

THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



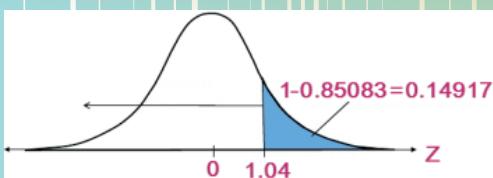
MATHEMATICAL TABLES AND FORMULAE

For Ordinary and Advanced Levels
Secondary Education

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

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

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



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

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**MATHEMATICAL TABLES
AND
FORMULAE**

**For Ordinary and Advanced Levels
Secondary Education**

Published by

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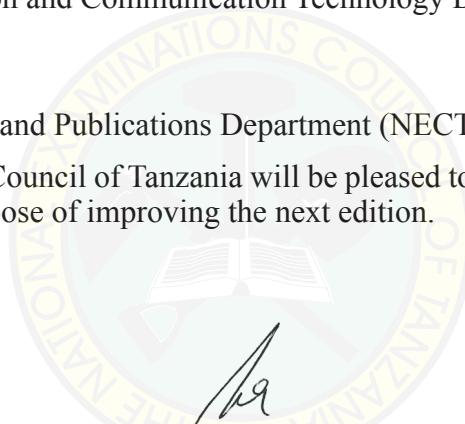
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The National Examinations Council of Tanzania will be pleased to accept comments from users of this document for the purpose of improving the next edition.



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PREFACE

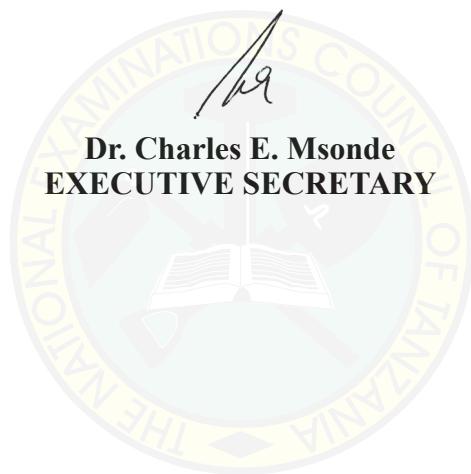
This booklet was prepared to address the shortcomings noted in Mathematical Tables (MT) which were used in National Examinations. It was observed that candidates used Mathematical Tables and Mathematical Formulae (MF) in National Examinations which were different from one school to another. The documents 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 MF 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 MF.

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
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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 (Naperian) 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

| x | $\log_{10} x$ or $\log x$ | | | | | | | | | | Mean Differences (Add) | | | | | | | | | |
|-----|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------------------|---|----|----|----|----|----|----|----|--|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 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 | |

| x | $\log_{10} x$ or $\log x$ | | | | | | | | | | Mean Differences (Add) | | | | | | | | |
|-----|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------------------|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | | | | 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 | 7 |
| 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 |

| $\log_{10} x$ or $\log x$ | | | | | | | | | | | | | Mean Differences (Add) | | | | | | | | |
|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------------------|---|------------------------|---|---|---|---|---|---|--|--|
| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Mean Differences (Add) | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 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

| x | 10^x | | | | | | | | | Mean Differences (Add) | | | | | | | | | |
|-----|--------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 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 | 1 | 1 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 1 | 2 | 2 | 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 | 1 | 2 | 2 | 2 | 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 |

| x | 10^x | | | | | | | | | Mean Differences (Add) | | | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 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 |
| <i>x</i> | <i>0</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>6</i> | <i>7</i> | <i>8</i> | <i>9</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>6</i> | <i>7</i> | <i>8</i> | <i>9</i> |

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

Degrees to Radians

| <i>Degrees, Minutes to Radians</i> | | | | | | | | | | | | | | Mean Differences (Add) | |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------------------|-----------|-----------|------------------------|-----------|
| <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 |
| 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> | | | | | | | | | | | | | | | |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------|-----------|-----------|-----------|-----------|
| <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' |
| 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 |
| <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° | | | | | |

| <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' |
| 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 |
| <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° | | | | | |



Sine of an Angle

| x | $\sin x$ | | | | | | | | | | | Mean Differences (Add) | | | | |
|-----------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------|
| | $0'$ | $6'$ | $12'$ | $18'$ | $24'$ | $30'$ | $36'$ | $42'$ | $48'$ | $54'$ | | $1'$ | $2'$ | $3'$ | $4'$ | $5'$ |
| | 0.0° | 0.1° | 0.2° | 0.3° | 0.4° | 0.5° | 0.6° | 0.7° | 0.8° | 0.9° | | | | | | |
| 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° | | | | | | |

| x | $\sin x$ | | | | | | | | | | | | Mean Differences (Add) | | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------|------|------------------------|------|------|--|--|
| | $0'$ | $6'$ | $12'$ | $18'$ | $24'$ | $30'$ | $36'$ | $42'$ | $48'$ | $54'$ | $1'$ | $2'$ | $3'$ | $4'$ | $5'$ | | |
| 0.0° | 0.0° | 0.1° | 0.2° | 0.3° | 0.4° | 0.5° | 0.6° | 0.7° | 0.8° | 0.9° | | | | | | | |
| 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

| x | $\cos x$ | | | | | | | | | | | Mean Differences (Subtract) | | | | |
|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|--------------------------------|-----------|-----------|-----------|--|
| | $0'$ | $6'$ | $12'$ | $18'$ | $24'$ | $30'$ | $36'$ | $42'$ | $48'$ | $54'$ | $0'$ | $2'$ | $3'$ | $4'$ | $5'$ | |
| 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° | | | | | | |

| x | $\cos x$ | | | | | | | | | | | | Mean Differences (Subtract) | | | | | | | | | | | | |
|-----|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|------|--------------------------------|------|------|------|------|------|------|------|----|----|----|----|----|
| | 0' | 6' | 12' | 18' | 24' | 30' | 36' | 42' | 48' | 54' | 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' |
| | 0.8387 | 0.8377 | 0.8368 | 0.8358 | 0.8348 | 0.8339 | 0.8329 | 0.8320 | 0.8310 | 0.8300 | 2 | 3 | 5 | 6 | 8 | | | | | | | | | | |
| 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° | | | | | | | | | | | | | | | |

| x | $\cos x$ | | | | | | | | | | | Mean Differences (Subtract) | | | | |
|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|--------------------------------|-----------|-----------|-----------|-----------|
| | 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° | | | | | | |
| 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

| x | $\tan x$ | | | | | | | | | | Mean Differences (Add) | | | | |
|-----------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | $0'$ | $6'$ | $12'$ | $18'$ | $24'$ | $30'$ | $36'$ | $42'$ | $48'$ | $54'$ | $1'$ | $2'$ | $3'$ | $4'$ | $5'$ |
| 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° | | | | | |

| $\tan x$ | | | | | | | | | | | | | Mean Differences (Add) | | | | | | |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|----|------------------------|-----|-----|--|--|--|--|
| 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 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 78 | 4.7046 | 4.7453 | 4.7867 | 4.8288 | 4.8716 | 4.9152 | 4.9594 | 5.0045 | 5.0504 | 5.0970 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 79 | 5.1446 | 5.1929 | 5.2422 | 5.2924 | 5.3435 | 5.3955 | 5.4486 | 5.5026 | 5.5578 | 5.6140 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 80 | 5.6713 | 5.7297 | 5.7894 | 5.8502 | 5.9124 | 5.9758 | 6.0405 | 6.1066 | 6.1742 | 6.2432 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 81 | 6.3138 | 6.3859 | 6.4596 | 6.5350 | 6.6122 | 6.6912 | 6.7720 | 6.8548 | 6.9395 | 7.0264 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 82 | 7.1154 | 7.2066 | 7.3002 | 7.3962 | 7.4947 | 7.5958 | 7.6996 | 7.8062 | 7.9158 | 8.0285 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 83 | 8.1443 | 8.2636 | 8.3863 | 8.5126 | 8.6427 | 8.7769 | 8.9152 | 9.0579 | 9.2052 | 9.3572 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 84 | 9.5144 | 9.6768 | 9.8448 | 10.019 | 10.199 | 10.385 | 10.579 | 10.780 | 10.988 | 11.205 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 85 | 11.430 | 11.664 | 11.909 | 12.163 | 12.429 | 12.706 | 12.996 | 13.300 | 13.617 | 13.951 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 86 | 14.301 | 14.669 | 15.056 | 15.464 | 15.895 | 16.350 | 16.832 | 17.343 | 17.886 | 18.464 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 87 | 19.081 | 19.740 | 20.446 | 21.205 | 22.022 | 22.904 | 23.859 | 24.898 | 26.031 | 27.271 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 88 | 28.636 | 30.145 | 31.821 | 33.694 | 35.801 | 38.188 | 40.917 | 44.066 | 47.740 | 52.081 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 89 | 57.290 | 63.657 | 71.615 | 81.847 | 95.489 | 114.59 | 143.24 | 190.98 | 286.48 | 572.96 | Mean Differences ceases to be sufficiently accurate | | | | | | | | |
| 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° | Mean Differences ceases to be sufficiently accurate | | | | | | | | |

Square Root

| x | \sqrt{x} | | | | | | | | | | Mean Differences (Add) | | | | | | | | | |
|-----------------------|------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------------------------|----------|----------|----------|----------|----------|----------|----------|----------|--|
| | 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 | 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 | 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 | 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 | 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 | 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 | 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 |

| x | \sqrt{x} | | | | | | | | | | Mean Differences (Add) | | | | | | | | |
|-----|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|---|---|---|---|---|---|---|---|
| | 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

| x | $\frac{1}{x}$ | | | | | | | | | | Mean Differences (Subtract) | | | | | | | | | |
|-----|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------------|----|----|----|----|----|----|----|----|--|
| | 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 | |

| x | $\frac{1}{x}$ | | | | | | | | | | Mean Differences (Subtract) | | | | | | | | | |
|-----|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------------|---|---|---|---|---|---|---|---|--|
| | 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) | | | | | | | | | |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------------|---|---|---|---|---|---|---|---|---|
| <i>x</i> | 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 |
| <i>x</i> | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |



Cube Root

| x | $\sqrt[3]{x}$ | | | | | | | | | Mean Differences (Add) | | | | | | | | | |
|-----------------|---------------|----------|----------|----------|----------|----------|----------|----------|----------|------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | 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 |
| <i>x</i> | 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 | |

| x | $\sqrt[3]{x}$ | | | | | | | | | Mean Difference (Add) | | | | | | | | | |
|-----|---------------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------|---|---|---|----|----|----|----|----|----|
| | 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 |

| x | $\sqrt[3]{x}$ | | | | | | | | | Mean Difference (Add) | | | | | | | | | |
|-----|---------------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------|---|---|---|---|---|----|----|----|----|
| | 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

| x | $\ln x$ or $\log_e x$ | | | | | | | | | | Mean Differences (Add) | | | | | | | | | |
|-----|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------------------|----|----|----|----|----|----|----|----|--|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 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 | |

| x | $\ln x$ or $\log_e x$ | | | | | | | | | | | | | Mean Differences (Add) | | | | | | | | |
|-----|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|------------------------|----|----|----|----|----|----|--|--|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | | |
| | | 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 | | |
| 4.8 | 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 | | | |

| x | $\ln x$ or $\log_e x$ | | | | | | | | | | Mean Differences (Add) | | | | | | | | |
|-----|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------------------|---|---|---|---|---|---|---|----|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 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 | 5 | 6 | 7 | 8 | 9 | 10 |
| 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 | 6 | 7 | 8 | 9 | 10 |
| 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 | 6 | 7 | 8 | 9 | 10 |
| 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 | 7 | 8 | 9 | 10 |
| 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 | 8 | 9 | 10 |
| 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 | 9 | 10 |
| 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 | 10 |
| 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 |

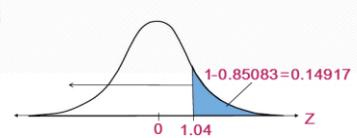
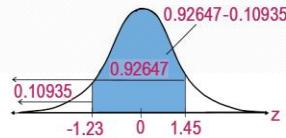
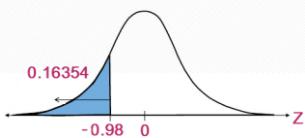


Binomial Distribution

| | | | | | | | | | | | | | |
|--------------|----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| | 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 |

| | 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

| 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 |

| λ | $P(X = x) = P_x(\lambda) = \sum_{x=r}^n \frac{e^{-\lambda} \lambda^x}{x!}$ | | | | | | | | | | |
|-----------|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 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 | $P(X = x) = P_x(\lambda) = \sum_{x=r}^n \frac{e^{-\lambda} \lambda^x}{x!}$ | | | | | | | | | | |
|-----|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 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 |

$$P(X = x) = P_x(\lambda) = \sum_{x=r}^n \frac{e^{-\lambda} \lambda^x}{x!}$$

| x | λ | | | | | | | | | | |
|------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 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

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

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:

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

Also,

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

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

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

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:

$$\begin{aligned} \sin x + \sin y &= 2 \sin\left(\frac{x+y}{2}\right) \cos\left(\frac{x-y}{2}\right); & \sin x - \sin y &= 2 \cos\left(\frac{x+y}{2}\right) \sin\left(\frac{x-y}{2}\right). \\ \cos x + \cos y &= 2 \cos\left(\frac{x+y}{2}\right) \cos\left(\frac{x-y}{2}\right); & \cos x - \cos y &= -2 \sin\left(\frac{x+y}{2}\right) \sin\left(\frac{x-y}{2}\right). \end{aligned}$$

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

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

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

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 $x\sqrt{a^2 + b^2 x^2}$ | $bx = a \operatorname{cosech} \theta$ |

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

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

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

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

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

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 $\lambda : \mu$:

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

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

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 $\sin ix = i \sinh x$ |
| $\cosh^2 x - \sinh^2 x = 1$ | $\sinh(x \pm y) = \sinh x \cosh y \pm \cosh x \sinh y$ |
| $\cosh(x \pm y) = \cosh x \cosh y \pm \sinh x \sinh y$ | $\sinh^{-1} x = \ln\left(x + \sqrt{x^2 + 1}\right)$ |
| $\cosh^{-1} x = \ln\left(x + \sqrt{x^2 - 1}\right)$, $x \geq 1$ | $\tanh^{-1} x = \frac{1}{2} \ln\left(\frac{1+x}{1-x}\right)$, $ 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 $a \frac{d^2y}{dx^2} + b \frac{dy}{dx} + cy = 0$:

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

$$\pi = 3.1415926\dots$$

$$e = 2.718281\dots$$

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

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

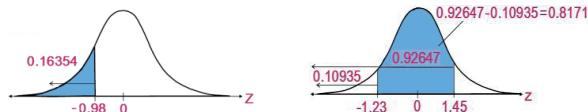
$$\text{Mean radius of the Earth} = 6371 \text{ Km}$$

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

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



Standard Normal Distribution



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

| 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

| x | $\log_{10} x$ or $\log x$ | | | | | | | | | Mean Differences (Add) | | | | | | | | | |
|-----|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|------------------------|---|---|----|----|----|----|----|----|----|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 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 |