}$											
	λ										
X	0	1	2	3	4	5	6	7	8	9	10
6.3	0.0018	0.0116	0.0364	0.0765	0.1205	0.1519	0.1595	0.1435	0.1130	0.0791	0.0498
6.4	0.0017	0.0106	0.0340	0.0726	0.1162	0.1487	0.1586	0.1450	0.1160	0.0825	0.0528
6.5	0.0015	0.0098	0.0318	0.0688	0.1118	0.1454	0.1575	0.1462	0.1188	0.0858	0.0558
6.6	0.0014	0.0090	0.0296	0.0652	0.1076	0.1420	0.1562	0.1472	0.1215	0.0891	0.0588
6.7	0.0012	0.0082	0.0276	0.0617	0.1034	0.1385	0.1546	0.1480	0.1240	0.0923	0.0618
6.8	0.0011	0.0076	0.0258	0.0584	0.0992	0.1349	0.1529	0.1486	0.1263	0.0954	0.0649
6.9	0.0010	0.0070	0.0240	0.0552	0.0952	0.1314	0.1511	0.1489	0.1284	0.0985	0.0679
7.0	0.0009	0.0064	0.0223	0.0521	0.0912	0.1277	0.1490	0.1490	0.1304	0.1014	0.0710
7.1	0.0008	0.0059	0.0208	0.0492	0.0874	0.1241	0.1468	0.1489	0.1321	0.1042	0.0740
7.2	0.0007	0.0054	0.0194	0.0464	0.0836	0.1204	0.1445	0.1486	0.1337	0.1070	0.0770
7.3	0.0007	0.0049	0.0180	0.0438	0.0799	0.1167	0.1420	0.1481	0.1351	0.1096	0.0800
7.4	0.0006	0.0045	0.0167	0.0413	0.0764	0.1130	0.1394	0.1474	0.1363	0.1121	0.0829
7.5	0.0006	0.0041	0.0156	0.0389	0.0729	0.1094	0.1367	0.1465	0.1373	0.1144	0.0858
7.6	0.0005	0.0038	0.0145	0.0366	0.0696	0.1057	0.1339	0.1454	0.1381	0.1167	0.0887
7.7	0.0005	0.0035	0.0134	0.0345	0.0663	0.1021	0.1311	0.1442	0.1388	0.1187	0.0914
7.8	0.0004	0.0032	0.0125	0.0324	0.0632	0.0986	0.1282	0.1428	0.1392	0.1207	0.0941
7.9	0.0004	0.0029	0.0116	0.0305	0.0602	0.0951	0.1252	0.1413	0.1395	0.1224	0.0967
8.0	0.0003	0.0027	0.0107	0.0286	0.0573	0.0916	0.1221	0.1396	0.1396	0.1241	0.0993
8.1	0.0003	0.0025	0.0100	0.0269	0.0544	0.0882	0.1191	0.1378	0.1395	0.1256	0.1017
8.2	0.0003	0.0023	0.0092	0.0252	0.0517	0.0849	0.1160	0.1358	0.1392	0.1269	0.1040
8.3	0.0002	0.0021	0.0086	0.0237	0.0491	0.0816	0.1128	0.1338	0.1388	0.1280	0.1063
8.4	0.0002	0.0019	0.0079	0.0222	0.0466	0.0784	0.1097	0.1317	0.1382	0.1290	0.1084
8.5	0.0002	0.0017	0.0074	0.0208	0.0443	0.0752	0.1066	0.1294	0.1375	0.1299	0.1104
8.6	0.0002	0.0016	0.0068	0.0195	0.0420	0.0722	0.1034	0.1271	0.1366	0.1306	0.1123
8.7	0.0002	0.0014	0.0063	0.0183	0.0398	0.0692	0.1003	0.1247	0.1356	0.1311	0.1140
8.8	0.0002	0.0013	0.0058	0.0171	0.0377	0.0663	0.0972	0.1222	0.1344	0.1315	0.1157
8.9	0.0001	0.0012	0.0054	0.0160	0.0357	0.0635	0.0941	0.1197	0.1332	0.1317	0.1172
9.0	0.0001	0.0011	0.0050	0.0150	0.0337	0.0607	0.0911	0.1171	0.1318	0.1318	0.1186
9.1	0.0001	0.0010	0.0046	0.0140	0.0319	0.0581	0.0881	0.1145	0.1302	0.1317	0.1198
9.2	0.0001	0.0009	0.0043	0.0131	0.0302	0.0555	0.0851	0.1118	0.1286	0.1315	0.1210
9.3	0.0001	0.0009	0.0040	0.0123	0.0285	0.0530	0.0822	0.1091	0.1269	0.1311	0.1219
9.4	0.0001	0.0008	0.0037	0.0115	0.0269	0.0506	0.0793	0.1064	0.1251	0.1306	0.1228
X	0	1	2	3	4	5	6	7	8	9	10

$P(X = x) = P_x(\lambda) = \sum_{x=r}^n \frac{e^{-\lambda} \lambda^x}{x!}$											
	λ										
X	0	1	2	3	4	5	6	7	8	9	10
9.5	0.0001	0.0007	0.0034	0.0107	0.0254	0.0483	0.0764	0.1037	0.1232	0.1300	0.1235
9.6	0.0001	0.0007	0.0031	0.0100	0.0240	0.0460	0.0736	0.1010	0.1212	0.1293	0.1241
9.7	0.0001	0.0006	0.0029	0.0093	0.0226	0.0439	0.0709	0.0982	0.1191	0.1284	0.1245
9.8	0.0001	0.0005	0.0027	0.0087	0.0213	0.0418	0.0682	0.0955	0.1170	0.1274	0.1249
9.9	0.0001	0.0005	0.0025	0.0081	0.0201	0.0398	0.0656	0.0928	0.1148	0.1263	0.1250
10.0	0.0000	0.0005	0.0023	0.0076	0.0189	0.0378	0.0631	0.0901	0.1126	0.1251	0.1251
X	0	1	2	3	4	5	6	7	8	9	10

3 FORMULAE

Algebra

If α , β and γ are roots of a cubic equation of the form $ax^3 + bx^2 + cx + d = 0$, then

$$\alpha + \beta + \gamma = -\frac{b}{a}, \quad \alpha\beta + \alpha\gamma + \beta\gamma = \frac{c}{a} \quad \text{and} \quad \alpha\beta\gamma = -\frac{d}{a}.$$

Binomial Expansion:

$$(a+b)^n = a^n + na^{n-1}b + \frac{n(n-1)}{2!}a^{n-2}b^2 + \frac{n(n-1)(n-2)}{3!}a^{n-3}b^3 + \dots + b^n.$$

Sequences and Series

Amount of money accumulated at the end of t years:

$$A_n = P \left(1 + \frac{r}{100n} \right)^{nt}, \quad \text{where } n \text{ is a number of compounded periods per year.}$$

Also,

$$A_n = P \left(1 + \frac{RT}{100} \right)^n, \quad \text{where } n \text{ is a number of years and } T \text{ is the interest period.}$$

Sum of n terms of some series:

$$S_n = \frac{G_1(1-r^n)}{1-r}; \quad S_n = \frac{1}{2}n[2A_1 + (n-1)d]; \quad \sum_{k=1}^n k = \frac{1}{2}n(n+1);$$

$$\sum_{k=1}^n k^2 = \frac{1}{6}n(n+1)(2n+1); \quad \sum_{k=1}^n k^3 = \frac{1}{4}n^2(n+1)^2.$$

Trigonometry

$$\text{Sine rule: } \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}.$$

$$\text{Cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A.$$

Compound angles:

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B; \quad \cos(A \pm B) = \cos A \cos B \mp \sin A \sin B.$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}.$$

Factor formulae:

$$\sin x + \sin y = 2 \sin \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right); \quad \sin x - \sin y = 2 \cos \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right).$$

$$\cos x + \cos y = 2 \cos \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right); \quad \cos x - \cos y = -2 \sin \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right).$$

Statistics

Mean: $\bar{x} = A + \frac{\sum_{i=1}^N f_i d_i}{N}$, where $d_i = x_i - A$ and A is assumed mean.

Standard deviation σ of grouped data:

$$\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{N}} = \sqrt{\frac{\sum fx^2}{N} - \left(\frac{\sum fx}{N}\right)^2} = \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2},$$

where $d = x - A$ and $\bar{d} = \frac{\sum fd}{N}$.

Standard deviation by coding method:

$$\sigma = c \sqrt{\frac{\sum fu^2}{N} - \left(\frac{\sum fu}{N}\right)^2}, \text{ where } u = \frac{x_i - A}{c}.$$

$$\text{Median} = L + \left(\frac{\frac{N}{2} - n_b}{n_w}\right) \times c; \quad \text{Mode} = L + \left(\frac{t_1}{t_1 + t_2}\right) \times c.$$

$$\text{Lower quartile: } Q_1 = L + \left(\frac{\frac{N}{4} - n_b}{n_w}\right) \times c; \quad \text{Upper quartile: } Q_3 = L + \left(\frac{\frac{3N}{4} - n_b}{n_w}\right) \times c.$$

$$\text{Percentile: } P_i = L + \left(\frac{\frac{iN}{100} - \sum f_b}{f_{p_i}}\right) c, \quad i = 1, 2, 3, 4, \dots, 99.$$

Perimeters, Areas and Volumes

Perimeter of a regular polygon having n sides inscribed in a circle of radius r :

$$P = 2nr \sin\left(\frac{180^\circ}{n}\right).$$

Area of a regular polygon of n sides inscribed in a circle of radius r :

$$A = \frac{1}{2}nr^2 \sin\left(\frac{360^\circ}{n}\right).$$

Total surface area of a circular cone: $A = \pi r(r + l)$.

Total surface area of cylinder: $A = 2\pi r(r + h)$.

Total surface area of a right pyramid: $A = \text{area of lateral surface} + \text{area of base}$.

Total surface area of a right prism: $A = \text{area of lateral surface} + \text{area of base}$.

Volume of a right prism: $V = \text{area of base} \times \text{height}$.

Volume of a right pyramid: $V = \frac{1}{3} \times \text{base area} \times \text{altitude}$.

Volume of a spherical shell with external radius R and internal radius r : $V = \frac{4\pi}{3}(R^3 - r^3)$.

Matrices and Transformations

Matrix of reflection in the line inclined at an angle α passing through the origin:

$$\begin{pmatrix} \cos 2\alpha & \sin 2\alpha \\ \sin 2\alpha & -\cos 2\alpha \end{pmatrix}$$

The matrix of anticlockwise rotation of a point through an angle θ about the origin:

$$\begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}$$

The Earth as a Sphere

Distance between two places measured along Great circle: $l = \frac{\pi R \theta}{180^\circ}$.

Distance between two points along the parallel of latitudes:

$l = \frac{\pi R \theta \cos \alpha}{180^\circ}$, where α is the degree of latitude and θ is the difference in longitudes and R is the radius of the Earth.

Probability

Probability of two mutually exclusive events A and B : $P(A \cup B) = P(A) + P(B)$.

The probability of two independent events A and B : $P(A \cap B) = P(A) \times P(B)$.

Probability of occurrence of event A provided that event B has occurred:

$$P(A/B) = \frac{P(A \cap B)}{P(B)}.$$

Expectation and Variance of Discrete and Continuous Random Variables

Discrete Random Variable X	Continuous Random Variable X
$E(X) = \mu = \sum_{\text{All } x} xP(x)$	$E(X) = \int_{-\infty}^{\infty} xf(x)dx$
$E(X^2) = \sum_{\text{All } x} x^2P(x)$	$E(X^2) = \int_{-\infty}^{\infty} x^2f(x)dx$
$\text{Var}(X) = \sigma^2 = E(X^2) - [E(X)]^2$	$\text{Var}(X) = E(X^2) - [E(X)]^2$

Standard Distributions

Distribution of X	Probability Function	Mean, $E(X)$	Variance, $Var(X)$
Binomial $B(n, p)$	$\binom{n}{x} p^x q^{n-x}$	np	$np(1-p)$
Poisson $P_x(\lambda)$	$\frac{e^{-\lambda} \lambda^x}{x!}$	λ	λ
Normal $N(\mu, \sigma^2)$	$\frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$	μ	σ^2

Differentiation

Differentiation of a function $y = f(x)$ from First Principles:

$$\frac{dy}{dx} = f'(x) = \lim_{h \rightarrow 0} \left(\frac{f(x+h) - f(x)}{h} \right).$$

Product Rule: $\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}.$

Quotient Rule: $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}.$

Chain rule:

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}.$$

Standard Derivatives of Some Functions

$\frac{d}{dx}(\tan x) = \sec^2 x$	$\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$
$\frac{d}{dx}(\sec x) = \sec x \tan x$	$\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$
$\frac{d}{dx}(e^{f(x)}) = e^{f(x)} \frac{df(x)}{dx}$	$\frac{d}{dx}(\ln f(x)) = \frac{f'(x)}{f(x)}$
$\frac{d}{dx}(a^{f(x)}) = a^{f(x)} \ln a \frac{df(x)}{dx}$	$\frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$
$\frac{d}{dx}(\cos^{-1} x) = -\frac{1}{\sqrt{1-x^2}}, \quad x < 1$	$\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}, \quad x < 1$
$\frac{d}{dx}(\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}, \quad x > 1$	$\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$
$\frac{d}{dx}(\cot^{-1} x) = -\frac{1}{1+x^2}$	$\frac{d}{dx}(\operatorname{cosech} x) = -\operatorname{cosech} x \coth x$
$\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} x \tanh x$	$\frac{d}{dx}(\coth x) = -\operatorname{cosech}^2 x$

$\frac{d}{dx}(\coth^{-1} x) = -\frac{1}{x^2 - 1}, \quad x \neq 1$	$\frac{d}{dx}(\sinh^{-1} x) = \frac{1}{\sqrt{1+x^2}}$
$\frac{d}{dx}(\cosh^{-1} x) = \frac{1}{\sqrt{x^2 - 1}}, \quad x > 1$	$\frac{d}{dx}(\tanh^{-1} x) = \frac{1}{1-x^2}, \quad x \neq 1$

Implicit differentiation of $u(x, y) = x^m y^n$:

$$\frac{d}{dx}(x^m y^n) = nx^m y^{n-1} \frac{dy}{dx} + mx^{m-1} y^n.$$

Taylor's series of a function $f(x)$ at $x = a$:

$$f(x) = f(a) + (x-a)f'(a) + (x-a)^2 \frac{f''(a)}{2!} + \dots + (x-a)^n \frac{f^{(n)}(a)}{n!} + \dots$$

Integration

Integrand	Possible Substitution
$\frac{1}{\sqrt{a^2 - x^2}}$ or $\sqrt{a^2 - x^2}$	$x = a \sin \theta$ or $x = a \cos \theta$
$\frac{1}{x^2 + a^2}$ or $\frac{1}{\sqrt{x^2 + a^2}}$	$x = a \tan \theta$ or $x = a \sinh \theta$
$\frac{1}{\sqrt{x^2 - a^2}}$ or $\sqrt{x^2 - a^2}$	$x = a \sec \theta$ or $x = a \cosh \theta$
$\frac{1}{x\sqrt{a^2 - x^2}}$ or $x\sqrt{a^2 - x^2}$	$x = a \operatorname{sech} \theta$
$\frac{1}{x\sqrt{a^2 + b^2 x^2}}$ or $x\sqrt{a^2 + b^2 x^2}$	$bx = a \operatorname{cosech} \theta$

$$\int \frac{f'(x)}{f(x)} dx = \ln |f(x)| + C, \quad f(x) \neq 0.$$

$$\int u dv = uv - \int v du + c.$$

$$\int \operatorname{cosec} x dx = -\ln |\operatorname{cosec} x + \cot x| + c \quad \text{or} \quad \int \operatorname{cosec} x dx = \ln \left| \tan \frac{x}{2} \right| + c.$$

$$\int \sec x dx = \ln |\sec x + \tan x| + c \quad \text{or} \quad \int \sec x dx = \ln \left| \tan \left(\frac{\pi}{4} + \frac{x}{2} \right) \right| + c.$$

$$\text{t-substitution: } t = \tan \left(\frac{x}{2} \right), \quad \sin x = \frac{2t}{1+t^2}, \quad \cos x = \frac{1-t^2}{1+t^2} \quad \text{and} \quad dx = \frac{2dt}{1+t^2}.$$

$$\text{Arc length: } s = \int_a^b \sqrt{1 + \left(\frac{dy}{dx} \right)^2} dx; \quad s = \int_\alpha^\beta \sqrt{r^2 + \left(\frac{dr}{d\theta} \right)^2} d\theta;$$

$$s = \int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt.$$

Area of a sector from $\theta = \alpha$ to $\theta = \beta$: $A = \frac{1}{2} \int_{\alpha}^{\beta} r^2 d\theta.$

Coordinate Geometry

Coordinates of a point $P(x, y)$ dividing the line segment connecting points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $\lambda : \mu$:

Internal division: $P(x, y) = \left(\frac{\lambda x_2 + \mu x_1}{\lambda + \mu}, \frac{\lambda y_2 + \mu y_1}{\lambda + \mu} \right).$

External division: $P(x, y) = \left(\frac{\lambda x_2 - \mu x_1}{\lambda - \mu}, \frac{\lambda y_2 - \mu y_1}{\lambda - \mu} \right).$

An angle θ between two intersecting lines $y = m_1x + c_1$ and $y = m_2x + c_2$:

$$\theta = \tan^{-1} \left[\frac{m_1 - m_2}{1 + m_1 m_2} \right].$$

Perpendicular distance from a point $P(x_1, y_1)$ to a line $ax + by + c = 0$:

$$d = \left| \frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}} \right|.$$

Equation of a circle when the end points of a diameter are $A(x_1, y_1)$ and $B(x_2, y_2)$:

$$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0.$$

Equation of a circle with centre $(-g, -f)$ and radius $r = \sqrt{g^2 + f^2 - c}$:

$$x^2 + y^2 + 2gx + 2fy + c = 0.$$

Equations of angle bisector between the lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$:

$$\frac{a_1x + b_1y + c_1}{\sqrt{a_1^2 + b_1^2}} = \pm \frac{a_2x + b_2y + c_2}{\sqrt{a_2^2 + b_2^2}}.$$

Area of a triangle whose vertices are $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$:

$$A = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|.$$

Conic Sections

Conic Section	Parabola	Ellipse	Hyperbola
Standard Form	$y^2 = 4ax$	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
Parametric form	$(at^2, 2at)$	$(a \cos \theta, b \sin \theta)$	$(a \sec \theta, b \tan \theta)$ $(\pm a \cosh \theta, b \sinh \theta)$
The condition for a line $y = mx + c$ to be a tangent to	$c = \frac{a}{m}$	$c^2 = a^2 m^2 + b^2$	$c^2 = a^2 m^2 - b^2$
Eccentricity	$e = 1$	$e < 1$ $b^2 = a^2(1 - e^2)$	$e > 1$ $b^2 = a^2(e^2 - 1)$
Foci	$(a, 0)$	$(\pm ae, 0)$	$(\pm ae, 0)$
Directrices	$x = -a$	$x = \pm \frac{a}{e}$	$x = \pm \frac{a}{e}$
Asymptotes	-	-	$y = \pm \frac{bx}{a}$

Permutations and Combinations

Permutations: ${}^n P_r = \frac{n!}{(n-r)!}$

Combinations: ${}^n C_r = \frac{n!}{(n-r)!r!}$

where $n! = n(n-1)(n-2)(n-3)\dots(3)(2)(1)$.

Sets

For finite sets A, B and C:

$$n(A \cup B) = n(A) + n(B) - n(A \cap B).$$

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C).$$

Complex Numbers

Exponent of a complex number z :

$$z^n = r^n (\cos n\theta + i \sin n\theta),$$

n^{th} root of a complex number :

$$z_k = r^{\frac{1}{n}} \left(\cos \left(\frac{\theta + 2\pi k}{n} \right) + i \sin \left(\frac{\theta + 2\pi k}{n} \right) \right), \text{ where } k = 0, 1, 2, 3, \dots, n-1.$$

Hyperbolic Identities

$\cosh x = \frac{e^x + e^{-x}}{2}$	$\sinh x = \frac{e^x - e^{-x}}{2}$
$\cosh ix = \cos x$ and $\cos ix = \cosh x$	$\sinh ix = i \sin x$ and $\sin ix = i \sinh x$
$\cosh^2 x - \sinh^2 x = 1$	$\sinh(x \pm y) = \sinh x \cosh y \pm \cosh x \sinh y$
$\cosh(x \pm y) = \cosh x \cosh y \pm \sinh x \sinh y$	$\sinh^{-1} x = \ln(x + \sqrt{x^2 + 1})$
$\cosh^{-1} x = \ln(x + \sqrt{x^2 - 1}), \quad x \geq 1$	$\tanh^{-1} x = \frac{1}{2} \ln\left(\frac{1+x}{1-x}\right), \quad x < 1$

Vectors

Cross Product:

$$\underline{a} \times (\underline{b} \times \underline{c}) = (\underline{a} \bullet \underline{c})\underline{b} - (\underline{a} \bullet \underline{b})\underline{c}.$$

Volume of a parallelepiped having $\underline{A}$, $\underline{B}$ and $\underline{C}$ as edges :

$$|\underline{A} \bullet (\underline{B} \times \underline{C})| = |\underline{B} \bullet (\underline{C} \times \underline{A})| = |\underline{C} \bullet (\underline{A} \times \underline{B})|.$$

Differential Equations

A differential equation $F(x, y)dx + G(x, y)dy = 0$ is exact if $\frac{\partial}{\partial y}[F(x, y)] = \frac{\partial}{\partial x}[G(x, y)]$.

General solutions for a Second Order Differential Equation $a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$:

Double roots: $y = (Ax + B)e^{\alpha x}$.

Two distinct real roots: $y = Ae^{\alpha x} + Be^{\beta x}$.

Complex roots: $y = e^{\alpha x} (A \cos \beta x + B \sin \beta x)$.

Numerical Methods

Newton-Raphson iterative method:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}.$$

Secant iterative method:

$$x_{n+2} = x_n - \left[\frac{x_{n+1} - x_n}{f(x_{n+1}) - f(x_n)} \right] \times f(x_n).$$

Trapezoidal rule:

$$\int_a^b f(x) dx = \frac{1}{2} h \left[(y_0 + y_n) + 2(y_1 + y_2 + \dots + y_{n-1}) \right], \text{ where } h = \frac{b-a}{n}$$

and n is a number of strips.

Simpson's rule:

$$\int_a^b f(x) dx = \frac{1}{3} h \left[(y_0 + y_n) + 4(y_1 + y_3 + \dots + y_{n-1}) + 2(y_2 + y_4 + \dots + y_{n-2}) \right],$$

where $h = \frac{b-a}{n}$ and n is a number of strips.

4 CONSTANTS

$$\pi = 3.1415926\dots$$

$$e = 2.718281\dots$$

$$1 \text{ Nautical Mile} = 1.852 \text{ Km}$$

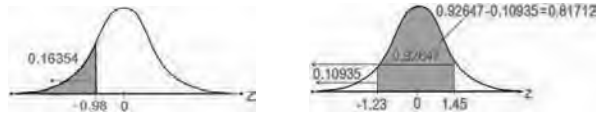
$$1 \text{ Radian} = \frac{180^\circ}{\pi} = 57.2958 \text{ degrees}$$

$$\text{Mean radius of the Earth} = 6371 \text{ Km}$$

$$\text{Mass of the Earth} = 5.977 \times 10^{24} \text{ Kg}$$

$$\text{Acceleration due to gravity, } g = 9.8 \text{ or } 10 \text{ m/s}^2$$

Standard Normal Distribution



$$P(Z \leq z) = \Phi(z) = \frac{1}{\sqrt{\pi}} \int_{-\infty}^z e^{-x^2} dx$$

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-1.2	0.11507	0.11314	0.11123	0.10935	0.10749	0.10565	0.10383	0.10204	0.10027	0.09853
-1.1	0.13567	0.13350	0.13136	0.12924	0.12714	0.12507	0.12302	0.12100	0.11900	0.11702
-1.0	0.15866	0.15625	0.15386	0.15151	0.14917	0.14686	0.14457	0.14231	0.14007	0.13786
-0.9	0.18406	0.18141	0.17879	0.17619	0.17361	0.17106	0.16853	0.16602	0.16354	0.16109
-0.8	0.21186	0.20897	0.20611	0.20327	0.20045	0.19766	0.19489	0.19215	0.18943	0.18673
-0.7	0.24196	0.23885	0.23576	0.23270	0.22965	0.22663	0.22363	0.22065	0.21770	0.21476
-0.6	0.27425	0.27093	0.26763	0.26435	0.26109	0.25785	0.25463	0.25143	0.24825	0.24510
-0.5	0.30854	0.30503	0.30153	0.29806	0.29460	0.29116	0.28774	0.28434	0.28096	0.27760
-0.4	0.34458	0.34090	0.33724	0.33360	0.32997	0.32636	0.32276	0.31918	0.31561	0.31207
-0.3	0.38209	0.37828	0.37448	0.37070	0.36693	0.36317	0.35942	0.35569	0.35197	0.34827
-0.2	0.42074	0.41683	0.41294	0.40905	0.40517	0.40129	0.39743	0.39358	0.38974	0.38591
-0.1	0.46017	0.45620	0.45224	0.44828	0.44433	0.44038	0.43644	0.43251	0.42858	0.42465
-0.0	0.50000	0.49601	0.49202	0.48803	0.48405	0.48006	0.47608	0.47210	0.46812	0.46414

Common Logarithms of Numbers

log ₁₀ x or log x																			
x	0	1	2	3	4	5	6	7	8	9	Mean Differences (Add)								
											1	2	3	4	5	6	7	8	9
1.0	0.0000	0.0043	0.0086	0.0128	0.0170	0.0212	0.0253	0.0294	0.0334	0.0374	4	8	12	17	21	25	29	33	37
1.1	0.0414	0.0453	0.0492	0.0531	0.0569	0.0607	0.0645	0.0682	0.0719	0.0755	4	8	11	15	19	23	26	30	34
1.2	0.0792	0.0828	0.0864	0.0899	0.0934	0.0969	0.1004	0.1038	0.1072	0.1106	3	7	10	14	17	21	24	28	31
1.3	0.1139	0.1173	0.1206	0.1239	0.1271	0.1303	0.1335	0.1367	0.1399	0.1430	3	6	10	13	16	19	23	26	29
1.4	0.1461	0.1492	0.1523	0.1553	0.1584	0.1614	0.1644	0.1673	0.1703	0.1732	3	6	9	12	15	18	21	24	27
1.5	0.1761	0.1790	0.1818	0.1847	0.1875	0.1903	0.1931	0.1959	0.1987	0.2014	3	6	8	11	14	17	20	22	25
1.6	0.2041	0.2068	0.2095	0.2122	0.2148	0.2175	0.2201	0.2227	0.2253	0.2279	3	5	8	11	13	16	18	21	24
1.7	0.2304	0.2330	0.2355	0.2380	0.2405	0.2430	0.2455	0.2480	0.2504	0.2529	2	5	7	10	12	15	17	20	22
1.8	0.2553	0.2577	0.2601	0.2625	0.2648	0.2672	0.2695	0.2718	0.2742	0.2765	2	5	7	9	12	14	16	19	21
1.9	0.2788	0.2810	0.2833	0.2856	0.2878	0.2900	0.2923	0.2945	0.2967	0.2989	2	4	7	9	11	13	16	18	20
2.0	0.3010	0.3032	0.3054	0.3075	0.3096	0.3118	0.3139	0.3160	0.3181	0.3201	2	4	6	8	11	13	15	17	19
2.1	0.3222	0.3243	0.3263	0.3284	0.3304	0.3324	0.3345	0.3365	0.3385	0.3404	2	4	6	8	10	12	14	16	18
2.2	0.3424	0.3444	0.3464	0.3483	0.3502	0.3522	0.3541	0.3560	0.3579	0.3598	2	4	6	8	10	12	14	15	17
2.3	0.3617	0.3636	0.3655	0.3674	0.3692	0.3711	0.3729	0.3747	0.3766	0.3784	2	4	6	7	9	11	13	15	17
2.4	0.3802	0.3820	0.3838	0.3856	0.3874	0.3892	0.3909	0.3927	0.3945	0.3962	2	4	5	7	9	11	12	14	16
2.5	0.3979	0.3997	0.4014	0.4031	0.4048	0.4065	0.4082	0.4099	0.4116	0.4133	2	3	5	7	9	10	12	14	15
2.6	0.4150	0.4166	0.4183	0.4200	0.4216	0.4232	0.4249	0.4265	0.4281	0.4298	2	3	5	7	8	10	11	13	15
2.7	0.4314	0.4330	0.4346	0.4362	0.4378	0.4393	0.4409	0.4425	0.4440	0.4456	2	3	5	6	8	9	11	13	14
2.8	0.4472	0.4487	0.4502	0.4518	0.4533	0.4548	0.4564	0.4579	0.4594	0.4609	2	3	5	6	8	9	11	12	14
2.9	0.4624	0.4639	0.4654	0.4669	0.4683	0.4698	0.4713	0.4728	0.4742	0.4757	1	3	4	6	7	9	10	12	13
3.0	0.4771	0.4786	0.4800	0.4814	0.4829	0.4843	0.4857	0.4871	0.4886	0.4900	1	3	4	6	7	9	10	11	13
3.1	0.4914	0.4928	0.4942	0.4955	0.4969	0.4983	0.4997	0.5011	0.5024	0.5038	1	3	4	6	7	8	10	11	12
3.2	0.5051	0.5065	0.5079	0.5092	0.5105	0.5119	0.5132	0.5145	0.5159	0.5172	1	3	4	5	7	8	9	11	12
3.3	0.5185	0.5198	0.5211	0.5224	0.5237	0.5250	0.5263	0.5276	0.5289	0.5302	1	3	4	5	6	8	9	10	12
3.4	0.5315	0.5328	0.5340	0.5353	0.5366	0.5378	0.5391	0.5403	0.5416	0.5428	1	3	4	5	6	8	9	10	11
3.5	0.5441	0.5453	0.5465	0.5478	0.5490	0.5502	0.5514	0.5527	0.5539	0.5551	1	2	4	5	6	7	9	10	11
3.6	0.5563	0.5575	0.5587	0.5599	0.5611	0.5623	0.5635	0.5647	0.5658	0.5670	1	2	4	5	6	7	8	10	11
3.7	0.5682	0.5694	0.5705	0.5717	0.5729	0.5740	0.5752	0.5763	0.5775	0.5786	1	2	3	5	6	7	8	9	10
3.8	0.5798	0.5809	0.5821	0.5832	0.5843	0.5855	0.5866	0.5877	0.5888	0.5899	1	2	3	5	6	7	8	9	10