# THE FOUR FOURS GAME

Fred E. Lusk III, P.E.

January 25, 2012

Version 3.30

# DEDICATION

This booklet is dedicated to Mr. Sherard, *Math Teacher Extraordinaire* at the old Sierra Junior High School in Fresno, CA, who introduced me and my classmates to **The Four Fours Game**.

This booklet is also dedicated to my father, who showed me the factorial function and a few others; to my mother, who helped with some of the harder solutions; to my friend Scott Endler, who competed with me for top honors in the game; and to my wife, three children, and now two grandchildren, who put up with all this nonsense.

Any mistakes herein are mine alone, of course, though I *am* looking for someone else to blame.

# DOCUMENT HISTORY

**1993:** This treatise was originally prepared with Microsoft Word for Windows 2.0 and some of its goodies, including the Equation Editor and WordArt, operating under MS-DOS 5.0 and Windows 3.1 on a Standard Technologies 486-33 with 8MB RAM (which wasn't always enough, even with a really big swap file).

**1998:** The next installment was prepared with Microsoft Word for Windows 6.0 operating under Windows 95 on a Gateway 2000 P5-90 with 24 MB RAM (which wasn't always enough). The 1993 through 1998 work was made even more difficult because documents with lots of equations sometimes behaved very badly during editing.

**2012:** After a long hiatus, work continues with Microsoft Word 2010 operating under Windows 7 on a 3.0-GHz Dell Dimension 8400 with 2.0 GBytes of RAM (again, not always enough). Besides updating the narrative and adding more solutions, a key task was replacing all the old Equation Editor objects with new Equation Editor objects. Now the documents are happy unless I am editing equations with several documents open at once..

# THE FOUR FOURS GAME

## TABLE OF CONTENTS

[NEARLY BLANK PAGE]

# THE FOUR FOURS GAME

## INTRODUCTION

### OBJECT

The object of **The Four Fours Game**[1] is to create every whole number (i.e. positive integer) beginning with 1, using only four fours (4s) and standard mathematical operations, symbols, and notation. Simple solutions[2] and clever and intricate solutions are equally worthy of note. However, **Four Fours** aficionados prefer the simpler solutions for "aesthetic reasons."

### PURPOSE

The *raison d'être* for **The Four Fours Game** is that there are too many extant fours. Original research by J.A. Lusk (1984) concluded that *one* is indeed the loneliest number, whilst *fours* are found in great abundance. The purpose of this game, then, is to spread these extra fours amongst the other numbers, thus eliminating mathematical discrimination and possibly homelessness.

The purpose of this treatise is fourfold: [1] to document the status of my own solutions library, [2] to provide a large number of solutions for **The Four Fours Game**, [3] to provide a variety of other relevant and useful information, and [4] to assist aficionados of **The Four Fours Game**, as well as mathematics teachers who use the game in the classroom. You know who you are. I can't compete with David Wheeler's awesome ***The Definitive Four Fours Answer Key*** (see *References*), but I trust that my treatise will find its place in **The Four Fours Game** pantheon.

For 1–300, I provide at least three solutions;[3] beyond 300, I provide at least one solution. Most of the solutions for 1–100 and all of the solutions beyond 100 I developed myself.[4] My solutions are not necessarily unique (see *References*), but I have not otherwise knowingly copied other people's work. My solutions for each number are representative, not exhaustive, and other solutions certainly exist. Where more than one solution is provided, the simpler ones are generally shown first. The sky is the limit, but for now I am concentrating on developing solutions for 1–1,000, in many cases multiple solutions.

[1] Or: *The Four 4*[']*s Game*, *The 4 Fours Game*, and *The Fours Game*. In the Internet age, *TFFG* seems appropriate. Some authors use "*Puzzle*" or "*Problem*" instead of "*Game*", though "*Obsession*" might be a better choice.
[2] That is, those using the more elementary operations, symbols, and notations.
[3] For 1–100, at least one solution is in the form of a square root.
[4] Unfortunately, after all these years, I am unable to properly credit most of the solutions provided by others.

## HISTORY

**The Four Fours Game** has a long and lively history. In the January 1964 issue of *Scientific American*, Martin Gardner, author of the column *Mathematical Games*, provided the following history and explanation of **The Four Fours Game**, to which I have added a few pertinent footnotes. This particular column, which I first saw about 1978,[5] was based on an imaginary conversation with Gardner's friend, Dr. Matrix.

> …"It occurred to me," I said, hoping to change the subject, "that because the new year ends with 4 it might be an appropriate time to introduce my readers to the old pastime of the four 4's. Do you know the game?"
>
> Dr. Matrix sighed painfully. "I know it well."
>
> Let me first explain the recreation. One seeks to form as many whole numbers as possible, starting with 1, by using only the digit 4 four times—no more, no less—together with simple mathematical symbols. Naturally one must establish what is meant by a "simple" symbol. This traditionally includes the arithmetic signs for addition, subtraction, multiplication, and division, together with the square root sign (repeated as many finite times as desired), parentheses, decimal points, and the factorial sign. (Factorial $n$ is written $n!$ It means $1 \times 2 \times 3 \times \cdots \times n$.) A decimal point may also be placed above $.4$, in which case it indicates the repeating decimal $.4444\cdots$, or $4/9$.[6]
>
> The numbers 1 through 10 are easily expressed, in many different ways, by using no more than the symbols for multiplication, division, addition, and/or subtraction [*see illustration*…]. By adding the square root sign, numbers 11 through 20 (except for 19) are readily obtained. By allowing the factorial sign and the dot used as both a decimal point and a repeating decimal sign, one can go to 112. There seems to be no way to express 113[7] within these restrictions unless one employs highly bizarre combinations of the above symbols, such as the combined square root, decimal, and repeated decimal signs in the denominator of the first term in the following equation:[8]
>
> $$\frac{4!}{.\dot{\sqrt{4}}} + \frac{\sqrt{4}}{.4}$$
>
> The pastime was first mentioned in the issue for December 30—in the palindromic, invertible year 1881—of a lively London Weekly that had been founded that year by the astronomer Richard Anthony Proctor. He called his periodical *Knowledge: An Illustrated Magazine of Science, Plainly Worded–Exactly Described*. A letter to the editor expressed astonishment at the fact (shown to the writer by a friend) that all integers from 1 through 20, except 19, could be expressed by four 4's and simple signs. Factorials and dots were not allowed. Readers were asked to try their hand at it before solutions were given in a later (January 13) issue. (With the help of the factorial sign, 19 can be expressed: $4! - 4 - 4/4$. Can the reader of *this* periodical find a way to do it by using only the four arithmetical signs and the decimal point?)
>
> Since 1881 the game has enjoyed occasional revivals. A lengthy article on the topic, by W. W. Rouse Ball, appeared in the *Mathematical Gazette* for May, 1912, and there have been scores of subsequent articles, including tables that go above 2,000. Even now the mania will

---

[5] Seven years after my own introduction to **The Four Fours Game**.

[6] I use a bar over the number instead of a dot to indicate a repeating decimal.

[7] Not quite true; see my solutions.

[8] Combining the symbols in this way (e.g. $.\overline{\sqrt{4}}$) doesn't follow any normal mathematical convention, which is why it isn't allowed.

suddenly seize the employees of an office or laboratory, sometimes causing a work stoppage that lasts for days.

"Is it possible," I asked Dr. Matrix, "to express 1964 with four 4's and the traditional symbols?"

He shook his head vigorously. "Of course many important dates *are* possible. 1776 is 4 times 444. But 1964 is not one of them. With five 4's, yes." He jotted on my note pad:

$$44^{\sqrt{4}} + 4! + 4$$

"But four 4's, no."

"How about 64?"

"That," said Dr. Matrix, "is not difficult. Oddly enough 64 can also be expressed—under the traditional restrictions, of course—with three 4's and also with two."

The reader is invited to try his skill on all three problems; that is, to express 64 with four 4's, with three 4's, and with two 4's. No symbols may be used other than those that have been mentioned. The task is middling hard with four 4's, ridiculously easy with three, extremely difficult with two. Next month[9] I shall give the best solutions known to Dr. Matrix."…

Gardner also gave the following solutions with this column, except for 19, which was provided in the next issue. Note that, while each of these solutions is very simple, I did not come up with all of them myself (see Section I). Obviously, there are many ways to skin this cat.

| | | | |
|---|---|---|---|
| $1 = \frac{44}{44}$ | $6 = 4 + \frac{4+4}{4}$ | $11 = \frac{44}{\sqrt{4}+\sqrt{4}}$ | $16 = 4+4+4+4$ |
| $2 = \frac{4}{4} + \frac{4}{4}$ | $7 = \frac{44}{4} - 4$ | $12 = \frac{44+4}{4}$ | $17 = (4 \times 4) + \frac{4}{4}$ |
| $3 = \frac{4+4+4}{4}$ | $8 = 4+4+4-4$ | $13 = \frac{44}{4} + \sqrt{4}$ | $18 = (4 \times 4) + 4 - \sqrt{4}$ |
| $4 = 4(4-4)+4$ | $9 = 4+4+\frac{4}{4}$ | $14 = 4+4+4+\sqrt{4}$ | $19 = \frac{4+4-.4}{.4}$ |
| $5 = \frac{(4 \times 4)+4}{4}$ | $10 = \frac{44-4}{4}$ | $15 = \frac{44}{4} + 4$ | $20 = (4 \times 4) + \sqrt{4} + \sqrt{4}$ |

I first met **The Four Fours Game** in the fall of 1971, while in 8th grade. One morning I walked in to Algebra I to see $1 = \frac{44}{44}$ on the chalkboard. Mr. Sherard then asked, "What's two?" We didn't quite understand what he meant until someone came up with $2 = \frac{4}{4} + \frac{4}{4}$. Under Mr. Sherard's guidance, we "discovered" the rules, then we quickly solved 3 through 10, but stalled at 11. Mr. Sherard then made it a contest: whoever solved 11 would get an ice cream at the campus canteen. This he did for each day's stumper. He used the game to teach algebra and creative thinking, as well as to stimulate interest in math—thus the contest.

Soon, however, only two of us were still "in the game": Scott Endler (3rd Period) and I (2nd Period).[10] We each tried very hard to beat the other to the next solution. Sometimes Scott would win, sometimes I would. I learned about the factorial function first, so that gave me an early

[9] i.e., February 1964 Scientific American.

[10] Our "unfair advantage" was that both of our fathers were engineers and my mom had been a math major.

edge. We discovered that the prime numbers were usually the hardest, and that odd numbers were harder than even numbers. Our two most challenging solutions within the first 100 integers were 71 and 73. I remember one day waiting for the school bus and telling Scott that I had 73. He tried everything he could think of to con me out of my solution, but to no avail. I actually had two solutions, but one was based on $.\sqrt{4} = .\bar{2}$, which is stretching the rules since the square root operation returns a number, not a digit. Mr. Sherard eventually dropped the game as general interest waned. Personally, I found the game an ideal introduction to recreational mathematics, as well as a stimulus to my own mathematical education. It's also a great time-waster.

## RULES

- The object of **The Four Fours Game** is to create every positive integer beginning with 1, using only four fours (4s) and standard mathematical operations, symbols, and notation.
- Only fours (4) may be used as digits and numerals; no other numbers (including $\pi$ and $e$) and no variables.
- Only four fours (4, 4, 4, and 4) may be used as digits and numerals—no more, no less.
- Only standard mathematical operations, symbols, and notation may be used, and they must be used in standard ways (e.g. the "output" is a number, not a digit for concatenation). The list of operations below is representative, but not exhaustive.

| Symbols | Operations* | Examples |
|---|---|---|
| $n$<br>$nn$<br>$nnn$<br>$nnnn$ | **Numbers & Digits** | $4$<br>$44$<br>$444$<br>$4444$ |
| $.n$<br>$.nn$<br>$n.n$ | **Decimal** | $.4 = \frac{4}{10} = \frac{2}{5}$<br>$.44 = \frac{44}{100} = \frac{11}{25}$<br>$4.4 = \frac{44}{10} = \frac{22}{5}$ |
| $.\bar{n}$<br>$.\dot{n}$<br>$n.\bar{n}$ | **Repeating Decimal**<br>(The overline will be used herein instead of the overdot.) | $.\bar{4} = \frac{4}{9}$<br>$4.\bar{4} = \frac{40}{9}$ |
| ( )<br>[ ]<br>{ } | **Parenthesis, Brackets, & Braces**<br>(Used for grouping. I purposely overuse these so that a detailed understanding of the order of operations is not required.) | $4 \cdot [4! + (4 \cdot 4!!)] = 224$<br>$\{(4 \times 4!) + 4\} \cdot 4!! = 800$ |

| Symbols | Operations* | Examples |
|---|---|---|
| $+$ | **Addition** | $4+4=8$ |
| $-$ | **Subtraction** | $44-4=40$ |
| $\times$<br>$\cdot$ | **Multiplication** | $4\times4\times4=64$<br>$44\cdot4=176$<br>Also implied multiplication: $(4)(4)=16$ |
| $\div$<br>$/$ | **Division**<br>(I usually use stand up fractions, but will sometimes opt for the other forms for formatting purposes.) | $44\div4=11$<br>$444/4=111$<br>$\frac{4!}{.\overline{4}}=54$ |
| $\sqrt{\mathrm{x}}$<br>$\sqrt{\sqrt{\mathrm{x}}}$<br>$\sqrt[\mathrm{y}]{\mathrm{x}}$ | **Square Root, Nested Square Roots, & Other Roots** | $\sqrt{4}=2$<br>$\sqrt{\sqrt{4^{4!}}}=\sqrt[4]{4^{4!}}=4{,}096$<br>$\sqrt[.4]{4\times4\times4}=32{,}768$<br>$\sqrt[.\overline{4}]{4\times4}=512$ |
| $x^y$ | **Powers**† | $4^4=256$<br>$\left(\Gamma(4)\right)^4=1{,}296$<br>$44^{\sqrt{4}}=1{,}936$<br>$(4^4)^4=4{,}294{,}967{,}296$<br>$4^{(4^4)}=1.340\cdots\times10^{154}$ |
| $x\%$<br>$x\%\%$<br>…etc. | **Percent**<br>(When used as an operator, % simply means to divide by 100.) | $4\%=0.04=\frac{1}{25}$<br>$(4!)\%=0.24=\frac{6}{25}$<br>$4\%\%=(4\%)\%=0.0004=\frac{1}{2{,}500}$ |
| $\Sigma(x)$ | **Summation Function**†<br>(For the special case of summing consecutive integers from 1 to $x$, the sigma operator can be written with just the $x$ instead of with an index variable and upper and lower limits of summation. This is analogous to the syntax for Factorial. See also page 9.) | $\Sigma(x)=\sum_{i=1}^{x} i=\frac{x(x+1)}{2}$<br>$\Sigma(4)=4+3+2+1=10$<br>$\Sigma(4+4)=36$<br>$\Sigma\left(\Sigma(4)\right)=55$<br>$\Sigma(4!)=300$<br>$\Sigma(44)=990$<br>$\Sigma(444)=98{,}790$<br>$\Sigma(4444)=9{,}876{,}790$ |

| Symbols | Operations* | Examples |
|---|---|---|
| $x!$ | **Factorial**† <br> (See also page 9.) | $x! = \prod_{i=1}^{x} i = x(x-1)(x-2)\cdots 3 \times 2 \times 1$ <br> $4! = 4 \times 3 \times 2 \times 1 = 24$ <br> $\left(4+\sqrt{4}\right)! = 720$ |
| $\Gamma(x)$ | **Gamma Function**† <br> (See also page 9.) | For integers, $\Gamma(x) = (x-1)!$ <br> $\Gamma(4) = 3! = 6$ <br> $\Gamma\left(\Gamma(4)\right) = 120$ |
| $x!!$ | **Double Factorial**† <br> (I first found this function in *Engineering Mathematics Handbook*, Jan J. Tuma, McGraw Hill. Note that the functions for odd and even numbers are *not* coincident. Being a Civil Engineer and not a true math expert, I don't know the origin of these functions or what they are used for. All I know is that they have nothing to do with fluid mechanics. ☺ I recall seeing somewhere a different definition for **Double Factorial**, but I don't remember where or what.) | For $x =$ even number: <br> $x!! = (2n)!!$ <br> $= 2n(2n-2)(2n-4)\cdots 6 \times 4 \times 2$ <br> $= 2^n n! = 2^n \Gamma(n+1)$ <br> $4!! = 8\ [n = 2]$ <br> For $y =$ odd number: <br> $y!! = (2n-1)!!$ <br> $= (2n-1)(2n-3)\cdots 5 \times 3 \times 1$ <br> $= 2^n \frac{\Gamma\left(n+\frac{1}{2}\right)}{\sqrt{\pi}}$ <br> $(4/.\bar{4})!! = 9!! = 945\ [n = 5]$ |
| $log(x)$ <br> $ln(x)$ | **Common and Natural Logarithms** <br> (There are several algorithms for producing every positive integer using logarithms and nested roots, but these trivialize **The Four Fours Game** and are thus not permitted.‡ Otherwise, logarithms are not very useful without the disallowed Integer, Floor, or Ceiling functions.) | $log(44) = 1.643\cdots$ <br> $log\left(\frac{4}{4\%}\right) = 2$ <br> $ln(4) = 1.386\cdots$ |
| $alog(x)$ <br> $aln(x)$ | **Antilogarithms** <br> (The base 10 antilogarithms are useful.) | $alog(x) = 10^x$ <br> $alog(4) = 10{,}000$ <br> $aln(x) = e^x$ <br> $aln(4) = 54.598\cdots$ |
| $sin(x)$ <br> $\cos(x)$ <br> $tan(x)$ <br> …etc. | **Trigonometric Functions** <br> (Very limited use. All trig and inverse trig functions used herein assume degrees. Radians would be useless and grads are obscure.) | $44 \times sin\left(\sqrt{\frac{4}{.\bar{4}\%}}\right) = 22$ |

| Symbols | Operations* | Examples |
|---|---|---|
| $arcsin(x)$<br>$arccos(x)$<br>$arctan(x)$<br>…etc. | **Inverse Trigonometric Functions**<br>(A few are useful. Note that *trig*$^{-1}$ introduces a non-4 number. For simplicity, "*arc*…" will be shortened to the common "*a*…") | $atan\left(\frac{4}{4}\right) = 45$ |
| $sinh(x), asinh(x)$<br>$cosh(x), acosh(x)$<br>$tanh(x), atanh(x)$ | **Hyperbolic Functions and their Inverses**<br>(Not very useful.) | $cosh(.4) = 1.081\cdots$ |
| $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$ | **Determinate**<br>(Redundant) | $\begin{vmatrix} 4! & \sqrt{4} \\ 4 & 4!! \end{vmatrix} = (4! \times 4!!) - \left(4 \times \sqrt{4}\right) = 184$ |
| $\binom{n}{k}$ | **Binomial Coefficient** | $\binom{n}{k} = C(n,k) = \frac{n!}{(n-k)!\,k!}$ |
| ${}_nC_k$<br>$C(n,k)$ | **Combination**†<br>(Combinations of $n$ objects taken $k$ at a time.) | $C(4!!,4) = \frac{8!}{(8-4)! \times 4!} = 70$<br>$C\left(\Gamma(4), \sqrt{4}\right) = 15$ |
| ${}_nP_k$<br>$P(n,k)$ | **Permutation**†<br>(Permutations—arrangements—of $n$ objects taken $k$ at a time.) | $P(n,k) = \frac{n!}{(n-k)!}$<br>$P(4!!,4) = \frac{8!}{(8-4)!} = 1{,}680$<br>$P\left(\Gamma(4), \sqrt{4}\right) = 30$ |
| $B(x,y)$ | **Beta Function**†<br>(Useful as a divisor. See also page 9.) | $B(x,y) = \frac{\Gamma(x)\cdot\Gamma(y)}{\Gamma(x+y)} = \frac{(x-1)!\cdot(y-1)!}{(x+y-1)!}$<br>$B\left(\sqrt{4}, \Sigma\left(\sqrt{4}\right)\right) = \frac{\Gamma(2)\cdot\Gamma(3)}{\Gamma(2+3)} = \frac{1\cdot 2}{24} = \frac{1}{12}$<br>$B\left(\Sigma\left(\sqrt{4}\right), \Gamma(4)\right) = \frac{1}{168}$ |
| ${}_xMOD_y$<br>$MOD(x,y)$ | **Modulus**<br>(Also known as the **Remainder Function**.) | $MOD(\Gamma(4!!), (4!!)!!) = MOD(5040{,}384)$<br>$= 48$<br>$MOD\left((4!!)!!, \Sigma\left(\Sigma\left(\Gamma(4)\right)\right)\right)$<br>$= MOD(384{,}231) = 153$ |

* The Absolute Value Function $|x|$ is not shown because it is unnecessary. Functions such as Integer, Floor, and Ceiling are not allowed because they trivialize the game by "converting" non-integer approximations into integers. On the other hand, there are certainly other legal functions that are not included in this table.

† See **USEFUL TABLES** (page 10) for values for these functions

‡ Paul Bourke (see *References*) provides the following information regarding several related generic solutions for all integers using three and even two 4s. These can be easily converted to use four 4s, but since these solutions trivialize **The Four Fours Game** they are not allowed.

- **"Any number with three 4's** (contributed by Ben Rudiak-Gould)
  A cute solution to ANY number using just 3 fours. By admitting natural logarithms, $ln(\ )$, then any positive integer $n$ can be represented as

  $$n = -ln\left[ln\left(sqrt\left(sqrt\left(\cdots\left(sqrt(4)\right)\cdots\right)\right)\right)/ln(4)\right]/ln(4)$$

  where the number of nested $sqrt(\ )$ functions is twice $n$. Or if base 4 logarithms are permitted, $log_4(\ )$, then the expression becomes

  $$n = -log_4\left(log_4\left(sqrt\left(sqrt\left(\cdots\left(sqrt(4)\right)\cdots\right)\right)\right)\right)$$

- **"Any number with two 4's** (Contributed by "whetstone")
  Using $log_{10}(\ )$, any number can be represented using two fours and creative use of % as shown below:

  $$log\left(\sqrt{4/4\%}\right) = \qquad log\left(\sqrt{100}\right) = \qquad log(10) \qquad 1$$

  $$log\left(\sqrt{4/4\%\%}\right) = \qquad log\left(\sqrt{10000}\right) = \qquad log(100) \qquad 2$$

  $$log\left(\sqrt{4/4\%\%\cdots\%}\right) = \qquad n\text{"}$$

Some **Four Fours** aficionados may question the legality of certain operations listed above. As mentioned in Gardner's column, only addition, subtraction, multiplication, and division were originally permitted, followed by the square root, factorial, and decimal point.

I take a broader yet thoroughly consistent approach.[11] So, if multiplication—which is really repeated addition—is allowed, then certainly square roots, factorials, and decimals—which also use simple symbols in place of longer, equivalent operations—should be allowed as well. And, of course, they are. And, if these operations are allowed, then many other well-known and documented operations, such as powers, the Summation and Gamma Functions, percent, etc. must also be allowed. All of these valid operations are analogous to a computer: they take input and produce output. The following examples illustrate these points:

| Legal Operation | Illegal Equivalent(s) |
|---|---|
| $4^{4+4} = 65{,}536$ | $4^{4+4} \Rightarrow 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$<br>$4^{4+4} \Rightarrow 4 + 4 + \cdots + 4$<br>(Both equivalents use too many 4s.) |
| $.4$ and $.\overline{4}$ | $.4 \Rightarrow \frac{4}{10}$ and $.\overline{4} \Rightarrow \frac{4}{9}$<br>(Both equivalents use non-4 numbers.) |
| $4\%$ and $4\%\%$ | $4\% \Rightarrow \frac{4}{100}$ and $4\%\% \Rightarrow \frac{4}{10{,}000}$<br>(Both equivalents use non-4 numbers.) |

[11] Well…almost. The Integer, Floor, Ceiling and similar functions and the log+square root tricks shown above, while technically meeting the criteria for legal operations, are excluded because they trivialize the game. We all agree that, by means of the log+square root tricks, **The Four Fours Game** has been definitively solved for integers from 1 to ∞, so now let's find solutions using other methods. This is analogous to chess: just because Deep Blue defeated Garry Kasparov does not mean we shouldn't continue to play chess.

| Legal Operation | Illegal Equivalent(s) |
|---|---|
| $4! = 24$ | $x! = \prod_{i=1}^{x} i$<br>$4! \Rightarrow \prod_{i=1}^{4} i$<br>$4! \Rightarrow 4 \cdot 3 \cdot 2 \cdot 1 = 24$<br>(The first equivalent uses a variable and the second uses non-4 numbers.) |
| $\Sigma(4) = 10$ | $\Sigma(x) = \sum_{i=1}^{x} i$<br>$\Sigma(4) \Rightarrow \sum_{i=1}^{4} i$<br>$\Sigma(4) \Rightarrow 4 + 3 + 2 + 1 = 10$<br>(The first equivalent uses a variable and the second uses non-4 numbers.) |
| $\Gamma(4)$ | $\Gamma(x) = \int_0^{\infty} t^{x-1} e^{-t} dt$<br>$\Gamma(x) = (x-1)!$ (for integer values, $x > 0$)<br>$\Gamma(4) \Rightarrow (4-1)! = 6$<br>(The definition uses varaibles and the equivalent for integers uses a non-4 number.) |
| $B(4, \sqrt{4})$ | $B(x, y) = \frac{\Gamma(x) \cdot \Gamma(y)}{\Gamma(x+y)} = \frac{(x-1)! \cdot (y-1)!}{(x+y-1)!}$<br>$B(4, \sqrt{4}) \Rightarrow \frac{\Gamma(4) \cdot \Gamma(2)}{\Gamma(4+2)} = \frac{6 \cdot 1}{120} = 0.05 = \frac{1}{20}$<br>(The Beta Function is based on the Gamma Function, so the same comments apply.) |

To carry this line of thinking even further, the trigonometric and logarithmic functions are really no different, except that the "symbol" requires several alphabetic characters. Keep in mind that most of the operations listed above are simply abbreviations for longer calculations that would otherwise use more than the one or two 4s allotted, as well as possibly other non-4 numbers. As long as the operation is common, exists outside **The Four Fours Game**, and conforms to the rules and caveats stated above, there is no particular reason it should be excluded.

Conversely, $.\overline{\sqrt{4}} = .\overline{2}$ (and similar) use non-standard mathematical syntax and thus are not allowed. In addition, unlike David Wheeler, I don't allow $sq(\ )$ for squaring a number because it appears to be a non-standard operator (I have only seen it used in computer programming). In

addition, I also don't allow the binary logical operators in Wheeler's "impurity levels" 7 and 8 because they rely on manipulating the digits of binary equivalents to base-ten integers. I am not an expert in the binary logical operators, but I suspect they can also be used to trivialize **The Four Fours Game** in a manner similar to the log+square root tricks shown above.

## USEFUL TABLES

In developing solutions for **The Four Fours Game**, I have found it very useful to refer to tables of values for different operations and functions. Since it is possible to construct many integers with just one 4 and huge quantities of integers with two and three 4s, scanning tables of values for matches with these partial solutions can aid in the development of complete solutions.[12]

I have made various tables of values using Microsoft Excel and include several examples here based on these tables. You are encouraged to make your own tables because, to be truly useful, these tables need to extend well beyond what is possible to show on 8½" × 11" paper. These tables aren't hard to build, especially if you know how to work with the $ operator and/or array functions. Two advantages to electronic tables are automating the calculations and the ability to use the search function to find specific numbers.

The first part of this section includes several tables of operations and functions, including multiplication, prime factors, powers, and the Summation, Factorial, Gamma, Double Factorial, Combination, and Permutation Functions, and the inverse of the Beta Function. Because all values for the Beta Function are less than or equal to 1, by using it as a divisor it actually works as a multiplier for the numerator. For this reason, I prefer to search for the inverse (reciprocal) of the Beta Function in concert with a multiplication table. Excel doesn't appear to have the Gamma Function, so it is necessary to use the Factorial function and the alternative definition for the Beta Function.

The second and third parts of this section include tables containing numerous partial solutions containing one or two 4s. These tables are representative, not exhaustive. Partial solutions are useful for targeting regions of the whole number domain to investigate and as building blocks for complete solutions. If you need to "waste" a 4 for a solution, all one-4 solutions can be turned into two-4 solutions and so on.

One final hint for **The Four Fours Game** aficionado: look for "families" of solutions. Consider the following related solutions:

$$\frac{4+4\mp .4}{.4}=\begin{bmatrix}19\\21\end{bmatrix} \qquad \frac{4+4\mp .4}{4\%}=\begin{bmatrix}190\\210\end{bmatrix} \qquad \frac{4+4\mp .4}{.4\%}=\begin{bmatrix}1900\\2100\end{bmatrix}$$

$$\frac{4+4\mp 4\%}{4\%}=\begin{bmatrix}199\\201\end{bmatrix} \qquad \frac{4+4\mp 4\%}{.4\%}=\begin{bmatrix}1990\\2010\end{bmatrix}$$

Now, change one or both 4s to 4!, 4!!, $\Gamma(4)$, 44, or some other one- or two-4 solution and/or change $.4$ to $.\overline{4}$ or $.4\%$ to $.\overline{4}\%$, etc., and/or change the $\mp$[13] to $\times$ and you will discover a nearly endless bounty of additional solutions. Now, apply similar changes to solutions with different configurations, and you will have solved the entire whole number domain without any tricks. ☺

[12] For example, the square root solutions for the larger integers in the 1–100 range.
[13] I used $\mp$ instead of $\pm$ so that the operations visually correspond to the results, which have the smallest on top.

## *MISCELLANEOUS OPERATIONS AND FUNCTIONS*

### ❖ *Multiplication and Prime Factors*

The following table provides values for multiplication up to $12 \times 24$ and prime factors up to 24. I suggest making a multiplication table up to at least $30 \times 30$ (my Excel table is $500 \times 500$ and could be made even larger) and a table of prime factors up to at least 300.

| Prime Factors | $n$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | ⋯ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| 2 | **2** | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | |
| 3 | **3** | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | |
| $2^2$ | **4** | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | |
| 5 | **5** | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | |
| $2 \cdot 3$ | **6** | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 | |
| 7 | **7** | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 | |
| $2^3$ | **8** | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | |
| $3^2$ | **9** | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 | |
| $2 \cdot 5$ | **10** | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | |
| 11 | **11** | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 121 | 132 | |
| $2^2 \cdot 3$ | **12** | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 | |
| 13 | **13** | 13 | 26 | 39 | 52 | 65 | 78 | 91 | 104 | 117 | 130 | 143 | 156 | |
| $2 \cdot 7$ | **14** | 14 | 28 | 42 | 56 | 70 | 84 | 98 | 112 | 126 | 140 | 154 | 168 | |
| $3 \cdot 5$ | **15** | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 | |
| $2^4$ | **16** | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 144 | 160 | 176 | 192 | |
| 17 | **17** | 17 | 34 | 51 | 68 | 85 | 102 | 119 | 136 | 153 | 170 | 187 | 204 | |
| $2 \cdot 3^2$ | **18** | 18 | 36 | 54 | 72 | 90 | 108 | 126 | 144 | 162 | 180 | 198 | 216 | |
| 19 | **19** | 19 | 38 | 57 | 76 | 95 | 114 | 133 | 152 | 171 | 190 | 209 | 228 | |
| $2^2 \cdot 5$ | **20** | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | |
| $3 \cdot 7$ | **21** | 21 | 42 | 63 | 84 | 105 | 126 | 147 | 168 | 189 | 210 | 231 | 252 | |
| $2 \cdot 11$ | **22** | 22 | 44 | 66 | 88 | 110 | 132 | 154 | 176 | 198 | 220 | 242 | 264 | |
| 23 | **23** | 23 | 46 | 69 | 92 | 115 | 138 | 161 | 184 | 207 | 230 | 253 | 276 | |
| $2^3 \cdot 3$ | **24** | 24 | 48 | 72 | 96 | 120 | 144 | 168 | 192 | 216 | 240 | 264 | 288 | |
| | ⋮ | | | | | | | | | | | | | ⋱ |

### ❖ *Powers and the Summation, Factorial, Gamma, and Double Factorial Functions*

The following table provides values for integer powers up to 4 and the Summation, Factorial, Gamma, and Double Factorial Functions, all for $n$ from 1 to 24. The largest values are presented in calculator-style scientific notation. Summations and squares for $n > 24$ also prove to be especially useful (my Excel table goes to 300). The larger values for the other functions are generally not useful for generating solutions for small integers, though there are exceptions.[14]

[14] For example, the two-4 solution for 64 based on $4^{24}$.

| $n$ | $n^2$ | $n^3$ | $n^4$ | $\Sigma(n)$ | $n!$ | $\Gamma(n)$ | $n!!$ |
|---|---|---|---|---|---|---|---|
| **1** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **2** | 4 | 8 | 16 | 3 | 2 | 1 | 2 |
| **3** | 9 | 27 | 81 | 6 | 6 | 2 | 3 |
| **4** | 16 | 64 | 256 | 10 | 24 | 6 | 8 |
| **5** | 25 | 125 | 625 | 15 | 120 | 24 | 15 |
| **6** | 36 | 216 | 1,296 | 21 | 720 | 120 | 48 |
| **7** | 49 | 343 | 2,401 | 28 | 5,040 | 720 | 105 |
| **8** | 64 | 512 | 4,096 | 36 | 40,320 | 5,040 | 384 |
| **9** | 81 | 729 | 6,561 | 45 | 362,880 | 40,320 | 945 |
| **10** | 100 | 1,000 | 10,000 | 55 | 3,628,800 | 362,880 | 3,840 |
| **11** | 121 | 1,331 | 14,641 | 66 | 39,916,800 | 3,628,800 | 10,395 |
| **12** | 144 | 1,728 | 20,736 | 78 | 479,001,600 | 39,916,800 | 46,080 |
| **13** | 169 | 2,197 | 28,561 | 91 | 6.227E09 | 479,001,600 | 135,135 |
| **14** | 196 | 2,744 | 38,416 | 105 | 8.718E10 | 6.227E09 | 645,120 |
| **15** | 225 | 3,375 | 50,625 | 120 | 1.308E12 | 8.718E10 | 2,027,025 |
| **16** | 256 | 4,096 | 65,536 | 136 | 2.092E13 | 1.308E12 | 10,321,920 |
| **17** | 289 | 4,913 | 83,521 | 153 | 3.557E14 | 2.092E13 | 34,459,425 |
| **18** | 324 | 5,832 | 104,976 | 171 | 6.402E15 | 3.557E14 | 185,794,560 |
| **19** | 361 | 6,859 | 130,321 | 190 | 1.216E17 | 6.402E15 | 654,729,075 |
| **20** | 400 | 8,000 | 160,000 | 210 | 2.433E18 | 1.216E17 | 3.716E09 |
| **21** | 441 | 9,261 | 194,481 | 231 | 5.109E19 | 2.433E18 | 1.375E10 |
| **22** | 484 | 10,648 | 234,256 | 253 | 1.124E21 | 5.109E19 | 8.175E10 |
| **23** | 529 | 12,167 | 279,841 | 276 | 2.585E22 | 1.124E21 | 3.162E11 |
| **24** | 576 | 13,824 | 331,776 | 300 | 6.204E23 | 2.585E22 | 1.635E12 |
| ⋮ | | | | | | | |

### ❖ *Combination Function*

The following table provides the number of combinations up to $n = 12$ and $k = 8$. I suggest making a table for at least $n = 20$. My Excel table goes to $n = 36$ by $k = 36$. The Combination Function is symmetrical about $k = n/2$.

| $n$ / $k$ | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | ⋯ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| **2** | – | 1 | 3 | 6 | 10 | 15 | 21 | 28 | 36 | 45 | 55 | 66 | |
| **3** | – | – | 1 | 4 | 10 | 20 | 35 | 56 | 84 | 120 | 165 | 220 | |
| **4** | – | – | – | 1 | 5 | 15 | 35 | 70 | 126 | 210 | 330 | 495 | |
| **5** | – | – | – | – | 1 | 6 | 21 | 56 | 126 | 252 | 462 | 792 | |
| **6** | – | – | – | – | – | 1 | 7 | 28 | 84 | 210 | 462 | 924 | |
| **7** | – | – | – | – | – | – | 1 | 8 | 36 | 120 | 330 | 792 | |
| **8** | – | – | – | – | – | – | – | 1 | 9 | 45 | 165 | 495 | |
| ⋮ | | | | | | | | | | | | | ⋱ |

### ❖ *Permutation Function*

The following table provides the number of permutations up to $n = 12$ and $k = 8$, but only for values less than 100,000 (to save space, larger values are denoted with "+++"). I suggest making a table for at least $n = 20$. My Excel table goes to $n = 36$ by $k = 12$. However, the results for $k \geq 8$ are so large that I haven't found a use for them…yet. Unlike the Combination Function, the Permutation Function is not symmetrical.

| $n$ / $k$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | … |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| **2** | – | 2 | 6 | 12 | 20 | 30 | 42 | 56 | 72 | 90 | 110 | 132 | |
| **3** | – | – | 6 | 24 | 60 | 120 | 210 | 336 | 504 | 720 | 990 | 1,320 | |
| **4** | – | – | – | 24 | 120 | 360 | 840 | 1,680 | 3,024 | 5,040 | 7,920 | 11,880 | |
| **5** | – | – | – | – | 120 | 720 | 2,520 | 6,720 | 15,120 | 30,240 | 55,440 | 95,040 | |
| **6** | – | – | – | – | – | 720 | 5,040 | 20,160 | 60,480 | +++ | +++ | +++ | |
| **7** | – | – | – | – | – | – | 5,040 | 40,320 | +++ | +++ | +++ | +++ | |
| **8** | – | – | – | – | – | – | – | 40,320 | +++ | +++ | +++ | +++ | |
| ⋮ | | | | | | | | | | | | | ⋱ |

### ❖ *Inverse Beta Function*

The following table provides values for the inverse (reciprocal) of the Beta Function up to $x = 12$ and $y = 8$, but only for values less than 100,000 (to save space, larger values are denoted with "+++"). I suggest making a table for at least $x = 20$. My Excel table goes to $x = 36$ by $y = 12$. However, the results for $k \geq 8$ are so large that I haven't found a use for them…yet. The Beta Function and its inverse are symmetrical about $y = x/2$.

| $x$ / $y$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | … |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| **2** | 2 | 6 | 12 | 20 | 30 | 42 | 56 | 72 | 90 | 110 | 132 | 156 | |
| **3** | 3 | 12 | 30 | 60 | 105 | 168 | 252 | 360 | 495 | 660 | 858 | 1,092 | |
| **4** | 4 | 20 | 60 | 140 | 280 | 504 | 840 | 1,320 | 1,980 | 2,860 | 4,004 | 5,460 | |
| **5** | 5 | 30 | 105 | 280 | 630 | 1,260 | 2,310 | 3,960 | 6,435 | 10,010 | 15,015 | 21,840 | |
| **6** | 6 | 42 | 168 | 504 | 1,260 | 2,772 | 5,544 | 10,296 | 18,018 | 30,030 | 48,048 | 74,256 | |
| **7** | 7 | 56 | 252 | 840 | 2,310 | 5,544 | 12,012 | 24,024 | 45,045 | 80,080 | +++ | +++ | |
| **8** | 8 | 72 | 360 | 1,320 | 3,960 | 10,296 | 24,024 | 51,480 | +++ | +++ | +++ | +++ | |
| ⋮ | | | | | | | | | | | | | ⋱ |

I also suggest making (or finding) a table of useful trig and inverse trig values. For example, $atan(1) = asin(1/\sqrt{2}) = acos(1/\sqrt{2}) = 45$ and $asin(0.5) = acos\left(\sqrt{3/4}\right) = 30$, etc. Such tables can be found in *Schaum's Outline of Mathematical Handbook of Formulas and Tables* and *Engineering Mathematics Handbook*, by Jan J. Tuma.

## *Some Partial Solutions With One Four*

| Fraction | Decimal | Equation |
|---|---|---|
| $\frac{1}{25{,}000}$ | $0.00004$ | $.4\%\%$ |
| $\frac{1}{22{,}500}$ | $0.000044\bar{4}\cdots$ | $.\bar{4}\%\%$ |
| $\frac{1}{2500}$ | $0.0004$ | $4\%\%$ |
| $\frac{1}{250}$ | $0.004$ | $.4\%$ |
| $\frac{1}{225}$ | $0.0044\bar{4}\cdots$ | $.\bar{4}\%$ |
| $\frac{1}{150}$ | $0.0066\bar{6}\cdots$ | $\sqrt{.\bar{4}\%\%} = \left(\sqrt{.\bar{4}}\right)\%$ |
| $\frac{1}{100}$ | $0.01$ | $\left(\Gamma\left(\sqrt{4}\right)\right)\%$ |
| $\frac{1}{50}$ | $0.02$ | $\left(\sqrt{4}\right)\%$ |
| $\frac{3}{100}$ | $0.03$ | $\left(\Sigma\left(\sqrt{4}\right)\right)\%$ |
| $\frac{1}{25}$ | $0.04$ | $4\%$ |
| $\frac{3}{50}$ | $0.06$ | $\left(\Gamma(4)\right)\%$ |
| $\frac{1}{15}$ | $0.066\bar{6}\cdots$ | $\sqrt{.\bar{4}\%}$ |
| $\frac{1}{5}$ | $0.2$ | $\sqrt{4\%}$ |
| $\frac{6}{25}$ | $0.24$ | $(4!)\%$ |
| $\frac{2}{5}$ | $0.4$ | $.4$ |
| $\frac{4}{9}$ | $0.44\bar{4}\cdots$ | $.\bar{4}$ |
| $\frac{2}{3}$ | $0.66\bar{6}\cdots$ | $\sqrt{.\bar{4}}$ |
| ***My partial one-4 solutions (fractions)*** | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Integer | Equation |
|---|---|
| $1$ | $\Gamma\left(\sqrt{4}\right)$ |
| $2$ | $\sqrt{4}$ |
| $3$ | $\Sigma\left(\sqrt{4}\right)$ |
| $4$ | $4$ |
| $6$ | $\Gamma(4) = \Sigma\left(\Sigma\left(\sqrt{4}\right)\right)$ |
| $8$ | $4!!$ |
| $10$ | $\Sigma(4) = alog\left(\Gamma\left(\sqrt{4}\right)\right)$ |
| $21$ | $\Sigma\left(\Gamma(4)\right)$ |
| $24$ | $4!$ |
| $30$ | $acsc\left(\sqrt{4}\right)$ |
| $36$ | $\Sigma(4!!)$ |
| $45$ | $atan\left(\Gamma\left(\sqrt{4}\right)\right)$ |
| $48$ | $\left(\Gamma(4)\right)!!$ |
| $55$ | $\Sigma\left(\Sigma(4)\right)$ |
| $60$ | $asec\left(\sqrt{4}\right)$ |
| $90$ | $asin\left(\Gamma\left(\sqrt{4}\right)\right)$ |
| $100$ | $alog\left(\sqrt{4}\right)$ |
| $120$ | $\Gamma\left(\Gamma(4)\right)$ |
| $135$[15] | $atan\left(-\Gamma\left(\sqrt{4}\right)\right)$ |
| $231$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)$ |
| $300$ | $\Sigma(4!)$ |
| $384$ | $(4!!)!!$ |
| $465$ | $\Sigma\left(acsc\left(\sqrt{4}\right)\right)$ |
| $666$ | $\Sigma\left(\Sigma(4!!)\right)$ |

[15] The trig functions are cyclical; 135 is the first positive value for $atan(-1)$. I use the first positive value for all trig functions.

| Integer | Equation |
|---|---|
| 720 | $(\Gamma(4))!$ |
| 1,000 | $alog\left(\Sigma(\sqrt{4})\right)$ |
| 1,035 | $\Sigma\left(atan\left(\Gamma(\sqrt{4})\right)\right)$ |
| 1,176 | $\Sigma\left((\Gamma(4))!!\right)$ |
| 1,540 | $\Sigma\left(\Sigma(\Sigma(4))\right)$ |
| 1,830 | $\Sigma\left(asec(\sqrt{4})\right)$ |
| 3,840 | $(\Sigma(4))!!$ |
| 4,095 | $\Sigma\left(asin\left(\Gamma(\sqrt{4})\right)\right)$ |
| 5,040 | $\Gamma(4!!)$ |
| 5,050 | $\Sigma\left(alog(\sqrt{4})\right)$ |
| 7,260 | $\Sigma\left(\Gamma(\Gamma(4))\right)$ |
| 9,180 | $\Sigma\left(atan\left(-\Gamma(\sqrt{4})\right)\right)$ |
| 10,000 | $alog(4)$ |
| 26,796 | $\Sigma\left(\Sigma\left(\Sigma(\Gamma(4))\right)\right)$ |
| 40,320 | $(4!!)!$ |
| 45,150 | $\Sigma(\Sigma(4!))$ |
| 73,920 | $\Sigma((4!!)!!)$ |
| ***My partial one-4 solutions (integers)*** | |
| | |
| | |
| | |
| | |
| | |
| | |

| Integer | Equation |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

***NOTES***

## *Some Partial Solutions With Two Fours*

The large number of one-4 solutions in the preceding tables (which, by the way, are not exhaustive) leads to an impossibly large number of two-4 solutions. Consequently, the following tables of two-4 solutions just scratch the surface. However, I *was* able to make nearly all of the integers from 1 to 100 with just two 4s. I also paid special attention to creating odd numbers, which are often harder to come by than even numbers. With two exceptions, this table ends at 10,000; it will be extended in the future.

Suggestions for making additional two-4 solutions by combining two one-4 solutions from the preceding tables include:

- Combine integers and fractions in various ways. I have provided several examples using 4 as the integer. The results should be useful for multiplying and dividing with other numbers to make complete solutions.
- Combine two fractions in various ways. I have provided more than a dozen examples. These should be useful as divisors for making complete solutions.

| Fraction | Decimal | Equation |
|---|---|---|
| $\frac{1}{2{,}500}$ | $0.0004$ | $\left(\left(\sqrt{4}\right)\%\right)^{\sqrt{4}}$ |
| $\frac{1}{1{,}000}$ | $0.001$ | $\frac{\left(\Gamma\left(\sqrt{4}\right)\right)\%}{\Sigma(4)}$ |
| $\frac{1}{625}$ | $0.0016$ | $(4\%)(4\%)$ |
| $\frac{1}{500}$ | $0.002$ | $\frac{\left(\sqrt{4}\right)\%}{\Sigma(4)}$ |
| $\frac{1}{375}$ | $0.00266\overline{6}\cdots$ | $\sqrt{.\overline{4}\%} \times 4\%$ |
| $\frac{11}{2{,}500}$ | $0.0044$ | $.44\%$ |
| $\frac{1}{168}$ | $0.0059523\cdots$ | $B\left(\Sigma\left(\sqrt{4}\right), \Gamma(4)\right)$ |
| $\frac{1}{100}$ | $0.01$ | $\left(\frac{4}{4}\right)\%$ |
| $\frac{4}{250}$ | $0.016$ | $(.4)(4\%)$ |
| $\frac{1}{50}$ | $0.02$ | $\frac{4\%}{\sqrt{4}}$ |
| $\frac{2}{75}$ | $0.0266\overline{6}\cdots$ | $\sqrt{.\overline{4}\%} - 4\%$ |
| $\frac{17}{300}$ | $0.0566\overline{6}\cdots$ | $\sqrt{.\overline{4}\%} - \left(\Gamma\left(\sqrt{4}\right)\right)\%$ |
| $\frac{23}{300}$ | $0.0766\overline{6}\cdots$ | $\sqrt{.\overline{4}\%} + \left(\Gamma\left(\sqrt{4}\right)\right)\%$ |
| $\frac{1}{12}$ | $0.0833\overline{3}\cdots$ | $B\left(\sqrt{4}, \Sigma\left(\sqrt{4}\right)\right)$ |
| $\frac{8}{75}$ | $0.1066\overline{6}\cdots$ | $\sqrt{.\overline{4}\%} + 4\%$ |
| $\frac{4}{25}$ | $0.16$ | $(.4)(.4)$ |
| $\frac{16}{90} = \frac{8}{45}$ | $0.177\overline{7}\cdots$ | $(.4)(.\overline{4})$ |

| Fraction | Decimal | Equation |
|---|---|---|
| $\frac{16}{81}$ | $0.19753\cdots$ | $(.\overline{4})(.\overline{4})$ |
| $\frac{59}{250}$ | $0.236$ | $(4!)\% - .4\%$ |
| $\frac{61}{250}$ | $0.244$ | $(4!)\% + .4\%$ |
| $\frac{8}{30} = \frac{4}{15}$ | $0.266\overline{6}\cdots$ | $.4 \times \sqrt{.\overline{4}}$ |
| $\frac{8}{27}$ | $0.296\overline{296}\cdots$ | $.\overline{4} \times \sqrt{.\overline{4}}$ |
| $\frac{391}{900}$ | $0.4344\overline{4}\cdots$ | $.\overline{4} - \left(\Gamma\left(\sqrt{4}\right)\right)\%$ |
| $\frac{11}{25}$ | $0.44$ | $.44$ |
| $\frac{409}{900}$ | $0.4544\overline{4}\cdots$ | $.\overline{4} + \left(\Gamma\left(\sqrt{4}\right)\right)\%$ |
| $\frac{1}{2}$ | $0.5$ | $sin\left(\sqrt{4 \div .\overline{4}\%}\right)$ |
| $\frac{154}{225}$ | $0.6844\overline{4}\cdots$ | $(4!)\% + .\overline{4}$ |
| $\frac{38}{45}$ | $0.844\overline{4}\cdots$ | $.4 + .\overline{4}$ |
| $\frac{8}{9}$ | $0.88\overline{8}\cdots$ | $.\overline{4} + .\overline{4}$ |
| ***Examples of fractions > 1 (based on 4)*** | | |
| $\frac{8}{5}$ | $1.6$ | $4 \times .4$ |
| $\frac{16}{9}$ | $1.77\overline{7}\cdots$ | $4 \times .\overline{4}$ |
| $\frac{8}{3}$ | $2.66\overline{6}\cdots$ | $4 \times \sqrt{.\overline{4}}$ |
| $\frac{10}{3}$ | $3.33\overline{3}\cdots$ | $4 - \sqrt{.\overline{4}}$ |
| $\frac{32}{9}$ | $3.55\overline{5}\cdots$ | $4 - .\overline{4}$ |
| $\frac{18}{5}$ | $3.6$ | $4 - .4$ |

| Fraction | Decimal | Equation |
|---|---|---|
| $\frac{99}{25}$ | $3.96$ | $4-4\%$ |
| $\frac{101}{25}$ | $4.04$ | $4+4\%$ |
| $\frac{22}{5}$ | $4.4$ | $4.4$ |
| $\frac{40}{9}$ | $4.44\overline{4}\cdots$ | $4.\overline{4}$ |
| $\frac{14}{3}$ | $4.66\overline{6}\cdots$ | $4+\sqrt{.\overline{4}}$ |
| $\frac{50}{3}$ | $16.66\overline{6}\cdots$ | $\frac{4}{(4!)\%}$ |
| $\frac{200}{3}$ | $66.66\overline{6}\cdots$ | $\frac{4}{\left(\Gamma(4)\right)\%}$ |
| $\frac{400}{3}$ | $133.33\overline{3}\cdots$ | $\frac{4}{\left(\Sigma\left(\sqrt{4}\right)\right)\%}$ |

***My partial two-4 solutions (fractions)***

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

| Fraction | Decimal | Equation |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

***NOTES***

| Integer | Equation |
|---|---|
| 1 | $\frac{4}{4}$ |
| 2 | $4-\sqrt{4}=\frac{4}{\sqrt{4}}$ |
| 3 | $\sqrt{\frac{4}{.\overline{4}}}=\frac{\Gamma(4)}{\sqrt{4}}$ |
| 4 | $\sqrt{4}+\sqrt{4}=\sqrt{4\times 4}$ |
| 5 | $\frac{\sqrt{4}}{.4}$ |
| 6 | $4+\sqrt{4}=\frac{4!}{4}$ |
| 7 | $4!!-\Gamma(\sqrt{4})$ |
| 8 | $4+4$ |
| 9 | $\frac{4}{.\overline{4}}=4!!+\Gamma(\sqrt{4})$ |
| 10 | $\frac{4}{.4}=\Gamma(4)+4$ |
| 11 | $4!!+\Sigma(\sqrt{4})$ |
| 12 | $\frac{4!}{\sqrt{4}}=4\times\Sigma(\sqrt{4})=4!!+4$ |
| 13 | $\Sigma(4)+\Sigma(\sqrt{4})$ |
| 14 | $\Sigma(4)+4$ |
| 15 | $\Sigma\left(\frac{\sqrt{4}}{.4}\right)=\left(\frac{\sqrt{4}}{.4}\right)!!$ |
| 16 | $4\times 4=4^{\sqrt{4}}$ |
| 17 | $\Sigma(\Gamma(4))-4$ |
| 18 | $\frac{4!!}{.\overline{4}}=\Sigma(4)+4!!$ |
| 19 | $\Sigma(\Gamma(4))-\sqrt{4}$ |
| 20 | $4!-4=\frac{4!!}{.4}$ |
| 21 | $4!-\Sigma(\sqrt{4})=\Sigma(4+\sqrt{4})$ |
| 22 | $4!-\sqrt{4}$ |

| Integer | Equation |
|---|---|
| 23 | $\Sigma(\Gamma(4))+\sqrt{4}$ |
| 24 | $(\sqrt{4}+\sqrt{4})!=4!!\cdot\Sigma(\sqrt{4})$ |
| 25 | $\frac{alog(\sqrt{4})}{4}=\Sigma(\Gamma(4))+4$ |
| 26 | $4!+\sqrt{4}$ |
| 27 | $4!+\Sigma(\sqrt{4})=\Sigma(\Gamma(4))+\Gamma(4)$ <br> $=\left(\Sigma(\sqrt{4})\right)^{\Sigma(\sqrt{4})}$ |
| 28 | $4!+4=\mathrm{C}(4!!,\sqrt{4})$ <br> $=\Sigma\left(4!!-\Gamma(\sqrt{4})\right)$ |
| 29 | $\Sigma(\Gamma(4))+4!!$ <br> $=acsc(\sqrt{4})-\Gamma(\sqrt{4})$ |
| 30 | $asin\left(\frac{\sqrt{4}}{4}\right)=\sqrt{\frac{4}{.\overline{4}\%}}$ |
| 31 | $\Sigma(\Gamma(4))+\Sigma(4)$ <br> $=acsc(\sqrt{4})+\Gamma(\sqrt{4})$ |
| 32 | $4!!\times 4=\sqrt[.4]{4}=4!+4!!$ |
| 33 | $acsc(\sqrt{4})+\Sigma(\sqrt{4})$ |
| 34 | $4!+\Sigma(4)=acsc(\sqrt{4})+4$ |
| 35 | $\Sigma(4!!)-\Gamma(\sqrt{4})$ |
| 36 | $\frac{4!}{\sqrt{.\overline{4}}}=\Sigma(4+4)=\left(\Gamma(4)\right)^{\sqrt{4}}$ |
| 37 | $\Sigma(4!!)+\Gamma(\sqrt{4})$ |
| 38 | $\Sigma(4!!)+\sqrt{4}$ |
| 39 | $\Sigma(4!!)+\Sigma(\sqrt{4})$ |
| 40 | $\Sigma(4!!)+4=\sqrt{\frac{(4!!)!!}{(4!)\%}}$ <br> $=(\Gamma(4))!!-4!!$ <br> $=.4\%\cdot alog(4)$ <br> $=4\cdot alog(\Gamma\sqrt{4})$ |

| Integer | Equation |
|---|---|
| 41 | $atan\left(\Gamma\left(\sqrt{4}\right)\right) - 4$ |
| 42 | $\Sigma(4!!) + \Gamma(4)$ $= atan\left(\Gamma\left(\sqrt{4}\right)\right) - \Sigma\left(\sqrt{4}\right)$ |
| 43 | $atan\left(\Gamma\left(\sqrt{4}\right)\right) - \sqrt{4}$ |
| 44 | $44$ |
| 45 | $atan\left(\frac{4}{4}\right) = \Sigma\left(\frac{4}{.\overline{4}}\right)$ |
| 46 | $atan\left(\Gamma\left(\sqrt{4}\right)\right) + \Gamma\left(\sqrt{4}\right)$ |
| 47 | $atan\left(\Gamma\left(\sqrt{4}\right)\right) + \sqrt{4}$ |
| 48 | $4! + 4! = 4!! \cdot \Gamma(4)$ |
| 49 | $atan\left(\Gamma\left(\sqrt{4}\right)\right) + 4$ |
| 50 | $\frac{\sqrt{4}}{4\%} = \frac{alog\left(\sqrt{4}\right)}{\sqrt{4}}$ |
| 51 | $\Sigma\left(\Sigma(4)\right) - 4$ |
| 52 | $\left(\Gamma(4)\right)!! + 4$ $= asec\left(\sqrt{4}\right) - 4!!$ |
| 53 | $\Sigma\left(\Sigma(4)\right) - \sqrt{4}$ |
| 54 | $\frac{4!}{.\overline{4}}$ |
| 55 | $\Sigma\left(\frac{4}{.4}\right) = \Sigma\left(\Sigma\left(\sqrt{4 \cdot 4}\right)\right)$ |
| 56 | $\left(\Gamma(4)\right)!! + 4!! = \frac{(4!!)!}{\left(\Gamma(4)\right)!}$ $= C\left(4!!, \Sigma\left(\sqrt{4}\right)\right)$ |
| 57 | $\Sigma\left(\Sigma(4)\right) + \sqrt{4}$ |
| 58 | $\left(\Gamma(4)\right)!! + \Sigma(4)$ $= asec\left(\sqrt{4}\right) - \sqrt{4}$ |
| 59 | $\Sigma\left(\Sigma(4)\right) + 4$ |
| 60 | $\frac{4!}{.4}$ |

| Integer | Equation |
|---|---|
| 61 | $asec\left(\sqrt{4}\right) + \Gamma\left(\sqrt{4}\right)$ |
| 62 | $asec\left(\sqrt{4}\right) + \sqrt{4}$ |
| 63 | $asec\left(\sqrt{4}\right) + \Sigma\left(\sqrt{4}\right)$ |
| 64 | $\sqrt{\sqrt{\sqrt{4^{4!}}}} = 4^{\Sigma\left(\sqrt{4}\right)} = \frac{(4!!)!!}{\Gamma(4)}$ |
| 65 | $\Sigma\left(\Sigma(4)\right) + \Sigma(4)$ |
| 66 | $\Sigma\left(4!! + \Sigma\left(\sqrt{4}\right)\right)$ |
| 67 | |
| 68 | $asec\left(\sqrt{4}\right) + 4!!$ |
| 69 | $atan\left(\Gamma\left(\sqrt{4}\right)\right) + 4!$ |
| 70 | $C(4!!, 4)$ |
| 71 | |
| 72 | $\left(\Gamma(4)\right)!! + 4! = \Sigma(4!!) \cdot \sqrt{4}$ |
| 73 | |
| 74 | |
| 75 | $\Sigma\left(\sqrt{4}\right) \div 4\%$ |
| 76 | $\Sigma\left(\Sigma(4)\right) + \Sigma\left(\Gamma(4)\right)$ |
| 77 | |
| 78 | $\Sigma\left(\frac{4!}{\sqrt{4}}\right)$ |
| 79 | $\Sigma\left(\Sigma(4)\right) + 4!$ |
| 80 | $\Sigma(4) \times 4!!$ |
| 81 | $\left(\Sigma\left(\sqrt{4}\right)\right)^4$ |
| 82 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) - 4!!$ |
| 83 | |
| 84 | $\Sigma\left(\Gamma(4)\right) \times 4$ |
| 85 | $\Sigma\left(\Sigma(4)\right) + acsc\left(\sqrt{4}\right)$ |
| 86 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) - 4$ |

| Integer | Equation |
|---|---|
| 87 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) - \Sigma\left(\sqrt{4}\right)$ |
| 88 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) - \sqrt{4}$ |
| 89 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) - \Gamma\left(\sqrt{4}\right)$ |
| 90 | $\frac{.4}{.\overline{4}\%} = asin\left(\frac{4}{4}\right)$ |
| 91 | $\Sigma\left(\Sigma(4) + \Sigma\left(\sqrt{4}\right)\right)$ $= asin\left(\Gamma\left(\sqrt{4}\right)\right) + \Gamma\left(\sqrt{4}\right)$ |
| 92 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) + \sqrt{4}$ |
| 93 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) + \Sigma\left(\sqrt{4}\right)$ |
| 94 | $asin\left(\Gamma\left(\sqrt{4}\right)\right) + 4$ |
| 95 | |
| 96 | $4! \times 4$ |
| 97 | $alog\left(\sqrt{4}\right) - \Sigma\left(\sqrt{4}\right)$ |
| 98 | $alog\left(\sqrt{4}\right) - \sqrt{4}$ |
| 99 | $alog\left(\sqrt{4}\right) - \Gamma\left(\sqrt{4}\right)$ |
| 100 | $\frac{4}{4\%} = alog\left(\frac{4}{\sqrt{4}}\right) = \left(\Sigma(4)\right)^{\sqrt{4}}$ |
| 105 | $\frac{(4!!)!}{(4!!)!!} = \left(4!! - \Gamma\left(\sqrt{4}\right)\right)!!$ $= \Sigma(\Sigma(4) + 4)$ |
| 111 | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - \Gamma\left(\Gamma(4)\right)$ |
| 112 | $\frac{\Gamma(4!!)}{atan\left(\Gamma\left(\sqrt{4}\right)\right)}$ |
| 120 | $\left(\frac{\sqrt{4}}{.4}\right)! = \Sigma\left(\left(\frac{\sqrt{4}}{.4}\right)!!\right)$ |
| 131 | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - alog\left(\sqrt{4}\right)$ |
| 135 | $atan\left(-\frac{4}{4}\right)$ |
| 136 | $\Sigma(4 \times 4)$ |

| Integer | Equation |
|---|---|
| 141 | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - asin\left(\Gamma\left(\sqrt{4}\right)\right)$ |
| 144 | $4! \times \Gamma(4) = \Sigma(4!!) \times 4$ $= \left(\Gamma(4)\right)!! \times \Sigma\left(\sqrt{4}\right)$ |
| 150 | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}$ |
| 153 | $(4!!)!! - \Sigma\left(\Sigma\left(\Gamma(4)\right)\right)$ |
| 154 | $\sqrt{.\overline{4}} \times \Sigma\left(\Sigma\left(\Gamma(4)\right)\right)$ |
| 165 | $\Sigma\left(\Sigma(4)\right) \times \Sigma\left(\sqrt{4}\right)$ |
| 168 | $\Sigma\left(\Gamma(4)\right) \times 4!!$ |
| 171 | $\Sigma(\Sigma(4) + 4!!)$ |
| 180 | $4 \cdot atan\left(\Gamma\left(\sqrt{4}\right)\right)$ |
| 183 | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - \left(\Gamma(4)\right)!!$ |
| 195 | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - \Sigma(4!!)$ |
| 200 | $\frac{4!!}{4\%} = \sqrt{4} \cdot alog\left(\sqrt{4}\right)$ |
| 201 | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - acsc\left(\sqrt{4}\right)$ |
| 207 | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - 4!$ |
| 210 | $\Sigma(4! - 4) = \frac{\Gamma(4!!)}{4!}$ $= C\left(alog\left(\Gamma\left(\sqrt{4}\right)\right), 4\right)$ |
| 216 | $\left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)}$ |
| 220 | $4 \times \Sigma\left(\Sigma(4)\right)$ |
| 231 | $\Sigma\left(\Sigma\left(4 + \sqrt{4}\right)\right)$ |
| 240 | $4! \times \Sigma(4)$ |
| 249 | $(4!!)!! - atan\left(-\Gamma\left(\sqrt{4}\right)\right)$ |
| 256 | $4^4$ |
| 270 | $\frac{\Gamma\left(\Gamma(4)\right)}{.\overline{4}}$ |

| Integer | Equation |
|---|---|
| 276 | $C\left(4!,\sqrt{4}\right)$ |
| 296 | $.\overline{4}\times\Sigma\left(\Sigma(4!!)\right)$ |
| 329 | $(4!!)!!-\Sigma\left(\Sigma(4)\right)$ |
| 300 | $\frac{\Gamma\left(\Gamma(4)\right)}{.4}$ |
| 330 | $\Sigma\left(\Sigma(4)\right)\times\Gamma(4)$ |
| 336 | $\frac{(4!!)!}{\Gamma\left(\Gamma(4)\right)}=P\left(4!!,\Sigma\left(\sqrt{4}\right)\right)$ |
| 339 | $(4!!)!!-atan\left(\Gamma\left(\sqrt{4}\right)\right)$ |
| 345 | $\Sigma\left(acsc\left(\sqrt{4}\right)\right)-\Gamma\left(\Gamma(4)\right)$ |
| 360 | $asec\left(\sqrt{4}\right)\times\Gamma(4)$ $=P(\Gamma(4),4)$ |
| 384 | $(4+4)!!$ |
| 435 | $C\left(acsc\left(\sqrt{4}\right),\sqrt{4}\right)$ |
| 441 | $\left(\Sigma\left(\Gamma(4)\right)\right)^{\sqrt{4}}$ |
| 444 | $\sqrt{.\overline{4}}\times\Sigma\left(\Sigma(4!!)\right)$ |
| 450 | $\frac{\sqrt{4}}{.\overline{4}\%}$ |
| 462 | $\sqrt{4}\times\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)$ |
| 500 | $\frac{\sqrt{4}}{.4\%}$ |
| 504 | $4!\times\Sigma\left(\Gamma(4)\right)$ |
| 512 | $(4!!)^{\Sigma\left(\sqrt{4}\right)}$ |
| 552 | $P\left(4!,\sqrt{4}\right)$ |
| 576 | $(4!)^{\sqrt{4}}$ |
| 600 | $\frac{4!}{4\%}$ |
| 630 | $acsc\left(\sqrt{4}\right)\times\Sigma\left(\Gamma(4)\right)$ |
| 675 | $\frac{\Sigma\left(\sqrt{4}\right)}{.\overline{4}\%}$ |

| Integer | Equation |
|---|---|
| 693 | $\Sigma\left(\sqrt{4}\right)\times\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)$ |
| 720 | $\left(\frac{4!}{4}\right)!$ |
| 729 | $\left(\Sigma\left(\sqrt{4}\right)\right)^{\Gamma(4)}$ |
| 750 | $\frac{\Sigma\left(\sqrt{4}\right)}{.4\%}$ |
| 756 | $\Sigma(4!!)\times\Sigma\left(\Gamma(4)\right)$ |
| 870 | $P\left(acsc\left(\sqrt{4}\right),\sqrt{4}\right)$ |
| 896 | $\frac{(4!!)!}{atan\left(\Gamma\left(\sqrt{4}\right)\right)}$ |
| 900 | $\frac{4}{.\overline{4}\%}$ |
| 924 | $4\times\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)$ |
| 945 | $\left(\frac{4}{.\overline{4}}\right)!!$ |
| 990 | $\Sigma(44)$ |
| 999 | $\frac{\Sigma\left(\Sigma(4!!)\right)}{\sqrt{.\overline{4}}}$ |
| 1,000 | $\frac{4}{.4\%}$ |
| 1,008 | $\left(\Gamma(4)\right)!!\times\Sigma\left(\Gamma(4)\right)$ |
| 1,024 | $\sqrt[\sqrt{4}\%]{4}=\left(\sqrt{4}\right)^{\Sigma(4)}$ |
| 1,080 | $\frac{\left(\Gamma(4)\right)!}{\sqrt{.\overline{4}}}$ |
| 1,155 | $\Sigma\left(\Sigma(4)\right)\times\Sigma\left(\Gamma(4)\right)$ |
| 1,260 | $asec\left(\sqrt{4}\right)\times\Sigma\left(\Gamma(4)\right)$ |
| 1,296 | $\left(\Gamma(4)\right)^{4}$ |
| 1,330 | $C\left(\Sigma\left(\Gamma(4)\right),\Sigma\left(\sqrt{4}\right)\right)$ |
| 1,350 | $\frac{\Gamma(4)}{.\overline{4}\%}$ |

| Integer | Equation |
|---|---|
| 1,500 | $\frac{\Gamma(4)}{.4\%}$ |
| 1,620 | $\frac{(\Gamma(4))!}{.\overline{4}}$ |
| 1,680 | $P(4!!,4)$ |
| 1,800 | $\frac{4!!}{.\overline{4}\%}$ |
| 2,000 | $\frac{4!!}{.4\%}$ |
| 2,024 | $C\left(4!,\Sigma\left(\sqrt{4}\right)\right)$ |
| 2,025 | $\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)\right)^{\sqrt{4}}$ |
| 2,250 | $\frac{\Sigma(4)}{.\overline{4}\%}$ |
| 2,304 | $\left((\Gamma(4))!!\right)^{\sqrt{4}}$ |
| 2,500 | $\frac{\Sigma(4)}{.4\%}$ |
| 2,640 | $\Sigma(\Sigma(4)) \times (\Gamma(4))!!$ |
| 2,880 | $4 \times (\Gamma(4))!$ |
| 3,025 | $\left(\Sigma(\Sigma(4))\right)^{\sqrt{4}}$ |
| 3,600 | $\left(asec\left(\sqrt{4}\right)\right)^{\sqrt{4}}$ |
| 3,840 | $\left(\frac{4}{.4}\right)!!$ |
| 4,096 | $(4!!)^4 = 4^{\Gamma(4)} = \sqrt{\sqrt{4^{4!}}}$ |
| 5,400 | $\frac{4!}{.\overline{4}\%}$ |
| 5,985 | $C(\Sigma(\Gamma(4)),4)$ |
| 6,000 | $\frac{4!}{.4\%}$ |
| 6,561 | $\left(\Sigma\left(\sqrt{4}\right)\right)^{4!!}$ |
| 7,776 | $\sqrt[.4]{\Sigma(4!!)}$ |

| Integer | Equation |
|---|---|
| 7,980 | $P\left(\Sigma(\Gamma(4)),\Sigma\left(\sqrt{4}\right)\right)$ |
| 8,100 | $\left(asin\left(\Gamma\left(\sqrt{4}\right)\right)\right)^{\sqrt{4}}$ |
| 9,000 | $\frac{.4}{.\overline{4}\%\%}$ |
| 9,261 | $\left(\Sigma(\Gamma(4))\right)^{\Sigma(\sqrt{4})}$ |
| 10,000 | $alog(4) = \left(\Sigma(4)\right)^4$ |
| 10,395 | $\left(4!! + \Sigma\left(\sqrt{4}\right)\right)!!$ |
| 46,080 | $(4!! + 4)!!$ |
| ***My partial two-4 solutions (integers)*** | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| Integer | Equation |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| Integer | Equation |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| Integer | Equation |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| Integer | Equation |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

***NOTES***

## REFERENCES

There are many websites devoted to **The Four Fours Game**. The following list is representative, not exhaustive. The sites with the most solutions are bolded.


Bogomolny, Alexander — *Representation of numbers with four 4's*
http://www.cut-the-knot.org/arithmetic/funny/4_4.shtml

**Bourke, Paul — *Four Fours Problem***
**http://paulbourke.net/fun/4444/**

Carver, Ruth — *Four 4's Puzzle*
http://mathforum.org/ruth/four4s.puzzle.html

Forman, Ben — *The Four 4's Project*
https://docs.google.com/viewer?a=v&q=cache:21s6joFz2loJ:s89940423.onlinehome.us/images/6/61/The_Four_4%25E2%2580%2599s_Project.doc+four+4's+solutions&hl=en&gl=us&pid=bl&srcid=ADGEESj8O-EA0wxXsn3puBqewGqwkJHGv0KPPeQdrq1pV3MPZEN2myWrma3Pcr7xP8COFEHAuXkVFfeIP0nRBKsPLPiliNu5P39WzVV4FzQo5T81y2zVQNRg7R6LrHfPbMDF1ZzEms8P&sig=AHIEtbTRpcGxfJaBDi0GPwTk8uknFQad4A

Hammond, Nicholas — *Four Four's Problem*
http://home.comcast.net/~nicolas.hammond/fun/four_fours.html

Johansen, Carl — *The Four Fours*
http://www.carljohansen.co.uk/fourfours/

Marxen, Heiner — *The Year Puzzle*
http://www.drb.insel.de/~heiner/Puzzles/Year/R4444

MersenneForum.org — *Classic Problem: Four 4's*
http://www.mersenneforum.org/showthread.php?t=4756

SciMath Newsgroup — *Help With Four 4's*
http://www.math.niu.edu/~rusin/uses-math/games/krypto/4fours

**Wheeler, David A. — *The Definitive Four Fours Answer Key***
**http://www.dwheeler.com/fourfours/**

Wheels.org — *The Four Fours Problem*
http://wheels.org/math/44s.html

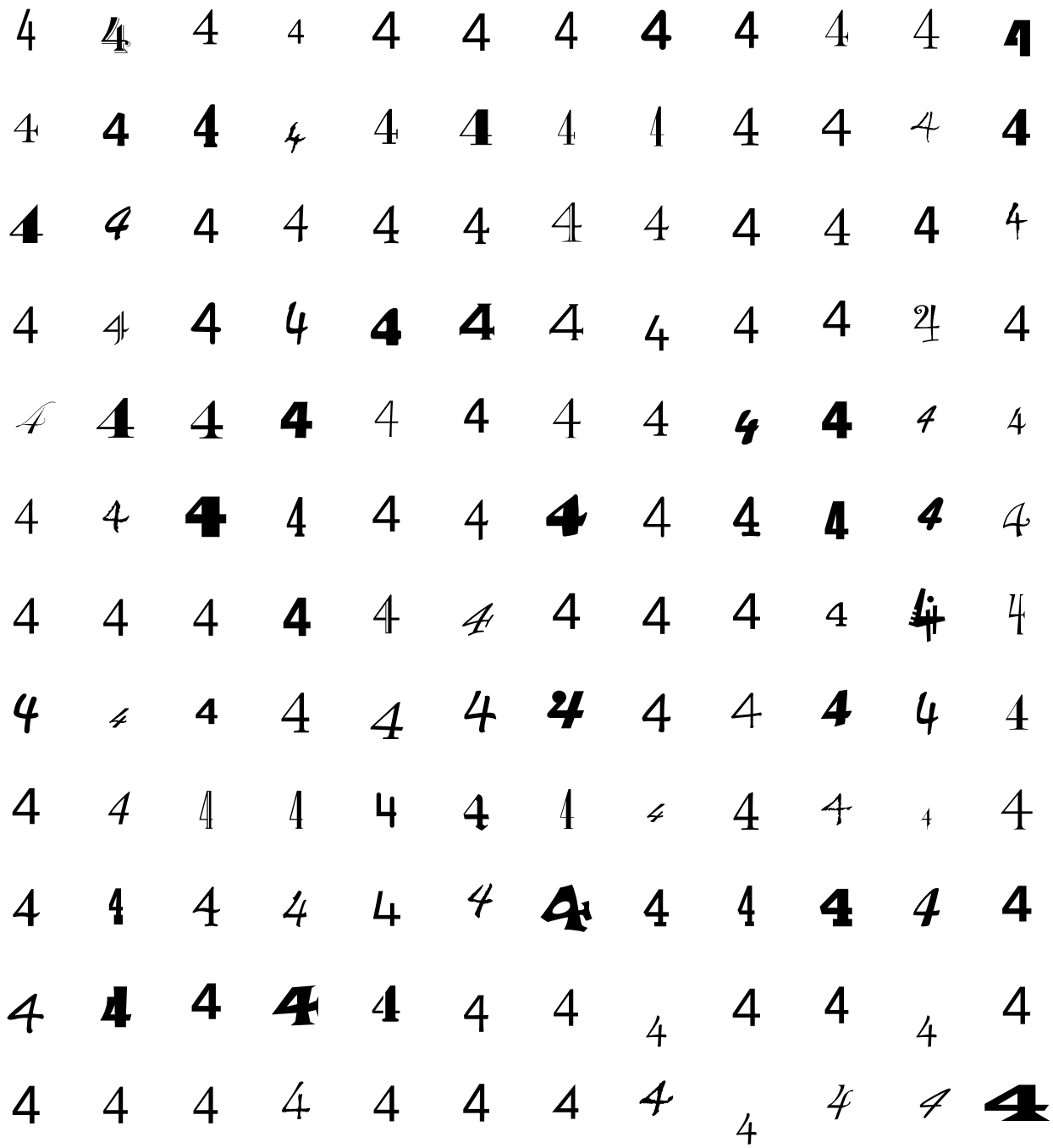
Wikipedia.org — *Four Fours*
http://en.wikipedia.org/wiki/Four_fours

**Valentine, John — *About Four Fours***
**http://johnvalentine.co.uk/fourfours.php**

**Wilson, Steven J. — Intergermania**
**http://www.milefoot.com/math/integermania/four4s-1.htm**

## PARTING SHOTS

Here are some extra 4's for you to use — $(4 + 4 + 4)^{\sqrt{4}}$ to be exact and in 4! pt size. Of course, if you don't have the same font catalog, your results will vary.



"May the fours be with you."

"Beware the dark side of the fours."

# SOLUTIONS

[NEARLY BLANK PAGE]

## SECTION I — SOLUTIONS 1–100

*Hang on, here goes…*[1]

| | | | |
|---|---|---|---|
| **1** | $\frac{44}{44}$ $= \sqrt{\frac{44}{44}}$ | $\frac{4}{.4} - \frac{4}{.\overline{4}}$ | $\frac{4+\sqrt{4}}{\left(\frac{4!}{4}\right)}$ |
| | $\frac{4^4}{4^4}$ | $4!! - 4 - \sqrt{4} - \Gamma\left(\sqrt{4}\right)$ | $4! + 4 - \Sigma\left(\Gamma(4)\right) - \Gamma(4)$ |
| | $\frac{4!! - 4}{\Gamma(4) - \sqrt{4}}$ | $\frac{\Sigma\left(\Sigma(4)\right) - \Sigma\left(\Gamma(4)\right)}{4! + \Sigma(4)}$ | $\frac{\sqrt{4} \cdot alog\left(\sqrt{4}\right) \cdot 4\%}{4!!}$ |
| **2** | $\frac{4}{4} + \frac{4}{4}$ | $\sqrt{4 + 4 - 4}$ | $4^{\left(\frac{4/4}{\sqrt{4}}\right)}$ |
| | $\frac{4!}{4+4+4}$ | $\frac{\sqrt{4}}{.4} - \sqrt{\frac{4}{.\overline{4}}}$ | $\sqrt{\frac{4}{.4} - \frac{4!}{4}}$ |
| | $\sqrt{4! + 4! - 44}$ | $\sqrt{\sqrt{\sqrt[4]{4^{(4+4)}}}}$ | $\frac{4! + 4}{\Sigma(4) + 4}$ |
| **3** | $4 + \frac{4}{4} - \sqrt{4}$ | $\sqrt{\sqrt{\left(\frac{4}{.\overline{4}}\right)\left(\frac{4}{.\overline{4}}\right)}}$ | $\frac{4!}{4 + \sqrt{4} + \sqrt{4}}$ |
| | $\frac{4! \times 4}{\sqrt[.4]{4}}$ | $\frac{\left(\Gamma(4)\right)!}{\sqrt{4} \times \left(\frac{\sqrt{4}}{.4}\right)!}$ | $\frac{\Sigma(\Sigma(4) + 4)}{\Sigma(4!!) - \Gamma\left(\sqrt{4}\right)}$ |
| **4** | $4 + 4 - \sqrt{4} - \sqrt{4}$ | $\sqrt{4 + 4 + 4 + 4}$ | $\frac{4!}{\sqrt{4} + \sqrt{4} + \sqrt{4}}$ |
| | $\left(\sqrt{4} + 4 - 4\right)^{\sqrt{4}}$ | $4! + 4! - 44$ | $\frac{44}{\Sigma(4) + \Gamma\left(\sqrt{4}\right)}$ |
| | $\frac{.4 \times (\Sigma(4!!) + 4)}{4}$ | $\sqrt{4! + \Sigma(4) + \sqrt{4}} - \sqrt{4}$ | $44 - \sqrt{\frac{(4!!)!!}{(4!)\%}}$ |
| | $\sqrt{\sqrt{\left(\Gamma(4)\right)^{\left(\Sigma\left(\sqrt{4}\right)\right)} + \Sigma(4!!) + 4}}$ | $\sqrt{\sqrt{\sqrt{\sqrt{(4 \times 4)^{(4+4)}}}}}$ | |

[1] The number of solutions provided for a particular integer most often reflects the amount of effort expended (or even dumb luck at stumbling across a solution) rather than the degree of difficulty. The solutions for 31, 33, 34, 36, and 38 that are flagged with *** are those solutions published in the Winter 1984 edition of *The Bent* (the quarterly magazine of Tau Beta Pi, the engineering honor society) that I had not independently developed.

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **4** (cont) | $\sqrt[4]{\frac{4!!^{\Sigma(\sqrt{4})}}{\sqrt{4}}}$ | $\frac{4!}{\sqrt{4}} - 4 - 4$ | $\frac{(4!!)!!}{\Gamma(4)} - \frac{4!}{.4}$ |
| | $\frac{4!!}{.4} - (4 \times 4)$ | $\frac{4!}{.4} \div \left(\frac{\sqrt{4}}{.4}\right)!!$ | $\frac{4}{4\%} - (4! \times 4)$ |
| | $\frac{(4!!)!}{alog(4) + (\Sigma(4) \times 4!!)}$ | $4^4 \div 4^{\Sigma(\sqrt{4})}$ | |
| | $\frac{(\Gamma(4))! - \Gamma(\Gamma(4)) - \Gamma(\Gamma(4))}{\Gamma(\Gamma(4))}$ | $\Sigma\left(alog(\sqrt{4})\right) - \Gamma(4!!) - 4 - \sqrt{4}$ | |
| **5** | $\sqrt{4} + \sqrt{4} + \frac{4}{4}$ | $\frac{4!}{4} - \frac{4}{4}$ | $\frac{4!}{4\%} \div \left(\frac{\sqrt{4}}{.4}\right)!$ |
| | $\sqrt{(\sqrt{4} + \sqrt{4})! + \frac{4}{4}}$ | $\frac{(4 \times 4) + 4}{4}$ | $\sqrt{\Sigma\left(\frac{\sqrt{4}}{.4}\right) + \frac{4}{.4}}$ |
| | $\frac{\sqrt{4}}{.4\%} \div \frac{4}{4\%}$ | | |
| **6** | $4 + 4 + \sqrt{4} - 4$ | $\frac{4 + 4 + 4}{\sqrt{4}}$ | $\frac{4!}{.4} - \frac{4!}{.\overline{4}}$ |
| | $\frac{4! \times \sqrt{4}}{4 + 4}$ | $\sqrt{4! + 4 + 4 + 4}$ | $\frac{acsc(\sqrt{4})}{4 + \frac{4}{4}}$ |
| | $\frac{4!}{4\%} \div \frac{4}{4\%}$ | $P(\Gamma(4), 4) \div \frac{4!}{.4}$ | |
| **7** | $4 + 4 - \frac{4}{4}$ | $\frac{4!}{4} + \frac{4}{4}$ | $\frac{4}{.\overline{4}} - 4 + \sqrt{4}$ |
| | $\sqrt{4! + 4! + \frac{4}{4}}$ | $\frac{\Sigma(\Gamma(4))}{4 - \frac{4}{4}}$ | $C(4!!, 4) \div \frac{.4}{4}$ |
| **8** | $4 + 4 + 4 - 4$ | $\sqrt{4} + \sqrt{4} + \sqrt{4} + \sqrt{4}$ | $(4 \times 4) - 4 - 4$ |
| | $\frac{4!}{4 - \frac{4}{4}}$ | $\frac{4! \times \sqrt{4}}{4 + \sqrt{4}}$ | $\sqrt{(4 \times 4!!) + \sqrt[.4]{4}}$ |
| | $\frac{(\Gamma(4))! + (\Sigma(4) \times 4!!)}{alog(\sqrt{4})}$ | $\frac{\Gamma(\Gamma(4))}{(4 \times 4) - \Gamma(\sqrt{4})}$ | $\frac{\frac{4!!}{4\%} - 4!!}{4!}$ |
| | $\frac{.4 \times \Sigma(4) \times 4!!}{4}$ | | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **9** | $4+4+\frac{4}{4}$ | $\frac{4!}{(.\overline{4})(4+\sqrt{4})}$ | $\frac{4!^{\sqrt{4}}}{\sqrt{\sqrt{\sqrt{4^{4!}}}}}$ |
| | $\sqrt{(\Sigma(4)\times 4!!)+\frac{4}{4}}$ | $\frac{4}{.\overline{4}}\times\frac{4}{4}$ | $\left(4-\frac{4}{4}\right)^{\sqrt{4}}$ |
| **10** | $4+4+4-\sqrt{4}$ | $4+\sqrt{4}+\sqrt{4}+\sqrt{4}$ | $4!-\frac{4}{.4}-4$ |
| | $\frac{4!}{(.4)(4+\sqrt{4})}$ | $\frac{4}{4\%}\div\frac{4}{.4}$ | $\sqrt{\left((4!+\sqrt{4})\times 4\right)-4}$ |
| | $\left(\frac{\sqrt{4}}{.4}\right)!\times B\left(\sqrt{4},\Sigma(\sqrt{4})\right)$ | | |
| **11** | $\frac{4}{.4}+\frac{4}{4}$ | $\frac{\sqrt{4}}{.4}+4+\sqrt{4}$ | $\frac{4!}{\sqrt{4}}-\frac{4}{4}$ |
| | $\sqrt{\left(\frac{\sqrt{4}}{.4}\right)!+\frac{4}{4}}$ | $4+4+\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{44}{\sqrt{4}+\sqrt{4}}$ |
| **12** | $4+4+\sqrt{4}+\sqrt{4}$ | $4\times\left(4-\frac{4}{4}\right)$ | $\frac{4!\times 4}{4+4}$ |
| | $\frac{4!^{\sqrt{4}}}{4!+4!}$ | $\sqrt{alog(\sqrt{4})+4!+4!-4}$ | $\sqrt{\sqrt{\left(4\times\Gamma(4!!)\right)+4!^{\sqrt{4}}}}$ |
| | $\left(4!!\cdot\Gamma(4)\right)-\Sigma(4+4)$ | $\Sigma\left(alog(\sqrt{4})\right)-\Gamma(4!!)+4-\sqrt{4}$ | |
| **13** | $\frac{44}{4}+\sqrt{4}$ | $4+4+\frac{\sqrt{4}}{.4}$ | $\frac{4}{.\overline{4}}+\sqrt{4}+\sqrt{4}$ |
| | $4!-\frac{44}{4}$ | $\frac{4}{.4}+\sqrt{\frac{4}{.\overline{4}}}$ | $atan\left(\frac{4}{4}\right)-(4!!\times 4)$ |
| | $\frac{4+4+\sqrt{.\overline{4}}}{\sqrt{.\overline{4}}}$ | $\frac{44+4!!}{4}$ | $\sqrt{\frac{(4!!)!}{(4!!)!!}+\frac{(4!!)!!}{\Gamma(4)}}$ |
| **14** | $4+4+4+\sqrt{4}$ | $4!-4-\frac{4!}{4}$ | $\frac{4!+4}{4-\sqrt{4}}$ |
| | $\frac{\Sigma(4\times 4)+4}{\Sigma(4)}$ | $\sqrt{\frac{4+4}{4\%}-4}$ | $\frac{(4!!)!!+4!!}{4!+4}$ |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| 15 | $(4 \times 4) - \frac{4}{4}$ | $\frac{4}{.4} + \frac{\sqrt{4}}{.4}$ | $\frac{4!}{\sqrt{4}} - \sqrt{\frac{4}{.\overline{4}}}$ |
| | $\frac{4}{.\overline{4}} + 4 + \sqrt{4}$ | $\frac{\sqrt{4}}{.4} \times \sqrt{\frac{4}{.\overline{4}}}$ | $\sqrt{\frac{\sqrt{4}}{4\%} \times \frac{\sqrt{4}}{.\overline{4}}}$ |
| | $\left(\sqrt{\sqrt{\sqrt{4^{4!}}} - 4}\right) \div 4$ | | |
| 16 | $4 + 4 + 4 + 4$ | $\frac{4 \times 4 \times 4}{4}$ | $\sqrt{4} \times \sqrt{4} \times \sqrt{4} \times \sqrt{4}$ |
| | $\frac{4}{.4} + \frac{4!}{4}$ | $(4 + 4 - 4)^{\sqrt{4}}$ | $\sqrt{\left(acsc\left(\sqrt{4}\right) \times \Sigma(4)\right) - 44}$ |
| | $\frac{4! + 4!}{\sqrt{\frac{4}{.\overline{4}}}}$ | $\frac{4^4}{4^{\sqrt{4}}}$ | $\frac{4 \cdot 4}{4\%} - (4!!)!!$ |
| | $4^4 - \left(4! \times \Sigma(4)\right)$ | $4! - 4 - \sqrt{4} - \sqrt{4}$ | $\frac{(4!!)!!}{\Gamma(4)} - 4! - 4!$ |
| | $\frac{(4!!)!}{4 \times acsc\left(\sqrt{4}\right) \times \Sigma\left(\Gamma(4)\right)}$ | | |
| 17 | $(4 \times 4) + \frac{4}{4}$ | $\frac{4!}{\sqrt{4}} + \frac{\sqrt{4}}{.4}$ | $4 + 4 + \frac{4}{.\overline{4}}$ |
| | $\frac{44 + 4!}{4}$ | $\frac{4 + 4 - .\overline{4}}{.\overline{4}}$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}} + 4}{4}$ |
| | $\sqrt{\Sigma(4!) - \Sigma(4) - \frac{4}{4}}$ | | |
| 18 | $(4 \times 4) + 4 - \sqrt{4}$ | $4 + 4 + \frac{4}{.4}$ | $\frac{4!}{\sqrt{4}} + \frac{4!}{4}$ |
| | $\frac{4! + 4! + 4!}{4}$ | $\frac{4 - .\overline{4}}{(.\overline{4})(.\overline{4})}$ | $\sqrt{\left(\sqrt{\frac{4}{.\overline{4}\%}} \cdot \Sigma(4)\right) + 4!}$ |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **19** | $4! - 4 - \frac{4}{4}$ | $(4 \times 4) + \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{4}{.4} + \frac{4}{.\overline{4}}$ |
| | $\frac{4 + 4.\overline{4}}{.\overline{4}}$ | $\frac{4!}{\sqrt{4}} + 4!! - \Gamma(\sqrt{4})$ | $\sqrt{(4!!)!! - 4! + \frac{4}{4}}$ |
| | $\sqrt{P(\Gamma(4), 4) + \frac{4}{4}}$ | $\sqrt{\left(\Sigma\left(\Gamma(4)\right)\right)^{\sqrt{4}} - (\Sigma(4) \times 4!!)}$ | |
| **20** | $(4 \times 4) + \sqrt{4} + \sqrt{4}$ | $\frac{4!}{\sqrt{4}} + 4 + 4$ | $\frac{4^{\sqrt{4}}}{.4 \times \sqrt{4}}$ |
| | $\sqrt{4} \times \left(4 + 4 + \sqrt{4}\right)$ | $\frac{4!}{.4 \times \sqrt{\frac{4}{.\overline{4}}}}$ | $\sqrt{\frac{\sqrt{4}}{.4\%} - \frac{4}{4\%}}$ |
| | $\frac{(4!!)!}{4! \times \Sigma\left(\Gamma(4)\right) \times 4}$ | | |
| **21** | $4! - 4 + \frac{4}{4}$ | $\frac{4!}{\sqrt{4}} + \frac{4}{.\overline{4}}$ | $(4 \times 4) + \frac{\sqrt{4}}{.4}$ |
| | $\frac{4 + 4 + .4}{.4}$ | $\frac{44 - \sqrt{4}}{\sqrt{4}}$ | $\frac{alog\left(\sqrt{4}\right) - (4 \times 4)}{4}$ |
| | $\sqrt{444 - \Sigma\left(\sqrt{4}\right)}$ | $\frac{\Gamma(4!!)}{4!} \times \frac{.4}{4}$ | |
| **22** | $(4 \times 4) + 4 + \sqrt{4}$ | $\frac{4!}{\sqrt{4}} + \frac{4}{.4}$ | $\frac{44}{4 - \sqrt{4}}$ |
| | $\frac{44 \times \sqrt{4}}{4}$ | $\frac{44 \times 4}{4!!}$ | $44 \times sin\left(\sqrt{\frac{4}{.\overline{4}\%}}\right)$ |
| | $\frac{\Gamma\left(\Gamma(4)\right) + alog\left(\sqrt{4}\right)}{4!! + \sqrt{4}}$ | $\sqrt{(4 + 4)!! + \frac{4}{4\%}}$ | |
| **23** | $4! - \sqrt{4} + \frac{4}{4}$ | $\frac{44 + \sqrt{4}}{\sqrt{4}}$ | $\Sigma\left(4 + \sqrt{4}\right) - \frac{4}{\sqrt{4}}$ |
| | $\frac{(4! \times 4) - 4}{4}$ | $\frac{4!^{\sqrt{4}} - 4!}{4!}$ | $\frac{\left(4! \times \Sigma(4)\right) - \Sigma(4)}{\Sigma(4)}$ |
| | $\sqrt{(4!!)^{\Sigma(\sqrt{4})} + \Sigma\left(\Gamma(4)\right) - 4}$ | $asin\left(\frac{\sqrt{4}}{4}\right) - 4!! + \Gamma\left(\sqrt{4}\right)$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **24** | $(4\times4)+4+4$ | $4\times\left(\sqrt{4}+\sqrt{4}+\sqrt{4}\right)$ | $(4+4+4)\times\sqrt{4}$ |
| | $\frac{44+4}{\sqrt{4}}$ | $\left(\frac{\sqrt{4}}{.4}\times4\right)+4$ | $(4+4)\times\sqrt{\frac{4}{.\overline{4}}}$ |
| | $\frac{\frac{4}{4\%}-4}{4}$ | $\left(\frac{\sqrt{4}}{4\%}+4\right)\times.\overline{4}$ | $\frac{\left(\Gamma(4)\right)^{\Sigma(\sqrt{4})}+4!}{\Sigma(4)}$ |
| | $4\times\Sigma\left(\sqrt{4}\right)\times\sqrt{4}\times\Gamma\left(\sqrt{4}\right)$ | $\frac{\frac{4}{.4}-.4}{.4}$ | $\frac{\frac{4}{.4}+\sqrt{.\overline{4}}}{.\overline{4}}$ |
| | $\left(\frac{\sqrt{4}}{.4}\right)!\times\frac{.4}{\sqrt{4}}$ | $\frac{(4+4)!!}{4\times4}$ | $\frac{(4+4)!}{P(4!!,4)}$ |
| | $\sqrt[\sqrt{4}]{\frac{4!}{4\%}-4!}$ | $\sqrt{\frac{\sqrt{4}}{.4\%}+\Sigma\left(\Sigma(4)\right)+\Sigma\left(\Gamma(4)\right)}$ | |
| **25** | $4!+\sqrt{4}-\frac{4}{4}$ | $(4\times4)+\frac{4}{.\overline{4}}$ | $\frac{4!-4}{.4+.4}$ |
| | $\frac{\sqrt{4}}{.4}\times\frac{\sqrt{4}}{.4}$ | $\left(4+\frac{4}{4}\right)^{\sqrt{4}}$ | $\frac{4.\overline{4}}{(.4)(.\overline{4})}$ |
| | $\frac{4!^{\sqrt{4}}+4!}{4!}$ | $\frac{4^4-\Gamma(4)}{\Sigma(4)}$ | $\frac{4!!}{.4}+\frac{\sqrt{4}}{.4}$ |
| | $\sqrt{\frac{4!}{4\%}+\Sigma\left(\Gamma(4)\right)+4}$ | | |
| **26** | $(4\times4)+\frac{4}{.4}$ | $\frac{\frac{4!}{.\overline{4}}-\sqrt{4}}{\sqrt{4}}$ | $\frac{4!}{\sqrt{.\overline{4}}}-\frac{4}{.4}$ |
| | $\frac{\frac{4}{4\%}+4}{4}$ | $44-\frac{4!!}{.\overline{4}}$ | $\sqrt{\Sigma\left(\Sigma(4!!)\right)+4+4+\sqrt{4}}$ |
| | $\frac{(4!!)!}{P(4!!,4)}+\sqrt{4}$ | | |
| **27** | $4!+4-\frac{4}{4}$ | $\left(\sqrt{\frac{4}{.\overline{4}}}\right)^{\sqrt{\frac{4}{.\overline{4}}}}$ | $\frac{4!!}{.\overline{4}}+\frac{4}{.\overline{4}}$ |
| | $\sqrt{\left(\Gamma(4)\right)!+4!!+\frac{4}{4}}$ | $\frac{alog\left(\sqrt{4}\right)+4+4}{4}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **28** | $\left((4\times4)-\sqrt{4}\right)\times\sqrt{4}$ | $4!+4+4-4$ | $\frac{4!}{.4+.4}-\sqrt{4}$ |
| | $\frac{\frac{4!}{.\overline{4}}+\sqrt{4}}{\sqrt{4}}$ | $\frac{\frac{4!}{\sqrt{4}}+.\overline{4}}{.\overline{4}}$ | $\sqrt{\left(4+\sqrt{4}\right)!+4^{\Sigma\left(\sqrt{4}\right)}}$ |
| | $\frac{\left(\frac{\sqrt{4}}{.4}\right)!-4!!}{4}$ | | |
| **29** | $4!+4+\frac{4}{4}$ | $\frac{\frac{4!}{.\overline{4}}+4}{\sqrt{4}}$ | $asin\left(\frac{\sqrt{4}}{4}\right)-\frac{4}{4}$ |
| | $\sqrt{P\left(acsc\left(\sqrt{4}\right),\sqrt{4}\right)-\left(acsc\left(\sqrt{4}\right)-\Gamma\left(\sqrt{4}\right)\right)}$ | | |
| **30** | $4!+4+4-\sqrt{4}$ | $\left(4^{\sqrt{4}}\times\sqrt{4}\right)-\sqrt{4}$ | $\frac{4}{.4}\times\sqrt{\frac{4}{.\overline{4}}}$ |
| | $\frac{4!!}{.\overline{4}}+\frac{4!}{\sqrt{4}}$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}-4}{\sqrt{4}}$ | $\sqrt{\Sigma(44)-\frac{.4}{.\overline{4}\%}}$ |
| **31** | $4!+\frac{4!+4}{4}$ | $\frac{\frac{4!}{\sqrt{4}}+.4}{.4}$ | *** $\frac{\left(4+\sqrt{4}\right)!+4!}{4!}$ |
| | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}-\sqrt{4}}{\sqrt{4}}$ | $\sqrt{\left(\frac{4}{.\overline{4}}\right)!!+(4\times4)}$ | |
| **32** | $(4\times4)+(4\times4)$ | $\frac{4\times4\times4}{\sqrt{4}}$ | $4!+\frac{4!}{\sqrt{4}}-4$ |
| | $4!!+4!!+4!!+4!!$ | $\frac{\Sigma(4!)+4!-4}{\Sigma(4)}$ | $(4!\times4)-\sqrt{\sqrt{\sqrt{4^{4!}}}}$ |
| | $\sqrt{\left(\sqrt{4}\right)^{\left(4+4+\sqrt{4}\right)}}$ | $\sqrt{C\left(4!,\Sigma\left(\sqrt{4}\right)\right)-\frac{4}{.4\%}}$ | $\sqrt[4]{\sqrt[\sqrt{4\%}]{4\times4}}$ |
| | $4!\times\frac{4}{\sqrt{\frac{4}{.\overline{4}}}}$ | $\frac{\left(\Sigma\left(\Sigma(4)\times\Gamma(4)\right)\right)-\Sigma(4)}{\Sigma(4)}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **33** | $4! + 4 + \frac{\sqrt{4}}{.4}$ | $\frac{4!}{\sqrt{.\overline{4}}} - \sqrt{\frac{4}{.\overline{4}}}$ | *** $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}} + \sqrt{4}}{\sqrt{4}}$ |
| | $\left(4 \cdot 4 \cdot \sqrt{4}\right) + \Gamma\left(\sqrt{4}\right)$ | $\left(4!! + \Sigma\left(\sqrt{4}\right)\right) \times \sqrt{\frac{4}{.\overline{4}}}$ | $\sqrt{\frac{\left(\Gamma(4)\right)!}{\sqrt{.\overline{4}}} + \frac{4}{.\overline{4}}}$ |
| | $\left((4 \div 4\%) - \Gamma\left(\sqrt{4}\right)\right) \div \Sigma\left(\sqrt{4}\right)$ | | |
| **34** | $4! + 4 + 4 + \sqrt{4}$ | $44 - \frac{4}{.4}$ | $\left(4 \times 4 \times \sqrt{4}\right) + \sqrt{4}$ |
| | $44 - \Gamma(4) - 4$ | $\left(alog\left(\sqrt{4}\right) + \frac{4!}{\sqrt{.\overline{4}}}\right) \div 4$ | *** $\left((4)(4+4)\right) + \sqrt{4}$ |
| | $\sqrt{\left(\Sigma\left(\Sigma(4)\right) \times \Sigma\left(\Gamma(4)\right)\right) + \frac{4}{4}}$ | | |
| **35** | $4! + \frac{44}{4}$ | $44 - \frac{4}{.\overline{4}}$ | $\frac{4!}{\sqrt{.\overline{4}}} - \frac{4}{4}$ |
| | $4! + 4!! + \sqrt{\frac{4}{.\overline{4}}}$ | $\left(\frac{\sqrt{4}}{.4}\right)\left(4!! - \Gamma\left(\sqrt{4}\right)\right)$ | $\frac{alog\left(\sqrt{4}\right)}{4} + \frac{4}{.4}$ |
| | $\sqrt{\left(\Sigma\left(\Sigma(4)\right) \times \Sigma\left(\Gamma(4)\right)\right) + C(4!!, 4)}$ | | |
| **36** | $4! + 4 + 4 + 4$ | $\left((4 \times 4) + \sqrt{4}\right)\left(\sqrt{4}\right)$ | $\left(\sqrt{4} + \sqrt{4} + \sqrt{4}\right)^{\sqrt{4}}$ |
| | $\frac{4 \times 4}{.4} - 4$ | $\frac{\left(\Gamma(4)\right)!}{4! - \sqrt{4} - \sqrt{4}}$ | *** $44 - 4 - 4$ |
| | $\frac{4!! + 4 + 4}{.\overline{4}}$ | $4! + 4! - \frac{4!}{\sqrt{4}}$ | $4 \times \left(4!! + \frac{4}{4}\right)$ |
| | $\frac{4!}{\sqrt{4}} \times \sqrt{\frac{4}{.\overline{4}}}$ | $4!! \times \left(4 + \frac{\sqrt{4}}{4}\right)$ | $\left(\Gamma(4)\right)!! \times \frac{\Gamma(4)}{4 \times \sqrt{4}}$ |
| | $\sqrt{\left(\sqrt{4} + \sqrt{4} + \sqrt{4}\right)^4}$ | $\sqrt{4! \times \left(\frac{\sqrt{4}}{4\%} + 4\right)}$ | $asin\left(\frac{\sqrt{4}}{4}\right) + 4 + \sqrt{4}$ |
| | $\sqrt{\Sigma\left(\left(4 + \sqrt{4}\right)!!\right) + \left(\frac{\sqrt{4}}{.4}\right)!}$ | $\sqrt{\left(\sqrt{4} \times \Sigma\left(\Sigma(4!!)\right)\right) - \Sigma(4+4)}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **37** | $4! + \frac{4! + \sqrt{4}}{\sqrt{4}}$ | $4! + 4 + \frac{4}{.\overline{4}}$ | $\frac{4!}{\sqrt{.\overline{4}}} + \frac{4}{4}$ |
| | $4! + 4!! + \frac{\sqrt{4}}{.4}$ | $\frac{(4 \times 4) + .\overline{4}}{.\overline{4}}$ | $\sqrt{\frac{\Gamma(4)}{.\overline{4}\%} + \Sigma\big(\Gamma(4)\big) - \sqrt{4}}$ |
| **38** | $4! + (4 \cdot 4) - \sqrt{4}$ | $4! + 4! - \frac{4}{.4}$ | *** $44 - 4 - \sqrt{4}$ |
| | $\sqrt{\Sigma\left(\Sigma\big(\Sigma(4)\big)\right) - \left((4! + 4!) \cdot \sqrt{4}\right)}$ | | $4! + \Gamma(4) + 4 + 4$ |
| **39** | $44 - \frac{\sqrt{4}}{.4}$ | $4! + 4! - \frac{4}{.\overline{4}}$ | $\frac{4!}{\sqrt{.\overline{4}}} + \sqrt{\frac{4}{.\overline{4}}}$ |
| | $\sqrt{\frac{\Gamma(4)}{.4\%} + \Sigma\big(4 + \sqrt{4}\big)}$ | $\left(\Sigma(4) + \Sigma\big(\sqrt{4}\big)\right) \times \sqrt{\frac{4}{.\overline{4}}}$ | |
| **40** | $4 \times \left(4 + 4 + \sqrt{4}\right)$ | $4! + 4! - 4 - 4$ | $(4 \cdot 4 \cdot 4) - 4!$ |
| | $44 + 4 - 4 - 4$ | $\sqrt{\frac{\big(\Gamma(4)\big)!}{.\overline{4}} - 4! + 4}$ | $\sqrt{\frac{\Gamma(4)}{.4\%} + \frac{4}{4\%}}$ |
| | $\frac{4^{\Sigma(\sqrt{4})}}{\sqrt{4} - .4}$ | | |
| **41** | $\frac{4! + \sqrt{4}}{.4} - 4!$ | $\frac{(4 \times 4) + .4}{.4}$ | $\frac{4! - 4}{.\overline{4}} - 4$ |
| | $44 - \sqrt{\frac{4}{.\overline{4}}}$ | $\sqrt{P(4!!, 4) + \frac{4}{4}}$ | |
| **42** | $44 - 4 + \sqrt{4}$ | $4! + 4! - 4 - \sqrt{4}$ | $\frac{\sqrt{4}}{4\%} - 4 - 4$ |
| | $\Gamma(4) \times \left(4!! - \frac{4}{4}\right)$ | $\frac{4!}{\sqrt{.\overline{4}}} + 4 + \sqrt{4}$ | $\sqrt{\frac{4!!}{.\overline{4}\%} - \frac{4!}{\sqrt{.\overline{4}}}}$ |
| **43** | $44 - \frac{4}{4}$ | $4! + 4! - \frac{\sqrt{4}}{.4}$ | $\frac{.4}{\big(\sqrt{4}\big)(.\overline{4}\%)} - \sqrt{4}$ |
| | $\sqrt{\frac{4!!}{.\overline{4}\%} + atan\left(\Gamma\big(\sqrt{4}\big)\right) + 4}$ | $\sqrt{\Sigma\left(asec\big(\sqrt{4}\big)\right) + \Sigma(4) + \frac{4}{.\overline{4}}}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **44** | $44+4-4$ | $4!+4!-\sqrt{4}-\sqrt{4}$ | $\frac{4\times .44}{4\%}$ |
| | $4\times\left(4!!+\sqrt{\frac{4}{.\overline{4}}}\right)$ | $atan\left(\frac{4}{4}\right)-\frac{4}{4}$ | $\frac{\left(4\times\Sigma\left(\Gamma(4)\right)\right)+4}{\sqrt{4}}$ |
| | $\sqrt{\frac{4!!}{.4\%}-\frac{(4!!)!!}{\Gamma(4)}}$ | $\sqrt{\frac{\left(\Sigma(4)\right)!!+\sqrt[.4]{4}}{\sqrt{4}}}$ | |
| **45** | $44+\frac{4}{4}$ | $4!+4!-\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{4!-\sqrt{4}-\sqrt{4}}{.\overline{4}}$ |
| | $atan\left(\frac{44}{44}\right)$ | $\Sigma\left(\Sigma\left(\sqrt{4\times 4}\right)\right)-\frac{4}{.4}$ | $4!\times\frac{\left(\frac{\sqrt{4}}{.4}\right)!!}{4!!}$ |
| | $\sqrt{C\left(4!,\Sigma\left(\sqrt{4}\right)\right)+\frac{4}{4}}$ | | |
| **46** | $44+4-\sqrt{4}$ | $\frac{4!-4}{.4}-4$ | $\frac{4!-4+.\overline{4}}{.\overline{4}}$ |
| | $\sqrt{4}\times\left(4!-\frac{4}{4}\right)$ | $\frac{(4!\times 4)-4}{\sqrt{4}}$ | $atan\left(\frac{4}{4}\right)+\frac{4}{4}$ |
| | $\sqrt{\frac{4!!}{.4\%}+\Gamma\left(\Gamma(4)\right)-4}$ | | |
| **47** | $4!+4!-\frac{4}{4}$ | $\frac{\sqrt{4}}{4\%}-\sqrt{\frac{4}{.\overline{4}}}$ | $44+\sqrt{\frac{4}{.\overline{4}}}$ |
| | $\sqrt{\Sigma\left(\left(\Gamma(4)\right)!!\right)+\Sigma\left(atan\left(\frac{4}{4}\right)\right)-\sqrt{4}}$ | | $atan\left(\frac{4}{4}\right)+\frac{4}{\sqrt{4}}$ |
| **48** | $(4+4+4)\times 4$ | $(4+4)\left(4+\sqrt{4}\right)$ | $(4!+4!)\left(\frac{4}{4}\right)$ |
| | $4\times 4\times\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{\frac{4}{4\%}-4}{\sqrt{4}}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}}-(4\times 4)$ |
| | $\frac{(4!!)!!+(4!\times 4)}{\Sigma(4)}$ | $\sqrt{\sqrt{4}\times\left(\left(\Sigma\left(\Sigma(4)\right)\times\Sigma\left(\Gamma(4)\right)\right)-\Sigma\left(\sqrt{4}\right)\right)}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **49** | $4! + 4! + \frac{4}{4}$ | $\frac{\sqrt{4}}{4\%} - \frac{4}{4}$ | $\frac{4! - 4}{.\overline{4}} + 4$ |
| | $\left(4!! - \frac{4}{4}\right)^{\sqrt{4}}$ | $\left(4 + \sqrt{\frac{4}{.\overline{4}}}\right)^{\sqrt{4}}$ | $atan\left(\frac{4}{4}\right) + \sqrt{4} + \sqrt{4}$ |
| | $\sqrt{\left(4! \times alog\left(\sqrt{4}\right)\right) + \frac{4}{4}}$ | | |
| **50** | $44 + 4 + \sqrt{4}$ | $\frac{4!}{.4} - \frac{4}{.4}$ | $\frac{\sqrt{4}}{.4} \times \frac{4}{.4}$ |
| | $4! + 4! + 4 - \sqrt{4}$ | $\left(4! + \frac{4}{4}\right) \times \sqrt{4}$ | $\frac{4}{(4!)\%} \times \sqrt{\frac{4}{.\overline{4}}}$ |
| | $\sqrt{\frac{4 + 4 + \sqrt{4}}{.4\%}}$ | $\sqrt{\frac{alog\left(\sqrt{4}\right)}{4} \times \frac{4}{4\%}}$ | |
| **51** | $\frac{4! - \sqrt{4}}{.4} - 4$ | $\frac{4!}{.4} - \frac{4}{.\overline{4}}$ | $\frac{\sqrt{4}}{4\%} + \frac{4}{4}$ |
| | $\frac{4! - 4 + .4}{.4}$ | $\sqrt{\frac{\Sigma(4)}{.4\%} + alog\left(\sqrt{4}\right) + \Gamma\left(\sqrt{4}\right)}$ | |
| **52** | $\frac{4! - 4}{.4} + \sqrt{4}$ | $\frac{4}{4\%} - 4! - 4!$ | $\frac{4!}{.4} - 4 - 4$ |
| | $\sqrt{\left(\Sigma\left(\Sigma(4)\right) \times \left(\Gamma(4)\right)!!\right) + \frac{(4!!)!!}{\Gamma(4)}}$ | | |
| **53** | $\frac{4! - \sqrt{4}}{.4} - \sqrt{4}$ | $44 + \frac{4}{.\overline{4}}$ | $\frac{\sqrt{4}}{4\%} + \sqrt{\frac{4}{.\overline{4}}}$ |
| | $\sqrt{\Sigma\left(asec\left(\sqrt{4}\right)\right) + \frac{4}{.4\%} - \Sigma\left(\Gamma(4)\right)}$ | $\sqrt{\left(\Sigma\left(\Sigma(4)\right)\right)^{\sqrt{4}} - \left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)}}$ | |
| **54** | $\frac{4! - 4}{.4} + 4$ | $\frac{.4}{.\overline{4}\%} - \frac{4!}{\sqrt{.\overline{4}}}$ | $\frac{4!}{.4} - 4 - \sqrt{4}$ |
| | $\sqrt{\left(\Sigma(4)\right)!! - \frac{4}{.\overline{4}\%} - 4!}$ | | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **55** | $\frac{\left(\frac{44}{.4}\right)}{\sqrt{4}}$ | $\frac{\sqrt{4}}{4\%}+\frac{\sqrt{4}}{.4}$ | $\frac{4!}{.4}-\frac{\sqrt{4}}{.4}$ |
| | $\Sigma\left(\Sigma\left(\sqrt{4\times 4}\right)\right)\times\frac{4}{4}$ | $\frac{(4!!)!}{(\Gamma(4))!}-\frac{4}{4}$ | $\frac{(\sqrt{4}+\sqrt{4})!+.\overline{4}}{.\overline{4}}$ |
| | $\sqrt{\Sigma\left(asin\left(\Gamma\left(\sqrt{4}\right)\right)\right)-\Sigma\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)\right)-\Sigma(4!!)+\Gamma\left(\sqrt{4}\right)}$ | | |
| **56** | $4!+4!+4+4$ | $\left(4!+\sqrt{4}+\sqrt{4}\right)\times\sqrt{4}$ | $\frac{\sqrt{4}}{4\%}+4+\sqrt{4}$ |
| | $\sqrt{(\Sigma(4))!!-(\Gamma(4))!+(4\times 4)}$ | $\sqrt{\left(\Sigma(\Sigma(4))\right)^{\sqrt{4}}+\Sigma\left(\Sigma(\Gamma(4))\right)-\Gamma(\Gamma(4))}$ | |
| **57** | $\frac{4!-\sqrt{4}}{.4}+\sqrt{4}$ | $\frac{4!}{.4}-\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{4!}{.\overline{4}}+\sqrt{\frac{4}{.\overline{4}}}$ |
| | $\sqrt{\Sigma\left(asec\left(\sqrt{4}\right)\right)+\Sigma\left(atan\left(\frac{4}{4}\right)\right)+(4!!)!!}$ | | |
| **58** | $4!+4!+\frac{4}{.4}$ | $\left((4!+4)\times\sqrt{4}\right)+\sqrt{4}$ | $\frac{(4!!)!!}{\Gamma(4)}-4-\sqrt{4}$ |
| | $\frac{alog\left(\sqrt{4}\right)+(4\cdot 4)}{\sqrt{4}}$ | $\frac{\sqrt{4}}{4\%}+4+4$ | $\sqrt{4}\times\left(\Sigma\left(\Gamma(4)\right)+4+4\right)$ |
| | $\sqrt{(\Sigma(4))!!-(4!!)!!-asin\left(\Gamma\left(\sqrt{4}\right)\right)-\sqrt{4}}$ | | |
| **59** | $\frac{4!}{.4}-\frac{4}{4}$ | $\frac{4!-\sqrt{4}}{.4}+4$ | $\frac{(4!!)!!}{\Gamma(4)}-\frac{\sqrt{4}}{.4}$ |
| | $\frac{4!}{.\overline{4}}+\frac{\sqrt{4}}{.4}$ | $\frac{\sqrt{4}}{4\%}+\frac{4}{.\overline{4}}$ | $\Sigma\left(4+4+\sqrt{4}\right)+4$ |
| | $\sqrt{\Sigma\left(asin\left(\Gamma\left(\sqrt{4}\right)\right)\right)-(4!!)!!-\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)+\Gamma\left(\sqrt{4}\right)}$ | | |
| **60** | $44+(4\times 4)$ | $\frac{4!}{.4}+4-4$ | $\left(4!+4+\sqrt{4}\right)\times\sqrt{4}$ |
| | $(4\times 4\times 4)-4$ | $\left((4!+4)\times\sqrt{4}\right)+4$ | $alog\left(\sqrt{4}\right)-44+4$ |
| | $\sqrt{4}\times\sqrt{4}\times\left(\frac{\sqrt{4}}{.4}\right)!!$ | $(4!!+4)\times\frac{\sqrt{4}}{.4}$ | $\sqrt{\frac{4}{4\%}\times\frac{4!}{\sqrt{.\overline{4}}}}$ |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| 61 | $\frac{4!}{.4}+\frac{4}{4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}}-\sqrt{\frac{4}{.\overline{4}}}$ | $C(4!!,4)-\frac{4}{.\overline{4}}$ |
| | $\frac{(\sqrt{4}+\sqrt{4})!+.4}{.4}$ | $\sqrt{\Sigma\left(asin\left(\Gamma(\sqrt{4})\right)\right)-(4!!)!!+\frac{4}{.4}}$ | |
| 62 | $\frac{4^4}{4}-\sqrt{4}$ | $\frac{4!+.4+.4}{.4}$ | $C(4!!,4)-4-4$ |
| | $\sqrt{(4+4+\sqrt{4})!!+4}$ | | |
| 63 | $\frac{4!+\sqrt{4}}{.4}-\sqrt{4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}}-\frac{4}{4}$ | $\frac{4!}{.\overline{4}}+\frac{4}{.\overline{4}}$ |
| | $\frac{4}{.\overline{4}}\times\left(4!!-\Gamma(\sqrt{4})\right)$ | $\frac{4^4-4}{4}$ | $\Sigma(4+\sqrt{4})\times\frac{\Gamma(4)}{\sqrt{4}}$ |
| | $\frac{4!}{.4}+\frac{\Gamma(4)}{\sqrt{4}}$ | $\sqrt{\left(\Sigma(\Gamma(4))\right)^{\sqrt{4}}\times\frac{4}{.\overline{4}}}$ | |
| 64 | $(4+4)(4+4)$ | $4!+4!+(4\times4)$ | $4\times4\times\sqrt{4}\times\sqrt{4}$ |
| | $(4+\sqrt{4}+\sqrt{4})^{\sqrt{4}}$ | $\frac{4^4}{\sqrt{4}+\sqrt{4}}$ | $\frac{4}{4\%}-\Sigma(4+4)$ |
| | $\frac{4!}{.4}+\sqrt{4}+\sqrt{4}$ | $\frac{4!}{.\overline{4}}+\frac{4}{.4}$ | $\frac{4!+4+.\overline{4}}{.\overline{4}}$ |
| | $\frac{\Sigma(\Sigma(4!!))-4!-\sqrt{4}}{\Sigma(4)}$ | $.\overline{4}\times\left(alog(\sqrt{4})+44\right)$ | $\sqrt{\sqrt{4}\times\sqrt{4}\times(\sqrt{4})^{\Sigma(4)}}$ |
| | $\left(4!\times\sqrt{\frac{4}{.\overline{4}}}\right)-4!!$ | $\frac{4!\times4!!}{\sqrt{\frac{4}{.\overline{4}}}}$ | $4\times\left(\left(\sqrt{4}^{\sqrt{4}}\right)^{\sqrt{4}}\right)$ |
| 65 | $\frac{4!+4-\sqrt{4}}{.4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}}+\frac{4}{4}$ | $\frac{4!}{.4}+\frac{\sqrt{4}}{.4}$ |
| | $\frac{4^4+4}{4}$ | $atan\left(\frac{4}{4}\right)+\frac{4!!}{.4}$ | $\Sigma\left(\frac{4}{.4}\right)+\frac{4}{.4}$ |
| | $\sqrt{\Sigma\left(asin\left(\frac{4}{4}\right)\right)+\Gamma(\Gamma(4))+\Sigma(4)}$ | | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **66** | $\frac{4^4}{4}+\sqrt{4}$ | $\frac{4!}{.4}+4+\sqrt{4}$ | $44+4!-\sqrt{4}$ |
| | $\frac{\Sigma\left(\Sigma(4!!)\right)-4-\sqrt{4}}{\Sigma(4)}$ | $alog\left(\sqrt{4}\right)-4!-\frac{4}{.4}$ | $4!+4!+\frac{4!!}{.\overline{4}}$ |
| | $\sqrt{4\times\left(\Sigma\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)\right)+\frac{4!}{.\overline{4}}\right)}$ | | |
| **67** | $\frac{4!+\sqrt{4}}{.4}+\sqrt{4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}}+\sqrt{\frac{4}{.\overline{4}}}$ | $atan\left(\frac{4}{4}\right)+4!-\sqrt{4}$ |
| | $\frac{4!}{.4}+4!!-\Gamma\left(\sqrt{4}\right)$ | $\Sigma\left(4!!+\Sigma\left(\sqrt{4}\right)\right)+\frac{4}{4}$ | $C(4!!,4)-\sqrt{\frac{4}{.\overline{4}}}$ |
| | $\sqrt{\Sigma\left(asin\left(\Gamma\left(\sqrt{4}\right)\right)\right)+(4!!)!!+\frac{4}{.4}}$ | | |
| **68** | $4!+4!+4!-4$ | $\frac{4!}{.4}+4+4$ | $\frac{4!+4!}{\sqrt{.\overline{4}}}-4$ |
| | $\left(\sqrt{4}\times\sqrt[.4]{4}\right)+4$ | $\frac{4}{4\%}-\sqrt[.4]{4}$ | $\sqrt{4}\times\left(\frac{4!}{\sqrt{.\overline{4}}}-\sqrt{4}\right)$ |
| | $\sqrt{4\times\left(\Sigma\left(\left(\Gamma(4)\right)!!\right)-4!+4\right)}$ | | |
| **69** | $\frac{4!+\sqrt{4}}{.4}+4$ | $\frac{4!+4-.4}{.4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}}+\frac{\sqrt{4}}{.4}$ |
| | $\sqrt{\Sigma\left(asin\left(\frac{4}{4}\right)\right)+\Sigma\left(\Sigma(4+4)\right)}$ | | $C(4!!,4)-\frac{4}{4}$ |
| **70** | $4!+4!+4!-\sqrt{4}$ | $\frac{4!+\sqrt{4}+\sqrt{4}}{.4}$ | $44+4!+\sqrt{4}$ |
| | $\frac{4}{4\%}-\sqrt{\frac{4}{.\overline{4}\%}}$ | $\frac{4}{.4}\times\left(4!!-\Gamma\left(\sqrt{4}\right)\right)$ | $\sqrt{\Gamma(4!!)-\Sigma(4\cdot4)-4}$ |
| | $\frac{4!}{.4}+\frac{4}{.4}$ | $C(4!!,4)\times\frac{4}{4}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **71** | $\frac{\sqrt{\frac{4}{.\overline{4}}}}{4\%} - 4$ | $\frac{4! + 4 + .4}{.4}$ | $\frac{4! + 4! - \sqrt{.\overline{4}}}{\sqrt{.\overline{4}}}$ |
| | $atan\left(\frac{4}{4}\right) + 4! + \sqrt{4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}} + 4!! - \Gamma(\sqrt{4})}$ | $\sqrt{\Gamma(4+4) + \frac{4}{4}}$ |
| | $\sqrt{\Sigma\left(alog(\sqrt{4})\right) - \frac{\sqrt{4}}{.4} - 4}$ | $\frac{(4! \times \Gamma(4)) - \sqrt{4}}{\sqrt{4}}$ | $\Sigma\left(\frac{4}{.4}\right) + (4 \times 4)$ |
| **72** | $4! \times \left(4 - \frac{4}{4}\right)$ | $\frac{4! + 4 + 4}{.\overline{4}}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}} + 4 + 4}$ |
| | $(4+4) \times \left(\frac{4}{.\overline{4}}\right)$ | $\left(\frac{4!}{\sqrt{4}}\right)^{\sqrt{4}} \div \sqrt{4}$ | $\frac{4!^{\sqrt{4}}}{4+4}$ |
| | $\frac{alog(\sqrt{4}) + 44}{\sqrt{4}}$ | $\frac{4}{4\%} - 4! - 4$ | $\left(\frac{4!}{4}\right)! \div \frac{4}{.4}$ |
| | $\sqrt{\Gamma(4!!) + \left(4! \times (4 + \sqrt{4})\right)}$ | | |
| **73** | $\sqrt{\sqrt{\sqrt{4^{4!}}} + \frac{4}{.\overline{4}}}$ | $\frac{\sqrt{4}}{4\% \times \sqrt{.\overline{4}}} - \sqrt{4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}} + 4!! + \Gamma(\sqrt{4})}$ |
| | $\frac{4! + 4! + \sqrt{.\overline{4}}}{\sqrt{.\overline{4}}}$ | $\frac{(4! \times \Gamma(4)) + \sqrt{4}}{\sqrt{4}}$ | $\frac{4! + 4!! + .\overline{4}}{.\overline{4}}$ |
| | $\sqrt{\Gamma(4+4) + \Gamma(\sqrt{4}) + \sqrt{4}}$ | $\sqrt{C(\Sigma(\Gamma(4)), 4) - \Sigma(\Sigma(4!!)) + \Sigma(4)}$ | |
| **74** | $4! + 4! + 4! + \sqrt{4}$ | $\frac{.4}{.\overline{4}\%} - (4 \times 4)$ | $\sqrt{\sqrt{\sqrt{4^{4!}}} + \frac{4}{.4}}$ |
| | $\sqrt{\Gamma(4!!) + \left(\sqrt{.\overline{4}} \times \Sigma(\Sigma(4!!))\right) - 4!!}$ | | $C(4+4,4) + 4$ |
| **75** | $\frac{4! + 4 + \sqrt{4}}{.4}$ | $\frac{4 - \frac{4}{4}}{4\%}$ | $atan\left(\frac{4}{4}\right) + asin\left(\frac{\sqrt{4}}{4}\right)$ |
| | $C(4!!,4) + \frac{\sqrt{4}}{.4}$ | $\Sigma\left(\frac{4}{.4}\right) + \frac{4!!}{.4}$ | $\Sigma\left(acsc(\sqrt{4})\right) - (4!!)!! - \frac{4!}{4}$ |
| | $\sqrt{\Sigma\left(alog(\sqrt{4})\right) + (4!)^{\sqrt{4}} - \Gamma(\sqrt{4})}$ | $\sqrt{C(\Sigma(\Gamma(4)), 4) - P(\Gamma(4), 4)}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **76** | $4! + 4! + 4! + 4$ | $\frac{4!}{.4} + (4 \times 4)$ | $\frac{4! + 4!}{\sqrt{.\overline{4}}} + 4$ |
| | $\sqrt{\Sigma\left(alog\left(\sqrt{4}\right)\right) + \left(\Gamma(4)\right)! + 4 + \sqrt{4}}$ | $\sqrt{4 \times \left(\Sigma\left(\Sigma\left(\Sigma(4)\right)\right) - (4 \times 4!)\right)}$ | |
| **77** | $\left(\frac{4}{.\overline{4}}\right)^{\sqrt{4}} - 4$ | $\left(4!! - \Gamma\left(\sqrt{4}\right)\right) \times \left(4!! + \Sigma\left(\sqrt{4}\right)\right)$ | $\frac{\sqrt{\frac{4}{.\overline{4}}}}{4\%} + \sqrt{4}$ |
| | $\sqrt{\Sigma\left(asin\left(\frac{4}{4}\right)\right) + \Sigma\left(asec\left(\sqrt{4}\right)\right) + 4}$ | $atan\left(\Gamma\left(\sqrt{4}\right)\right) + \left(4 \times (4 + 4)\right)$ | |
| **78** | $\left(4! + \sqrt{4}\right) \times \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{.4}{.\overline{4}\%} - \frac{4!}{\sqrt{4}}$ | $C(4!!, 4) + 4 + 4$ |
| | $\sqrt{\frac{4!}{.4\%} + \left(4 \times \Sigma\left(\Gamma(4)\right)\right)}$ | $\sqrt{\Gamma(4!!) + \Sigma\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)\right) + \frac{4}{.\overline{4}}}$ | |
| **79** | $\left(\frac{4}{.\overline{4}}\right)^{\sqrt{4}} - \sqrt{4}$ | $\frac{\sqrt{\frac{4}{.\overline{4}}}}{4\%} + 4$ | $C(4!!, 4) + \frac{4}{.\overline{4}}$ |
| | $\sqrt{\Gamma(4!!) + \Sigma\left(\left(\Gamma(4)\right)!!\right) + \Sigma\left(\Gamma(4)\right) + 4}$ | | |
| **80** | $\frac{4}{.4} \times (4 + 4)$ | $\frac{4 \times (4 + 4)}{.4}$ | $\frac{.4}{.\overline{4}\%} - \frac{4}{.4}$ |
| | $\left((4 \times 4) + 4\right) \times 4$ | $(44 - 4) \times \sqrt{4}$ | $\frac{4}{4\%} - 4! + 4$ |
| | $\frac{4!}{.4} + 4! - 4$ | $\sqrt{\frac{4}{4\%} \times \sqrt{\sqrt{\sqrt{4^{4!}}}}}$ | $\sqrt{\frac{4!}{.\overline{4}\%} + \frac{4}{.4\%}}$ |
| **81** | $\frac{4}{.\overline{4}} \times \frac{4}{.\overline{4}}$ | $\frac{(4!)^4}{\sqrt{\sqrt{4^{4!}}}}$ | $\frac{.4}{.\overline{4}\%} - \frac{4}{.\overline{4}}$ |
| | $\left(4 - \frac{4}{4}\right)^4$ | $\frac{4! + 4!! + .4}{.4}$ | $\left(4 \times (4! - 4)\right) + \Gamma\left(\sqrt{4}\right)$ |
| | $atan\left(\frac{4}{4}\right) + \Sigma(4 + 4)$ | $\sqrt{\left(\sqrt{\frac{4}{.\overline{4}}}\right)^{(4+4)}}$ | $\sqrt{C\left(\Sigma\left(\Gamma(4)\right), 4\right) + (4!)^{\sqrt{4}}}$ |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| 82 | $\frac{4!}{.4}+4!-\sqrt{4}$ | $\frac{4!}{.\overline{4}}+4!+4$ | $\frac{.4}{.\overline{4}\%}-4-4$ |
| | $\frac{\Sigma(4+4)+.\overline{4}}{.\overline{4}}$ | $\sqrt{\Sigma\left(\Gamma\left(\Gamma(4)\right)\right)-(4!!)^{\Sigma(\sqrt{4})}-4!}$ | |
| 83 | $\left(\frac{4}{.\overline{4}}\right)^{\sqrt{4}}+\sqrt{4}$ | $\frac{\sqrt{\frac{4}{.\overline{4}}}}{4\%}+4!!$ | $\frac{(4!!)!}{(4!!)!!}-4!+\sqrt{4}$ |
| | $\Sigma\left(\frac{4}{.4}\right)+4!+4$ | $\sqrt{\Sigma\left(\Gamma\left(\Gamma(4)\right)\right)-(4!!)!!+\Sigma(4)+\Sigma(\sqrt{4})}$ | |
| 84 | $\left(44-\sqrt{4}\right)\times\sqrt{4}$ | $\left(44\times\sqrt{4}\right)-4$ | $\frac{4}{4\%}-(4\times 4)$ |
| | $(4!+4)\times\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{\Sigma\left(\Gamma(4)\right)\times(4+4)}{\sqrt{4}}$ | $\sqrt{\Sigma\left(\Gamma\left(\Gamma(4)\right)\right)-\frac{4!!}{4\%}-4}$ |
| | $\sqrt{\Sigma\left(alog\left(\sqrt{4}\right)\right)+\frac{4!!}{.4\%}+\Gamma(4)}$ | | |
| 85 | $\left(\frac{4}{.\overline{4}}\right)^{\sqrt{4}}+4$ | $\frac{.4}{.\overline{4}\%}-\frac{\sqrt{4}}{.4}$ | $atan\left(\Gamma\left(\sqrt{4}\right)\right)+44-4$ |
| | $\sqrt{\Sigma\left(\Gamma\left(4+\sqrt{4}\right)\right)-\Sigma(4!!)+\Gamma\left(\sqrt{4}\right)}$ | $\sqrt{\left(\Sigma\left(\sqrt{4}\right)\right)^{4!!}+\Sigma\left(\Sigma(4!!)\right)-\sqrt{4}}$ | |
| 86 | $\frac{4!}{.4}+4!+\sqrt{4}$ | $\left(44\times\sqrt{4}\right)-\sqrt{4}$ | $(4!\times 4)-\frac{4}{.4}$ |
| | $\sqrt{\Sigma\left(\Gamma\left(4+\sqrt{4}\right)\right)+\Sigma(4\times 4)}$ | | |
| 87 | $\frac{4!+4}{.\overline{4}}+4!$ | $\frac{.4}{.\overline{4}\%}-\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{(4!!)!}{(4!!)!!}-\frac{4!!}{.\overline{4}}$ |
| | $atan\left(\Gamma\left(\sqrt{4}\right)\right)+44-\sqrt{4}$ | $\left(44\times\sqrt{4}\right)-\Gamma\left(\sqrt{4}\right)$ | $\Sigma\left(\frac{4}{.4}\right)+4!+4!!$ |
| | $\sqrt{\Sigma\left(\Gamma\left(\Gamma(4)\right)\right)+\Sigma(4!)+\frac{4}{.\overline{4}}}$ | $\sqrt{\left(\Sigma\left(\sqrt{4}\right)\right)^{4!!}+\left(\left(\Gamma(4)\right)!!\times\Sigma\left(\Gamma(4)\right)\right)}$ | |
| 88 | $44+44$ | $44\times\frac{4}{\sqrt{4}}$ | $\frac{4!}{.4}+4!+4$ |
| | $4\times\left(4!-4+\sqrt{4}\right)$ | $\frac{4}{4\%}-\frac{4!}{\sqrt{4}}$ | $\sqrt{\sqrt[.4]{\Sigma(4!!)}-\sqrt[.4]{4}}$ |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| **89** | $\frac{4!+\sqrt{4}}{.4}+4!$ | $\frac{.4}{.\overline{4}\%}-\frac{4}{4}$ | $atan\left(\frac{4}{4}\right)+44$ |
| | $\left(44\times\sqrt{4}\right)+\Gamma\left(\sqrt{4}\right)$ | $\frac{(4!!)!}{(4!!)!!}-(4\times 4)$ | $\frac{4}{4\%}+4!!-\Sigma\left(\sqrt{4}\right)$ |
| | $\sqrt{\Sigma\left(\Gamma\left(\Gamma(4)\right)\right)+\Sigma\left(\Sigma(4!!)\right)-\frac{\sqrt{4}}{.4}}$ | | |
| **90** | $(4!\times 4)-4-\sqrt{4}$ | $\left(44\times\sqrt{4}\right)+\sqrt{4}$ | $\frac{4}{.4}\times\frac{4}{.\overline{4}}$ |
| | $\frac{4}{4\%}-\frac{4}{.4}$ | $\sqrt{\frac{4}{4\%}\times\left(\Sigma\left(\sqrt{4}\right)\right)^4}$ | $\sqrt{\frac{4}{.\overline{4}\%}}\times\sqrt{\frac{4}{.\overline{4}}}$ |
| **91** | $(4!\times 4)-\frac{\sqrt{4}}{.4}$ | $\frac{4}{4\%}-\frac{4}{.\overline{4}}$ | $\frac{.4}{.\overline{4}\%}+\frac{4}{4}$ |
| | $\Sigma\left(\frac{4}{.4}\right)+\Sigma(4+4)$ | $\frac{\Sigma(4+4)+.4}{.4}$ | $\frac{\Sigma(4!!)+4+.\overline{4}}{.\overline{4}}$ |
| | $\sqrt{\Sigma\left(atan\left(-\Gamma\left(\sqrt{4}\right)\right)\right)-\frac{4}{.\overline{4}\%}+\Gamma\left(\sqrt{4}\right)}$ | | |
| | $\sqrt{\Sigma\left(\Gamma\left(\Gamma(4)\right)\right)+\Sigma\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)\right)-4!!-\Gamma(4)}$ | | |
| **92** | $44+4!+4!$ | $(4!\times 4)-\sqrt{4}-\sqrt{4}$ | $\left(44\times\sqrt{4}\right)+4$ |
| | $\sqrt{\Sigma\left(atan\left(-\frac{4}{4}\right)\right)-\left(\Gamma(4)\right)!+4}$ | | $\frac{4}{4\%}-4-4$ |
| | $\sqrt{\Sigma\left(\Gamma\left(\Gamma(4)\right)\right)+\Sigma\left(\left(\Gamma(4)\right)!!\right)+4!+4}$ | | |
| **93** | $(4!\times 4)-\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{.4}{.\overline{4}\%}+\sqrt{\frac{4}{.\overline{4}}}$ | $atan\left(\frac{4}{4}\right)+4!+4!$ |
| | $\sqrt{\Sigma\left(asin\left(\Gamma\left(\sqrt{4}\right)\right)\right)+\left(\Sigma(4)\right)!!+\left(\Gamma(4)\right)!-\Gamma(4)}$ | | $\Sigma\left(\Sigma(4)\right)+\Sigma(4+4)+\sqrt{4}$ |
| **94** | $(4!\times 4)-4+\sqrt{4}$ | $\frac{4}{4\%}-4-\sqrt{4}$ | $\frac{.4}{.\overline{4}\%}+\sqrt{4}+\sqrt{4}$ |
| | $\left(\sqrt{4}\times atan\left(\frac{4}{4}\right)\right)+4$ | $\sqrt{\Sigma\left(atan\left(-\Gamma\left(\sqrt{4}\right)\right)\right)-(4!!)!!+\Sigma(4!!)+4}$ | |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| 95 | $(4! \times 4) - \frac{4}{4}$ | $\frac{4}{4\%} - \frac{\sqrt{4}}{.4}$ | $\frac{.4}{.\overline{4}\%} + \frac{\sqrt{4}}{.4}$ |
| | $\frac{(4!!)!}{(4!!)!!} - \frac{4}{.4}$ | $\left(\Sigma\left(\Gamma(4)\right) - \sqrt{4}\right) \times \frac{\sqrt{4}}{.4}$ | $\Sigma\left(\Sigma(4)\right) + \Sigma(4+4) + 4$ |
| | $\sqrt{\Sigma\left(atan\left(-\Gamma\left(\sqrt{4}\right)\right)\right) - atan\left(-\Gamma\left(\sqrt{4}\right)\right) - \frac{4!!}{.4}}$ | | |
| 96 | $4! + 4! + 4! + 4!$ | $4 \times 4 \times \left(4 + \sqrt{4}\right)$ | $\frac{.4}{.\overline{4}\%} + 4 + \sqrt{4}$ |
| | $\sqrt{\sqrt{\sqrt{4^{4!}}}} + (4!! \times 4)$ | $\left(44 \times \sqrt{4}\right) + 4!!$ | $\frac{4}{4\%} - \sqrt{4} - \sqrt{4}$ |
| | $\sqrt{4} \times (44 + 4)$ | $(\Sigma(4) \times 4!!) + (4 \times 4)$ | $\Gamma\left(\sqrt{4} + \sqrt{4} + \sqrt{4}\right) - 4!$ |
| | $\frac{\Sigma\left(\Sigma(4!!)\right) + \Gamma(4)}{4!! - \Gamma\left(\sqrt{4}\right)}$ | $\frac{(4!!)!}{(4!!)!!} - \frac{4}{.\overline{4}}$ | $\frac{\frac{4!!}{4\%} - 4!!}{\sqrt{4}}$ |
| | $\Sigma\left(\Sigma(4)\right) + 44 - \Sigma\left(\sqrt{4}\right)$ | $\sqrt{.\overline{4}} \times \left(alog\left(\sqrt{4}\right) + 44\right)$ | $\frac{\left(\Gamma(4)\right)! + \left(\Gamma(4)\right)!!}{4+4}$ |
| | $\sqrt{\frac{.4}{.\overline{4}\%\%} + \left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)}}$ | $\sqrt{\Sigma\left(atan\left(-\frac{4}{4}\right)\right) + \Sigma(4+4)}$ | |
| | $\sqrt{\left(\Sigma\left(\Gamma(4)\right)\right)^{\Sigma\left(\sqrt{4}\right)} - \Sigma\left(\frac{4}{.\overline{4}}\right)}$ | $\sqrt{alog(4) - \left(\Gamma(4)\right)! - \frac{(4!!)!!}{\Gamma(4)}}$ | |
| | $\sqrt{4 \times \left(\left(4 + \sqrt{4}\right)!!\right)^{\sqrt{4}}}$ | $\sqrt{\sqrt{4} \times \left(\left(\Sigma(4)\right)!! + \left(\sqrt{4} \times (4!!)!!\right)\right)}$ | |
| | $\sqrt{4!! \times \left(\left(\Sigma\left(\Sigma(4)\right) \times \Sigma\left(\Gamma(4)\right)\right) - \Sigma\left(\sqrt{4}\right)\right)}$ | | $\frac{4 \times (\Sigma(4) - .4)}{.4}$ |
| 97 | $(4! \times 4) + \frac{4}{4}$ | $\frac{4}{4\%} - \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}} + \sqrt{.\overline{4}}}{\sqrt{.\overline{4}}}$ |
| | $\sqrt{\Sigma\left(atan\left(-\frac{4}{4}\right)\right) + \Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - \sqrt{4}}$ | | $\frac{(4!!)!}{(4!!)!!} - 4 - 4$ |
| | $\sqrt{\left(\Sigma\left(\Gamma(4)\right)\right)^{\Sigma\left(\sqrt{4}\right)} + alog\left(\sqrt{4}\right) + \left(\Gamma(4)\right)!!}$ | | $\Sigma\left(\Sigma(4)\right) + 44 - \sqrt{4}$ |

## SECTION I — SOLUTIONS 1–100

| | | | |
|---|---|---|---|
| 98 | $(4! \times 4) + 4 - \sqrt{4}$ | $\frac{44 - .\overline{4}}{.\overline{4}}$ | $\frac{.4}{.\overline{4}\%} + 4 + 4$ |
| | $\frac{\frac{4!!}{4\%} - 4}{\sqrt{4}}$ | $\frac{4}{4\%} - 4 + \sqrt{4}$ | $\left(\frac{\sqrt{4}}{.4}\right)! - 4! + \sqrt{4}$ |
| | $\sqrt{\Sigma\left(atan\left(-\Gamma\left(\sqrt{4}\right)\right)\right) + (4!!)!! + \Sigma(4!!) + 4}$ | | $\sqrt{alog(4) - (4!!)!! - \frac{4!}{\sqrt{4}}}$ |
| 99 | $(4! \times 4) + \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{4}{4\%} - \frac{4}{4}$ | $\frac{.4}{.\overline{4}\%} + \frac{4}{.\overline{4}}$ |
| | $\left(4! \times \Gamma(4)\right) - atan\left(\frac{4}{4}\right)$ | $\frac{\Sigma(44) \times .4}{4}$ | $\frac{(4!!)!}{(4!!)!!} - 4 - \sqrt{4}$ |
| | $\sqrt{alog(4) - \frac{4!!}{4\%} + \Gamma\left(\sqrt{4}\right)}$ | $\sqrt{\Gamma(4!!) + \Sigma\left(asin\left(\frac{4}{4}\right)\right) + \Sigma\left(\Sigma(4!!)\right)}$ | |
| 100 | $(4! \times 4) + \sqrt{4} + \sqrt{4}$ | $\frac{4}{.4} \times \frac{4}{.4}$ | $4 \times \left(4! + \frac{4}{4}\right)$ |
| | $(4! - 4) \times \frac{\sqrt{4}}{.4}$ | $\frac{44.\overline{4}}{.\overline{4}}$ | $\frac{4!!}{4\%} - \frac{4}{4\%}$ |
| | $\left(\sqrt{4} \times atan\left(\frac{4}{4}\right)\right) + \Sigma(4)$ | $\frac{(4!!)!}{(4!!)!!} - \frac{\sqrt{4}}{.4}$ | $\left(\frac{\sqrt{4}}{.4}\right)! - 4! + 4$ |
| | $\sqrt{alog\left(\frac{4 \times 4}{\sqrt{4} \times \sqrt{4}}\right)}$ | $\sqrt{\frac{.4}{.\overline{4}\%\%} + \frac{4}{.4\%}}$ | $\left(\Sigma\left(\sqrt{4}\right) \times \sqrt[.4]{4}\right) + 4$ |
| | $\sqrt{\Sigma\left(alog\left(\sqrt{4}\right)\right) + \Gamma(4!!) - \frac{.4}{.\overline{4}\%}}$ | | $\left(\Sigma\left(\sqrt{4}\right) \times \frac{4!}{\sqrt{.\overline{4}}}\right) - 4!!$ |

# Solutions History 1–100

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| 1 | 3 | 3 | 10 | |
| 2 | 3 | 3 | 9 | |
| 3 | 3 | 3 | 6 | |
| 4 | 3 | 3 | 21 | |
| 5 | 3 | 3 | 7 | |
| 6 | 3 | 3 | 8 | |
| 7 | 3 | 3 | 6 | |
| 8 | 3 | 3 | 10 | |
| 9 | 3 | 3 | 6 | |
| 10 | 3 | 3 | 7 | |
| 11 | 3 | 3 | 6 | |
| 12 | 3 | 3 | 8 | |
| 13 | 6 | 6 | 9 | |
| 14 | 3 | 3 | 6 | |
| 15 | 5 | 5 | 7 | |
| 16 | 3 | 5 | 13 | |
| 17 | 6 | 6 | 7 | |
| 18 | 5 | 5 | 6 | |
| 19 | 5 | 5 | 8 | |
| 20 | 3 | 3 | 7 | |
| 21 | 4 | 4 | 8 | |
| 22 | 3 | 3 | 8 | |
| 23 | 3 | 3 | 8 | |
| 24 | 4 | 4 | 17 | |
| 25 | 5 | 5 | 10 | |
| 26 | 3 | 5 | 7 | |
| 27 | 3 | 3 | 5 | |
| 28 | 3 | 5 | 7 | |
| 29 | 3 | 3 | 4 | |
| 30 | 3 | 5 | 6 | |
| 31 | 3 | 3 | 5 | |
| 32 | 3 | 3 | 11 | |
| 33 | 4 | 4 | 7 | |
| 34 | 3 | 3 | 7 | |
| 35 | 4 | 4 | 7 | |
| 36 | 3 | 3 | 17 | |
| 37 | 4 | 4 | 6 | |
| 38 | 3 | 3 | 5 | |
| 39 | 3 | 3 | 5 | |
| 40 | 3 | 3 | 7 | |

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| 41 | 3 | 3 | 5 | |
| 42 | 3 | 3 | 6 | |
| 43 | 3 | 3 | 5 | |
| 44 | 3 | 3 | 8 | |
| 45 | 3 | 3 | 7 | |
| 46 | 3 | 3 | 7 | |
| 47 | 3 | 3 | 5 | |
| 48 | 3 | 3 | 8 | |
| 49 | 3 | 3 | 7 | |
| 50 | 5 | 5 | 8 | |
| 51 | 3 | 3 | 5 | |
| 52 | 3 | 3 | 4 | |
| 53 | 3 | 3 | 5 | |
| 54 | 3 | 3 | 4 | |
| 55 | 3 | 3 | 7 | |
| 56 | 3 | 3 | 5 | |
| 57 | 3 | 3 | 4 | |
| 58 | 4 | 4 | 7 | |
| 59 | 4 | 4 | 7 | |
| 60 | 5 | 5 | 9 | |
| 61 | 3 | 3 | 5 | |
| 62 | 3 | 3 | 4 | |
| 63 | 3 | 3 | 8 | |
| 64 | 4 | 4 | 15 | |
| 65 | 3 | 3 | 7 | |
| 66 | 3 | 3 | 7 | |
| 67 | 3 | 3 | 7 | |
| 68 | 3 | 3 | 7 | |
| 69 | 3 | 3 | 5 | |
| 70 | 4 | 4 | 8 | |
| 71 | 6 | 6 | 9 | |
| 72 | 6 | 6 | 10 | |
| 73 | 4 | 4 | 8 | |
| 74 | 3 | 3 | 5 | |
| 75 | 3 | 3 | 8 | |
| 76 | 3 | 3 | 5 | |
| 77 | 3 | 3 | 5 | |
| 78 | 3 | 3 | 5 | |
| 79 | 3 | 3 | 4 | |
| 80 | 4 | 4 | 9 | |

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| 81 | 4 | 4 | 9 | |
| 82 | 3 | 3 | 5 | |
| 83 | 3 | 3 | 5 | |
| 84 | 4 | 4 | 7 | |
| 85 | 3 | 3 | 5 | |
| 86 | 3 | 3 | 4 | |
| 87 | 4 | 4 | 8 | |
| 88 | 3 | 3 | 6 | |
| 89 | 4 | 4 | 7 | |
| 90 | 4 | 4 | 6 | |
| 91 | 3 | 3 | 8 | |
| 92 | 3 | 3 | 6 | |
| 93 | 3 | 3 | 5 | |
| 94 | 4 | 4 | 5 | |
| 95 | 3 | 3 | 7 | |
| 96 | 3 | 4 | 23 | |
| 97 | 3 | 3 | 7 | |
| 98 | 4 | 4 | 8 | |
| 99 | 4 | 4 | 8 | |
| 100 | 5 | 5 | 14 | |
| Σ | 345 | 354 | 741 | |

| Partial Solutions* | | | | |
|---|---|---|---|---|
| #4s | 1993 | 1998 | 2012 | |
| One | 28 | 28 | 58 | |
| Two | 77 | 77 | 287 | |
| Σ | 105 | 105 | 345 | |

* Does not include tables of Miscellaneous Operations and Functions, which are new to the 2012 publication.

[NEARLY BLANK PAGE]

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **101** | $\frac{4}{4\%}+\frac{4}{4}$ | $(4!\times 4)+\frac{\sqrt{4}}{.4}$ | $\sqrt{alog(4)+\frac{4!!}{4\%}+\Gamma(\sqrt{4})}$ |
| | $\frac{\Sigma(4!!)+4+.4}{.4}$ | | |
| **102** | $\frac{4}{4\%}+\frac{4}{\sqrt{4}}$ | $(4!\times 4)+4+\sqrt{4}$ | $\frac{(4!!)!}{(4!!)!!}-\sqrt{\frac{4}{.\overline{4}}}$ |
| | $\sqrt{alog(4)+(4!!)!!+\frac{4!!}{.4}}$ | | |
| **103** | $\frac{4}{4\%}+\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{(4!!)!}{(4!!)!!}-\frac{4}{\sqrt{4}}$ | $alog(\sqrt{4})+4-\frac{4}{4}$ |
| | $\sqrt{alog(4)+\Sigma(\Sigma(4!!))-\Sigma(\Sigma(4))-\sqrt{4}}$ | | |
| **104** | $\frac{4}{4\%}+\sqrt{4}+\sqrt{4}$ | $(4!\times 4)+4+4$ | $\frac{(4!!)!}{(4!!)!!}-\frac{4}{4}$ |
| | $\sqrt{alog(4)+(\Gamma(4))!+(4!\times 4)}$ | | |
| **105** | $\frac{4}{4\%}+\frac{\sqrt{4}}{.4}$ | $(4!\times 4)+\frac{4}{.\overline{4}}$ | $\frac{(4+4)!}{(4+4)!!}$ |
| | $\sqrt{alog(4)+(\sqrt{4})^{\Sigma(4)}+\Gamma(\sqrt{4})}$ | $atan\left(-\frac{4}{4}\right)-asin\left(\frac{\sqrt{4}}{4}\right)$ | |
| | $\sqrt{\Sigma\left(\Gamma(\Gamma(4))\right)+\Sigma\left(asin\left(\Gamma(\sqrt{4})\right)\right)-\left(\Sigma(\Sigma(4))\times\Gamma(4)\right)}$ | | $\left(4+4-\frac{4}{4}\right)!!$ |
| **106** | $\frac{4}{4\%}+4+\sqrt{4}$ | $(4!\times 4)+\frac{4}{.4}$ | $\frac{44}{.4}-4$ |
| | $\sqrt{alog(4)+\Sigma\left((\Gamma(4))!!\right)+\frac{4!}{.4}}$ | | $\frac{(4!!)!}{(4!!)!!}+\frac{4}{4}$ |
| **107** | $\frac{4!+4!-.\overline{4}}{.\overline{4}}$ | $\frac{(4!!)!}{(4!!)!!}+4-\sqrt{4}$ | $\frac{\Sigma(\Sigma(4!!))-4!}{4+\sqrt{4}}$ |
| | $atan\left(\Gamma(\sqrt{4})\right)+\frac{(4!!)!!}{\Gamma(4)}-\sqrt{4}$ | $\frac{4}{4\%}+4!!-\Gamma(\sqrt{4})$ | |
| | $\sqrt{\Sigma\left(\Gamma(\Gamma(4))\right)+\Sigma\left(asin\left(\Gamma(\sqrt{4})\right)\right)+asin\left(\Gamma(\sqrt{4})\right)+4}$ | | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **108** | $\frac{4}{4\%}+4+4$ | $\frac{44}{.4}-\sqrt{4}$ | $\frac{4!}{\sqrt{4}}\times\frac{4}{.\overline{4}}$ |
| | $\frac{(4!!)!}{(4!!)!!}+\sqrt{\frac{4}{.\overline{4}}}$ | $\left(\frac{\sqrt{4}}{4\%}+4\right)\times\sqrt{4}$ | $44+\frac{(4!!)!!}{\Gamma(4)}$ |
| | $\sqrt{alog(4)+\Sigma\left(\Sigma\left(\Sigma(4)\right)\right)+alog\left(\sqrt{4}\right)+4!}$ | | |
| **109** | $\frac{4}{4\%}+\frac{4}{.\overline{4}}$ | $\frac{44-.4}{.4}$ | $\frac{4!+4!+.\overline{4}}{.\overline{4}}$ |
| | $atan\left(\frac{4}{4}\right)+\frac{(4!!)!!}{\Gamma(4)}$ | $\sqrt{P\left(\frac{4!}{\sqrt{4}},4\right)+\Gamma\left(\sqrt{4}\right)}$ | |
| **110** | $\frac{4}{4\%}+\frac{4}{.4}$ | $\frac{(4!!)!}{(4!!)!!}+\frac{\sqrt{4}}{.4}$ | $\left(4!!+\Sigma\left(\sqrt{4}\right)\right)\times\frac{4}{.4}$ |
| | $\left(4!\times\frac{\sqrt{4}}{.4}\right)-\Sigma(4)$ | $\frac{4}{\sqrt{4}}\times\Sigma\left(\frac{4}{.4}\right)$ | $\left(\frac{\sqrt{4}}{.4}\right)!-\frac{4}{.4}$ |
| | $\sqrt{\left(\Gamma\left(\Gamma(4)\right)+\frac{4}{4}\right)\times alog\left(\sqrt{4}\right)}$ | $\sqrt{\sqrt{4}\times\left(\Sigma\left(alog\left(\sqrt{4}\right)\right)+\frac{4}{.4\%}\right)}$ | |
| | $\sqrt{4\times\left(\Sigma\left(\frac{4}{.4}\right)\right)^{\sqrt{4}}}$ | $\sqrt{4\times\left(\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)\right)^{\sqrt{4}}+alog\left(\Sigma\left(\sqrt{4}\right)\right)\right)}$ | |
| **111** | $\frac{444}{4}$ | $\frac{44.4}{.4}$ | $\frac{(4!!)!}{(4!!)!!}+4+\sqrt{4}$ |
| | $\frac{4}{4\%}+4!!+\Sigma\left(\sqrt{4}\right)$ | $\frac{\Gamma(4!!)}{atan\left(\Gamma\left(\sqrt{4}\right)\right)}-\frac{4}{4}$ | |
| **112** | $(4!\times4)+(4\times4)$ | $\frac{44}{.4}+\sqrt{4}$ | $\left(\frac{\sqrt{4}}{.4}\right)!-4-4$ |
| | $\frac{4}{4\%}+\frac{4!}{\sqrt{4}}$ | | |
| **113** | $\frac{(4!!)!}{(4!!)!!}+4+4$ | $\Gamma\left(\Gamma(4)\right)-4-\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{\Gamma(4!!)}{atan\left(\Gamma\left(\sqrt{4}\right)\right)}+\frac{4}{4}$ |
| | $\left(\sqrt{4}\times\frac{(4!!)!}{\left(\Gamma(4)\right)!}\right)+\Gamma\left(\sqrt{4}\right)$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}+atan\left(\Gamma\left(\sqrt{4}\right)\right)+4}$ | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **114** | $\frac{44}{.4}+4$ | $\left(\frac{\sqrt{4}}{.4}\right)!-4-\sqrt{4}$ | $C(4!!,4)+44$ |
| **115** | $\left(\frac{\sqrt{4}}{.4}\right)!-\frac{\sqrt{4}}{.4}$ | $\frac{(4!!)!}{(4!!)!!}+\frac{4}{.4}$ | $\frac{.4}{.\overline{4}\%}+\frac{alog\left(\sqrt{4}\right)}{4}$ |
| | $\sqrt{\Sigma\left(atan\left(-\Gamma\left(\sqrt{4}\right)\right)\right)+\Sigma\left(asin\left(\Gamma\left(\sqrt{4}\right)\right)\right)-\frac{\sqrt{4}}{4\%}}$ | | |
| **116** | $\frac{4}{4\%}+(4\times 4)$ | $(4!\times 4)+4!-4$ | $\frac{4^4-4!}{\sqrt{4}}$ |
| | $\sqrt{\frac{\Sigma\left(\Sigma\left(\Sigma(\Gamma(4))\right)\right)}{\sqrt{4}}+\left(\Gamma(4)\right)!!+\Sigma(4)}$ | | |
| **117** | $\left(\frac{\sqrt{4}}{.4}\right)!-\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{4!+\sqrt{4}}{.\overline{4}}\times\sqrt{4}$ | $\frac{(4!!)!}{(4!!)!!}+\frac{4!}{\sqrt{4}}$ |
| **118** | $(4!\times 4)+4!-\sqrt{4}$ | $\left(\frac{\sqrt{4}}{.4}\right)!-\frac{4}{\sqrt{4}}$ | $\frac{\left(4!\times\Sigma(4)\right)-4}{\sqrt{4}}$ |
| | $\frac{4}{4\%}+\frac{4!!}{.\overline{4}}$ | $\frac{\left(\Gamma(4)\right)!!+4+.\overline{4}}{.\overline{4}}$ | |
| **119** | $\left(\frac{\sqrt{4}}{.4}\right)!-\frac{4}{4}$ | $\frac{4!+4!-.4}{.4}$ | $\frac{(4!!)!}{(4!!)!!}+\Sigma(4)+4$ |
| **120** | $4\times\left(4!+4+\sqrt{4}\right)$ | $\frac{4!}{\sqrt{4}}\times\frac{4}{.4}$ | $\sqrt{\frac{4}{4\%}\times 4!\times\Gamma(4)}$ |
| | $\frac{4}{4\%}+\frac{4!!}{.4}$ | $\sqrt{alog(4)+\frac{4!}{.\overline{4}\%}-alog\left(\Sigma\left(\sqrt{4}\right)\right)}$ | |
| **121** | $\left(\frac{\sqrt{4}}{.4}\right)!+\frac{4}{4}$ | $\frac{\left(4!-\sqrt{4}\right)^{\sqrt{4}}}{4}$ | $\frac{4!+4!+.4}{.4}$ |
| | $\left(\Sigma(4)+\frac{4}{4}\right)^{\sqrt{4}}$ | $\frac{4}{4\%}+\Sigma\left(4+\sqrt{4}\right)$ | $\frac{(4!!)!}{(4!!)!!}+(4\times 4)$ |
| | $\sqrt{\sqrt{\sqrt{\left(\frac{\sqrt{4}}{.4}\right)^{4!}}}}-4$ | | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| 122 | $(4! \times 4) + 4! + \sqrt{4}$ | $\left(\frac{\sqrt{4}}{.4}\right)! + \frac{4}{\sqrt{4}}$ | $\frac{4}{4\%} + 4! - \sqrt{4}$ |
| | $\sqrt{\sqrt{\sqrt{\left(\frac{\sqrt{4}}{.4}\right)^{4!}}} - \Sigma(\sqrt{4})}$ | | |
| 123 | $\left(\frac{\sqrt{4}}{.4}\right)! + \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{44}{.\overline{4}} + 4!$ | $\frac{(4!!)!}{(4!!)!!} + \frac{4!!}{.\overline{4}}$ |
| | $\sqrt{\sqrt{\sqrt{\left(\frac{\sqrt{4}}{.4}\right)^{4!}}} - \sqrt{4}}$ | | |
| 124 | $(4! \times 4) + 4! + 4$ | $\frac{4^4}{\sqrt{4}} - 4$ | $(\Sigma(4) \times 4!!) + 44$ |
| | $\frac{\frac{\sqrt{4}}{.4\%} - 4}{4}$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}} + \frac{4!}{.4}$ | $\sqrt{4} \times \left(\frac{(4!!)!!}{\Gamma(4)} - \sqrt{4}\right)$ |
| | $\sqrt{\left(\Sigma(\sqrt{4}) \times \Gamma(4!!)\right) + 4^4}$ | | |
| 125 | $\left(\frac{\sqrt{4}}{.4}\right)! + \frac{\sqrt{4}}{.4}$ | $\sqrt{\sqrt{\sqrt{\left(4 + \frac{4}{4}\right)^{4!}}}}$ | $\sqrt{\left(\frac{\sqrt{4}}{.4}\right)^{(4+\sqrt{4})}}$ |
| | $C(4!!, 4) + \Sigma\left(\frac{4}{.4}\right)$ | | |
| 126 | $\frac{4^4 - 4}{\sqrt{4}}$ | $\frac{4}{4\%} + 4! + \sqrt{4}$ | $\left(\sqrt{4} \times 4^{\Sigma(\sqrt{4})}\right) - \sqrt{4}$ |
| 127 | $\frac{4^4 - \sqrt{4}}{\sqrt{4}}$ | $\frac{\frac{\sqrt{4}}{.4\%} + 4!!}{4}$ | $\Sigma(4 \times 4) - \frac{4}{.\overline{4}}$ |
| | $\frac{\left(\Gamma(4)\right)!! + 4!! + .\overline{4}}{.\overline{4}}$ | | |
| 128 | $(4! + 4 + 4) \times 4$ | $\frac{4^4 \times \sqrt{4}}{4}$ | $\sqrt{\sqrt{\sqrt{\left(\sqrt{4}\right)^{(4!+4!+4!!)}}}}$ |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **129** | $\frac{4^4+\sqrt{4}}{\sqrt{4}}$ | $\left(\frac{\sqrt{4}}{.4}\right)!+\frac{4}{.\overline{4}}$ | $\left(44-\Gamma\left(\sqrt{4}\right)\right)\times\Sigma\left(\sqrt{4}\right)$ |
| **130** | $\frac{4^4+4}{\sqrt{4}}$ | $\left(\frac{\sqrt{4}}{.4}\right)!+\frac{4}{.4}$ | $\frac{(4!!)!}{(4!!)!!}+\frac{alog\left(\sqrt{4}\right)}{4}$ |
| **131** | $\frac{\Gamma\left(\sqrt{4}\right)}{.4\%\times\sqrt{4}}+\Gamma(4)$ | $\frac{(4!!)!}{(4!!)!!}+4!+\sqrt{4}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-\frac{4}{4\%}$ |
| | $\frac{\left(\Gamma(4)\right)!!+4+.4}{.4}$ | | |
| **132** | $\frac{4^4}{\sqrt{4}}+4$ | $\frac{4}{4\%}+4!+4!!$ | $4\times\left(4!+\frac{4}{.\overline{4}}\right)$ |
| **133** | $\frac{\Gamma\left(\sqrt{4}\right)}{.4\%\times\sqrt{4}}+4!!$ | $\frac{\left(4\times alog\left(\sqrt{4}\right)\right)-\Gamma\left(\sqrt{4}\right)}{\Sigma\left(\sqrt{4}\right)}$ | $\frac{(4!!)!}{(4!!)!!}+4!+4$ |
| **134** | $\frac{44}{.4}+4!$ | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}-(4\times4)$ | $\frac{C\left(4!,\sqrt{4}\right)-4!!}{\sqrt{4}}$ |
| **135** | $\frac{\frac{\sqrt{4}}{.4}+.4}{4\%}$ | $\frac{\frac{4!}{4\%}-asec\left(\sqrt{4}\right)}{4}$ | $\frac{4}{4}\times atan\left(-\frac{4}{4}\right)$ |
| | $\frac{(4!!)!}{(4!!)!!}+asin\left(\frac{\sqrt{4}}{4}\right)$ | | |
| **136** | $\left(\frac{\sqrt{4}}{.4}\right)!+(4\times4)$ | $4\times\left(4!+\frac{4}{.4}\right)$ | $\frac{4}{4\%}+\frac{4!}{\sqrt{.\overline{4}}}$ |
| | $\left(\frac{4!}{\sqrt{4}}\right)^{\sqrt{4}}-4!!$ | $\sqrt{4}\times\left(\frac{(4!!)!!}{\Gamma(4)}+4\right)$ | $\frac{\frac{4!}{.4}+.\overline{4}}{.\overline{4}}$ |
| **137** | $\frac{\frac{\sqrt{4}}{.4\%}+\left(\Gamma(4)\right)!!}{4}$ | $\frac{C\left(4!,\sqrt{4}\right)-\sqrt{4}}{\sqrt{4}}$ | $\frac{(4!!)!}{(4!!)!!}+(4\times4!!)$ |
| | $\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)\times\sqrt{\frac{4}{.\overline{4}}}\right)+\sqrt{4}$ | $asin\left(\Gamma\left(\sqrt{4}\right)\right)+\left(\Gamma(4)\right)!!-\frac{4}{4}$ | |
| **138** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}-\frac{4!}{\sqrt{4}}$ | $\frac{4}{4\%}+\Sigma(4!!)+\sqrt{4}$ | $\Gamma\left(\Gamma(4)\right)+(4\times4)+\sqrt{4}$ |
| | $\left(\sqrt{4}\times\Sigma\left(\Sigma(4)\right)\right)+4!+4$ | $\left(44+\sqrt{4}\right)\times\Sigma\left(\sqrt{4}\right)$ | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **139** | $\left(4! \times \Gamma(4)\right) - \frac{\sqrt{4}}{.4}$ | $\Gamma\left(\Gamma(4)\right) + 4! - \frac{\sqrt{4}}{.4}$ | $\frac{(4!!)!}{(4!!)!!} + 4! + \Sigma(4)$ |
| | $\frac{4}{4\%} + atan\left(\Gamma\left(\sqrt{4}\right)\right) - \Gamma(4)$ | | |
| **140** | $\left(\frac{\sqrt{4}}{.4}\right)! + 4! - 4$ | $\left(\frac{4!}{\sqrt{4}}\right)^{\sqrt{4}} - 4$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}}{.\overline{4}} - 4$ |
| | $alog\left(\sqrt{4}\right) + 44 - 4$ | $\Sigma\left(\Sigma(4)\right) + \Sigma\left(\Gamma(4)\right) + 4^{\Sigma\left(\sqrt{4}\right)}$ | |
| **141** | $\Gamma\left(\Gamma(4)\right) + 4! - \sqrt{\frac{4}{.\overline{4}}}$ | $(4! \times 4) + atan\left(\frac{4}{4}\right)$ | $\frac{asin\left(\frac{4}{4}\right) + 4}{\sqrt{.\overline{4}}}$ |
| | $\left(atan\left(\Gamma\left(\sqrt{4}\right)\right) + \sqrt{4}\right) \times \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{\Sigma\left(\Sigma(4!!)\right) - alog\left(\sqrt{4}\right) - \sqrt{4}}{4}$ | |
| | $\frac{\frac{(4!!)!}{\left(\Gamma(4)\right)!} + .4}{.4}$ | $\frac{4}{4\%} + atan\left(\Gamma\left(\sqrt{4}\right)\right) - 4$ | |
| **142** | $\left(\frac{\sqrt{4}}{.4}\right)! + 4! - \sqrt{4}$ | $\left(\frac{4!}{\sqrt{4}}\right)^{\sqrt{4}} - \sqrt{4}$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}}{.\overline{4}} - \sqrt{4}$ |
| | $\frac{\Sigma\left(\Sigma(4!!)\right) - alog\left(\sqrt{4}\right) + \sqrt{4}}{4}$ | $\frac{(4!!)!! - \frac{4}{4\%}}{\sqrt{4}}$ | |
| **143** | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}} - .\overline{4}}{.\overline{4}}$ | $\Gamma\left(\Gamma(4)\right) + 4! - \frac{4}{4}$ | $alog\left(\sqrt{4}\right) + 44 - \Gamma\left(\sqrt{4}\right)$ |
| | $\left(\frac{4!}{\sqrt{4}}\right)^{\sqrt{4}} - \Gamma\left(\sqrt{4}\right)$ | $\frac{\Sigma\left(\Sigma(4!!)\right) - alog\left(\sqrt{4}\right) + \Gamma(4)}{4}$ | |
| **144** | $(4 + 4 + 4)^{\sqrt{4}}$ | $\frac{4}{4\%} + 44$ | $\frac{4!}{\sqrt{4}} \times \frac{4!}{\sqrt{4}}$ |
| | $\frac{4^{\Sigma\left(\sqrt{4}\right)}}{\sqrt{.\overline{4}} \times \sqrt{.\overline{4}}}$ | $\frac{.4 \times \left(4 + \sqrt{4}\right)!}{\sqrt{4}}$ | $\frac{.44}{.\overline{4}\%} + atan\left(\Gamma\left(\sqrt{4}\right)\right)$ |
| | $\Sigma(4 + 4) \times \left(\sqrt{4} + \sqrt{4}\right)$ | $\frac{\Sigma\left(\left(\Gamma(4)\right)!!\right) - 4!}{4 + 4}$ | $\left(\Sigma\left(\Gamma(4)\right) \times 4\right) + \frac{4!}{.4}$ |
| | $\sqrt{\frac{(4!!)! + \Sigma\left(\left(\Gamma(4)\right)!!\right) - 4!}{\sqrt{4}}}$ | $\sqrt{\frac{(4!!)!}{\sqrt{4}} + (4!)^{\sqrt{4}}}$ | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **145** | $\frac{4}{4\%}+\Sigma\left(\frac{4}{.\overline{4}}\right)$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}+.\overline{4}}{.\overline{4}}$ | $\Gamma\left(\Gamma(4)\right)+4!+\frac{4}{4}$ |
| | $alog\left(\sqrt{4}\right)+44+\Gamma\left(\sqrt{4}\right)$ | $\Sigma\left(acsc\left(\sqrt{4}\right)\right)-\Sigma(4!)-4!+4$ | |
| **146** | $\left(\frac{\sqrt{4}}{.4}\right)!+4!+\sqrt{4}$ | $\left(\frac{4!}{\sqrt{4}}\right)^{\sqrt{4}}+\sqrt{4}$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}}{.\overline{4}}+\sqrt{4}$ |
| | $\frac{\left(\Gamma(4)\right)!!+\sqrt{.\overline{4}}}{\sqrt{.\overline{4}}}\times\sqrt{4}$ | $alog\left(\sqrt{4}\right)+44+\sqrt{4}$ | |
| **147** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}-\sqrt{\frac{4}{.\overline{4}}}$ | $\Gamma\left(\Gamma(4)\right)+4!+\sqrt{\frac{4}{.\overline{4}}}$ | $\left(\left(\Gamma(4)\right)!!+\frac{4}{4}\right)\times\Sigma\left(\sqrt{4}\right)$ |
| | $\frac{(4!!)!}{(4!!)!!}+atan\left(\Gamma\left(\sqrt{4}\right)\right)-\Sigma\left(\sqrt{4}\right)$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-\left(\Sigma\left(\Gamma(4)\right)\times 4\right)$ | |
| **148** | $\left(\frac{\sqrt{4}}{.4}\right)!+4!+4$ | $\left(\frac{4!}{\sqrt{4}}\right)^{\sqrt{4}}+4$ | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}}{.\overline{4}}+4$ |
| | $\frac{4}{4\%}+4!+4!$ | $4^{\Sigma\left(\sqrt{4}\right)}+\left(\Gamma(4)\right)!!+\Sigma(4!!)$ | |
| | $\Sigma(4\times 4)+\frac{4!}{\sqrt{4}}$ | | |
| **149** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}-\frac{4}{4}$ | $\Gamma\left(\Gamma(4)\right)+4!+\frac{\sqrt{4}}{.4}$ | $\frac{\frac{4!}{4\%}-4}{4}$ |
| | $\frac{(4!!)!}{(4!!)!!}+44$ | $\frac{\left(asec\left(\sqrt{4}\right)\right)^{\sqrt{4}}-4!}{4!}$ | |
| **150** | $\frac{4!}{4\%\times\left(\sqrt{4}+\sqrt{4}\right)}$ | $\frac{4}{4\%}\times\frac{\sqrt{.\overline{4}}}{.\overline{4}}$ | $\frac{4!\times 4}{\left(4^{\Sigma\left(\sqrt{4}\right)}\right)\%}$ |
| | $\frac{4\times 4}{.\overline{4}\times(4!)\%}$ | $\left(\frac{\sqrt{4}}{.4}\right)!!\times\frac{4}{.4}$ | $\left(4!+\frac{4}{4}\right)\times\Gamma(4)$ |
| | $\frac{\sqrt{4}+\sqrt{4}+\sqrt{4}}{4\%}$ | $asin\left(\frac{4}{4}\right)+asec\left(\frac{4}{\sqrt{4}}\right)$ | $\Gamma\left(\Gamma(4)\right)+4!+4+\sqrt{4}$ |
| | $\frac{4}{4\%}+\left(\Gamma(4)\right)!!+\sqrt{4}$ | $\sqrt{\frac{4}{4}\div.\overline{4}\%\%}$ | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **151** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}+\frac{4}{4}$ | $\frac{4!}{4\times 4\%}+\Gamma(\sqrt{4})$ | $\frac{\left(asec(\sqrt{4})\right)^{\sqrt{4}}+4!}{4!}$ |
| | $\frac{\frac{4!}{.4}+.4}{.4}$ | $\frac{4}{4\%}+\Sigma(\Sigma(4))-4$ | |
| | $\Gamma(\Gamma(4))+4!+4!!-\Gamma(\sqrt{4})$ | | |
| **152** | $(44\times 4)-4!$ | $\frac{4!}{.4\times .4}+\sqrt{4}$ | $\frac{\left(asec(\sqrt{4})\right)^{\sqrt{4}}+(\Gamma(4))!!}{4!}$ |
| **153** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}+\sqrt{\frac{4}{.\overline{4}}}$ | $\Gamma(\Gamma(4))+4!+\frac{4}{.\overline{4}}$ | $\frac{4}{4\%}+\Sigma(\Sigma(4))-\sqrt{4}$ |
| **154** | $\frac{4!}{.4\times .4}+4$ | $(4!\times\Gamma(4))+\frac{4}{.4}$ | $\frac{\Sigma(4!)+4+4}{\sqrt{4}}$ |
| | $\frac{asec(\sqrt{4})+4!!+.\overline{4}}{.\overline{4}}$ | | |
| **155** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}+\frac{\sqrt{4}}{.4}$ | $\frac{4^{\Sigma(\sqrt{4})}-\sqrt{4}}{.4}$ | $\frac{\Sigma(4!)+\Gamma(4)+4}{\sqrt{4}}$ |
| | $\frac{4}{4\%}+\Sigma\left(\frac{4}{.4}\right)$ | $atan\left(-\frac{4}{4}\right)+\frac{4!!}{.4}$ | |
| **156** | $\frac{(4+\sqrt{4})!}{4}-4!$ | $(4!\times\Gamma(4))+\frac{4!}{\sqrt{4}}$ | $\frac{\Sigma(4!)+\frac{4!}{\sqrt{4}}}{\sqrt{4}}$ |
| **157** | $\left(4\times atan\left(\Gamma(\sqrt{4})\right)\right)-4!+\Gamma(\sqrt{4})$ | | $\frac{\left(asec(\sqrt{4})\times\Sigma(\Gamma(4))\right)-4}{4!!}$ |
| | $\left(\Sigma(\Sigma(4))\times\Sigma(\sqrt{4})\right)-4!!$ | | $\frac{(4!!)!}{(4!!)!!}+asec(\sqrt{4})-4!!$ |
| **158** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}+4+4$ | $\left(\Sigma(\Gamma(4))\times 4!!\right)-\frac{4}{.4}$ | $\frac{\Sigma(4!)+(4\times 4)}{\sqrt{4}}$ |
| **159** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}+\frac{4}{.\overline{4}}$ | $asin\left(\Gamma(\sqrt{4})\right)+(\Gamma(4))!!+atan\left(\Gamma(\sqrt{4})\right)-4!$ | |
| | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}}-.4}{.4}$ | $\frac{\Sigma(4!)+\frac{4!!}{.\overline{4}}}{\sqrt{4}}$ | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **160** | $4 \times 4 \times \frac{4}{.4}$ | $\frac{\sqrt{.\bar{4}}}{.\bar{4}\%} + \frac{4}{.4}$ | $\frac{.\bar{4} \times (4+\sqrt{4})!}{\sqrt{4}}$ |
| | $\sqrt{\Sigma\left(\Sigma\left(\Sigma(\Gamma(4))\right)\right) - \Sigma\left((\Gamma(4))!!\right) - \frac{4!!}{.4}}$ | | |
| **161** | $\frac{\sqrt{\sqrt{\sqrt{4^{4!}}}} + .4}{.4}$ | $\frac{(\Gamma(4))^4 - 4!!}{4!!}$ | $\frac{(\Gamma(4))!! + 4! - .\bar{4}}{.\bar{4}}$ |
| **162** | $\frac{4!}{.\bar{4}} \times \sqrt{\frac{4}{.\bar{4}}}$ | $\frac{(\Gamma(4))^4}{4+4}$ | $\frac{(4+\sqrt{4})!! + 4!}{.\bar{4}}$ |
| **163** | $\frac{(\Gamma(4))!! + 4! + .\bar{4}}{.\bar{4}}$ | $\frac{(\Gamma(4))^4 + 4!!}{4!!}$ | $\frac{\Sigma(4!) + 4! + \sqrt{4}}{\sqrt{4}}$ |
| **164** | $\left(\frac{\sqrt{4}}{.4}\right)! + 44$ | $\frac{4}{4\%} + 4^{\Sigma(\sqrt{4})}$ | $\frac{\Sigma(\Sigma(4+4)) - \Sigma(4)}{4}$ |
| | $\sqrt{\Sigma\left(\Sigma\left(\Sigma(4+\sqrt{4})\right)\right) + \frac{4}{4\%}}$ | | |
| **165** | $\frac{4^{\Sigma(\sqrt{4})} + \sqrt{4}}{.4}$ | $\frac{\Sigma(\Sigma(4)) \times (4+\sqrt{4})}{\sqrt{4}}$ | $\frac{\Sigma(4!) + asin\left(\frac{\sqrt{4}}{4}\right)}{\sqrt{4}}$ |
| **166** | $\frac{\sqrt{.\bar{4}}}{.\bar{4}\%} + (4 \times 4)$ | $4^4 - \frac{.4}{.\bar{4}\%}$ | $\frac{\frac{(4!!)!}{\Gamma(\Gamma(4))} - 4}{\sqrt{4}}$ |
| | $\Gamma(\Gamma(4)) + 44 + \sqrt{4}$ | $.4 \times \left(\Sigma\left(acsc(\sqrt{4})\right) - \frac{\sqrt{4}}{4\%}\right)$ | |
| | $\left((\Sigma(\Gamma(4)) \times 4) - \Gamma(\sqrt{4})\right) \times \sqrt{4}$ | $alog(\sqrt{4}) + 4^{\Sigma(\sqrt{4})} + \sqrt{4}$ | |
| **167** | $\left(\frac{\sqrt{4}}{.4}\right)! + (\Gamma(4))!! - \Gamma(\sqrt{4})$ | $\frac{\frac{(4!!)!}{\Gamma(\Gamma(4))} - \sqrt{4}}{\sqrt{4}}$ | |
| | $\frac{(4!!)!}{(4!!)!!} + asec(\sqrt{4}) + \sqrt{4}$ | $\Sigma\left(\Sigma(\Gamma(4))\right) - (4 \times 4 \times 4)$ | |
| **168** | $(44 - \sqrt{4}) \times 4$ | $\left(\Sigma(\Sigma(4)) + \frac{4}{4}\right) \times \Sigma(\sqrt{4})$ | $\left(\frac{4!}{.4} + 4!\right) \times \sqrt{4}$ |
| | $(4! + 4) \times (4 + \sqrt{4})$ | $\Sigma(\Gamma(4)) \times 4!! \times \frac{4}{4}$ | $(4^4 - 4) \times \sqrt{.\bar{4}}$ |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **169** | $\frac{\left(4!+\sqrt{4}\right)^{\sqrt{4}}}{4}$ | $\frac{(4!!)!}{(4!!)!!}+4^{\Sigma(\sqrt{4})}$ | $\left(4!!+\frac{\sqrt{4}}{.4}\right)^{\sqrt{4}}$ |
| **170** | $\frac{4}{4\%}+C(4!!,4)$ | $\frac{4!!}{4\%}-\sqrt{\frac{4}{.\overline{4}\%}}$ | $\frac{\frac{(4!!)!}{\Gamma\left(\Gamma(4)\right)}+4}{\sqrt{4}}$ |
| **171** | $\frac{\frac{4}{4\%}-4!}{.\overline{4}}$ | $\frac{(4!!)!!+\Sigma(4!)}{\sqrt{4}+\sqrt{4}}$ | $\left(\Sigma\left(\Gamma(4)\right)-\sqrt{4}\right)\times\frac{4}{.\overline{4}}$ |
| | $\frac{asec\left(\sqrt{4}\right)+4!!+.4}{.4}$ | | |
| **172** | $(44\times 4)-4$ | $\frac{4!!}{4\%}-4!-4$ | $\frac{(4!!)!!-\Sigma(4!!)-4}{\sqrt{4}}$ |
| | $\frac{\Sigma\left(\Sigma(4)\right)+\Sigma\left(\Gamma(4)\right)+.\overline{4}}{.\overline{4}}$ | $alog\left(\sqrt{4}\right)+4!+4!+4!$ | |
| **173** | $\frac{(4!!)!!-\left(\Gamma(4)\right)!!+\Sigma(4)}{\sqrt{4}}$ | $\left(\Sigma(4)+\Sigma\left(\sqrt{4}\right)\right)^{\sqrt{4}}+4$ | |
| | $\left(\Sigma\left(\Sigma(4)\right)\times\Sigma\left(\sqrt{4}\right)\right)+4+4$ | $\frac{\Sigma\left(\Sigma(4!!)\right)+4!+\sqrt{4}}{4}$ | |
| **174** | $(44\times 4)-\sqrt{4}$ | $\frac{\left(4+\sqrt{4}\right)!-4!}{4}$ | $\sqrt{(4!!)!-alog(4)-44}$ |
| **175** | $\frac{4!+4}{.4\times .4}$ | $\frac{4!!}{4\%}-\frac{alog\left(\sqrt{4}\right)}{4}$ | $\left(\Sigma(4!!)-\Gamma\left(\sqrt{4}\right)\right)\times\frac{\sqrt{4}}{.4}$ |
| | $\frac{\left(\Gamma(4)\right)!-4!+4}{4}$ | $(\Sigma(4)+4)^{\sqrt{4}}-\Sigma\left(\Gamma(4)\right)$ | $\left(4\cdot atan\left(\Gamma\left(\sqrt{4}\right)\right)\right)-\frac{\sqrt{4}}{.4}$ |
| **176** | $44\times\sqrt{4}\times\sqrt{4}$ | $\frac{\left(4+\sqrt{4}\right)!}{4}-4$ | $\frac{4+4}{4\%}-4!$ |
| | $\frac{4}{4\%}+\Sigma\left(\Sigma(4)\right)+\Sigma\left(\Gamma(4)\right)$ | $\left(\frac{\sqrt{4}}{.4}\right)!+\left(\Gamma(4)\right)!!+4!!$ | $\frac{C(4!!,4)+.4}{.4}$ |
| | $\frac{(4!!)!!-4!-4!!}{\sqrt{4}}$ | $\left(4!\times\Sigma(4)\right)-4^{\Sigma(\sqrt{4})}$ | $4^4-(\Sigma(4)\times 4!!)$ |
| | $\left(\sqrt{4}\times 4^{\Sigma(\sqrt{4})}\right)+\left(\Gamma(4)\right)!!$ | $alog\left(\sqrt{4}\right)+\left(\Gamma(4)\right)!!+4!+4$ | |
| **177** | $\frac{(4!!)!!-\sqrt{\frac{4}{.\overline{4}\%}}}{\sqrt{4}}$ | $\frac{(4!!)!}{(4!!)!!}+\left(\Sigma(4!!)\times\sqrt{4}\right)$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)-44-\Sigma(4)$ |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **178** | $(44 \times 4) + \sqrt{4}$ | $\frac{(4+\sqrt{4})!}{4} - \sqrt{4}$ | $\Gamma(\Gamma(4)) + (\Gamma(4))!! + \frac{4}{.4}$ |
| | $\frac{4}{4\%} + \Sigma\left(\frac{4!}{\sqrt{4}}\right)$ | $\frac{4!!}{4\%} - 4! + \sqrt{4}$ | |
| **179** | $\left(4 \cdot atan\left(\Gamma(\sqrt{4})\right)\right) - \frac{4}{4}$ | $\frac{4!!}{4\%} - \Sigma(4+\sqrt{4})$ | $\Sigma\left(\Sigma(\Gamma(4))\right) - 44 - 4!!$ |
| **180** | $(44 \times 4) + 4$ | $\frac{(\sqrt{4}+\sqrt{4}+\sqrt{4})!}{4}$ | $\frac{4}{.4\%} - \left(\frac{4!}{4}\right)!$ |
| | $\frac{\frac{4!!}{.4} \times 4}{.\overline{4}}$ | $\frac{4!!}{4\%} - \frac{4!!}{.4}$ | |
| **181** | $\left(4 \cdot atan\left(\Gamma(\sqrt{4})\right)\right) + \frac{4}{4}$ | $\frac{4!!}{4\%} - \Sigma(\Gamma(4)) + \sqrt{4}$ | $\Sigma\left(\Sigma(\Gamma(4))\right) - 44 - \Gamma(4)$ |
| | $\frac{(\Sigma(4) \times 4!!) + .\overline{4}}{.\overline{4}}$ | $\frac{(\Gamma(4))!! + 4! + .4}{.4}$ | |
| **182** | $\frac{(4+\sqrt{4})!}{4} + \sqrt{4}$ | $(44 \times 4) + \Gamma(4)$ | $(4!!)!! - \frac{4!!}{4\%} - \sqrt{4}$ |
| | $\frac{4!!}{4\%} - \frac{4!!}{.\overline{4}}$ | | |
| **183** | $\left(4 \cdot atan\left(\Gamma(\sqrt{4})\right)\right) + \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{4!!}{4\%} - \Sigma(\Gamma(4)) + 4$ | $\frac{(4!!)!}{(4!!)!!} + \Sigma\left(\frac{4!}{\sqrt{4}}\right)$ |
| **184** | $\frac{(4+\sqrt{4})!}{4} + 4$ | $\frac{4!!}{4\%} - (4 \times 4)$ | $(4+4)!! - \frac{4!!}{4\%}$ |
| | $(4! \times 4!!) - (4 \times \sqrt{4})$ | $4 \times (44 + \sqrt{4})$ | |
| **185** | $\left(4 \cdot atan\left(\Gamma(\sqrt{4})\right)\right) + \frac{\sqrt{4}}{.4}$ | $\Sigma\left(\Sigma(\Gamma(4))\right) - 44 - \sqrt{4}$ | $\frac{(4!!)!}{(4!!)!!} + (\Sigma(4) \times 4!!)$ |
| | $\frac{4!!}{4\%} - \left(\frac{\sqrt{4}}{.4}\right)!!$ | | |
| **186** | $\frac{(4+\sqrt{4})! + 4!}{4}$ | $\left(4 \cdot atan\left(\frac{4}{4}\right)\right) + \Gamma(4)$ | $\frac{\frac{4}{4\%} + 4!}{\sqrt{.\overline{4}}}$ |
| | $\frac{4!!}{4\%} - \Sigma(4) - 4$ | | |
| **187** | $\frac{atan\left(\Gamma(\sqrt{4})\right)}{(4!)\%} - \frac{\sqrt{4}}{4}$ | $\Sigma\left(\Sigma(4+\sqrt{4})\right) - 44$ | $\frac{(\Gamma(4))! + 4! + 4}{4}$ |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **188** | $\left(4! \times 4 \times \sqrt{4}\right) - 4$ | $\frac{4!!}{4\%} - \frac{4!}{\sqrt{4}}$ | $\sqrt{4} \times \left(\frac{.4}{.\overline{4}\%} + 4\right)$ |
| | $\sqrt{(4!!)! - \Gamma(4!!) + 4^{\Sigma(\sqrt{4})}}$ | $\frac{(4!!)!! - 4 - 4}{\sqrt{4}}$ | |
| **189** | $\left(4 \cdot atan\left(\Gamma\left(\sqrt{4}\right)\right)\right) + \frac{4}{.\overline{4}}$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - 44 + \sqrt{4}$ | $\frac{(4!!)!}{(4!!)!!} + \left(\Sigma\left(\Gamma(4)\right) \times 4\right)$ |
| | $\Sigma\left(4 + \sqrt{4}\right) \times \frac{4}{.\overline{4}}$ | | |
| **190** | $\left(4! \times 4 \times \sqrt{4}\right) - \sqrt{4}$ | $\frac{4!!}{4\%} - \frac{4}{.4}$ | $\frac{4}{4\%} + \frac{.4}{.\overline{4}\%}$ |
| | $\left(\Sigma\left(\Gamma(4)\right) - \sqrt{4}\right) \times \frac{4}{.4}$ | $\frac{\left(4 \times \Sigma\left(\Gamma(4)\right)\right) + .\overline{4}}{.\overline{4}}$ | |
| **191** | $\frac{4!!}{4\%} - \frac{4}{.\overline{4}}$ | $\Sigma(\Sigma(4) + 4!!) + 4! - 4$ | $\frac{(4+4)!! - \sqrt{4}}{\sqrt{4}}$ |
| | $\frac{\Sigma\left(\Sigma(4)\right) + \Sigma\left(\Gamma(4)\right) + .4}{.4}$ | | |
| **192** | $(4! \times 4) + (4! \times 4)$ | $\frac{4!!}{4\%} - 4 - 4$ | $\sqrt{\sqrt{\sqrt{4^{4!}}}} \times \sqrt{\frac{4}{.\overline{4}}}$ |
| | $4! \times \left(4 + \sqrt{4} + \sqrt{4}\right)$ | | |
| **193** | $\Sigma(\Sigma(4) + 4!!) + 4! - \sqrt{4}$ | $alog\left(\sqrt{4}\right) + asin\left(\Gamma\left(\sqrt{4}\right)\right) + \sqrt{\frac{4}{.\overline{4}}}$ | |
| | $\left(\Sigma\left(\Gamma(4)\right) \times \frac{4}{.\overline{4}}\right) + 4$ | $(\Sigma(4) + 4)^{\sqrt{4}} - \Sigma\left(\sqrt{4}\right)$ | $\frac{(4+4)!! + \sqrt{4}}{\sqrt{4}}$ |
| **194** | $\left(4! \times 4 \times \sqrt{4}\right) + \sqrt{4}$ | $(\Sigma(4) + 4)^{\sqrt{4}} - \sqrt{4}$ | $\frac{4!!}{4\%} - 4 - \sqrt{4}$ |
| | $\Sigma(4! - 4) - (4 \times 4)$ | | |
| **195** | $\frac{4!!}{4\%} - \frac{\sqrt{4}}{.4}$ | $\Sigma\left(\frac{4}{.4} + 4!!\right) + 4!$ | $\left(\Sigma(4!!) + \Sigma\left(\sqrt{4}\right)\right) \times \frac{\sqrt{4}}{.4}$ |
| **196** | $\left(4! \times 4 \times \sqrt{4}\right) + 4$ | $\left(\frac{4}{.4} + 4\right)^{\sqrt{4}}$ | $\frac{4!!}{4\%} - \sqrt{4} - \sqrt{4}$ |
| | $4^4 - \frac{4!}{.4}$ | | |

## SECTION II — SOLUTIONS 101–200

| | | | |
|---|---|---|---|
| **197** | $\frac{4!!}{4\%} - \sqrt{\frac{4}{.\overline{4}}}$ | $\Sigma(\Sigma(4) + 4!!) + 4! + \sqrt{4}$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right) - 4! - \frac{4}{.4}$ |
| | $(4!!)!! - \Sigma\left(\Sigma\left(\Gamma(4)\right)\right) + 44$ | | |
| **198** | $\frac{4!!}{4\%} - \frac{4}{\sqrt{4}}$ | $(\Sigma(4) + 4)^{\sqrt{4}} + \sqrt{4}$ | $\left(\left(\Gamma(4)\right)!! \times 4\right) + 4 + \sqrt{4}$ |
| | $\Sigma(\sqrt{4}) \times \left(\sqrt{\sqrt{\sqrt{4^{4!}}} + \sqrt{4}}\right)$ | $\left(4 \cdot atan\left(\Gamma(\sqrt{4})\right)\right) + \frac{4!!}{.\overline{4}}$ | |
| **199** | $\frac{4!!}{4\%} - \frac{4}{4}$ | $\Sigma(\Sigma(4) + 4!!) + 4! + 4$ | $\Sigma\left(\Sigma\left(4 + \sqrt{4}\right)\right) - \sqrt[.4]{4}$ |
| | $\frac{asin\left(\Gamma(\sqrt{4})\right) - \sqrt{4} + .\overline{4}}{.\overline{4}}$ | | |
| **200** | $(4! - 4) \times \frac{4}{.4}$ | $4 \times \left(4! + 4! + \sqrt{4}\right)$ | $\left(4! + \frac{4}{4}\right) \times 4!!$ |
| | $(4! \times 4!!) + \left(4 \times \sqrt{4}\right)$ | $(44 \times 4) + 4!$ | $\left(\Gamma(4)\right)^{\Sigma(\sqrt{4})} - 4^{\sqrt{4}}$ |
| | $\frac{4}{4\%} + \frac{4}{4\%}$ | $4^4 - \frac{(4!!)!}{\left(\Gamma(4)\right)!}$ | $\left(4 \times \Sigma\left(\Sigma(4)\right)\right) - \frac{4!!}{.4}$ |
| | $\sqrt{(4!!)! - (4!!)!! + \sqrt{\sqrt{\sqrt{4^{4!}}}}}$ | $\left(4 \cdot atan\left(\Gamma(\sqrt{4})\right)\right) + 4! - 4$ | |
| | $\left(\Sigma(\sqrt{4}) \times \Sigma\left(4!! + \Sigma(\sqrt{4})\right)\right) + \sqrt{4}$ | | |

# Solutions History 101–200

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| **101** | 1 | 1 | 4 | |
| **102** | 2 | 2 | 4 | |
| **103** | 1 | 1 | 4 | |
| **104** | 2 | 2 | 4 | |
| **105** | 2 | 2 | 7 | |
| **106** | 3 | 3 | 5 | |
| **107** | 4 | 4 | 6 | |
| **108** | 4 | 4 | 7 | |
| **109** | 3 | 3 | 5 | |
| **110** | 2 | 2 | 10 | |
| **111** | 3 | 3 | 5 | |
| **112** | 2 | 2 | 4 | |
| **113** | 5 | 5 | 5 | |
| **114** | 1 | 1 | 3 | |
| **115** | 1 | 1 | 4 | |
| **116** | 2 | 2 | 4 | |
| **117** | 1 | 1 | 3 | |
| **118** | 1 | 1 | 5 | |
| **119** | 2 | 2 | 3 | |
| **120** | 2 | 2 | 5 | |
| **121** | 3 | 3 | 7 | |
| **122** | 1 | 1 | 4 | |
| **123** | 2 | 2 | 4 | |
| **124** | 2 | 2 | 7 | |
| **125** | 2 | 2 | 4 | |
| **126** | 1 | 1 | 3 | |
| **127** | 1 | 1 | 4 | |
| **128** | 2 | 2 | 3 | |
| **129** | 2 | 2 | 3 | |
| **130** | 2 | 2 | 3 | |
| **131** | 1 | 1 | 4 | |
| **132** | 1 | 1 | 3 | |
| **133** | 1 | 1 | 3 | |
| **134** | 2 | 2 | 3 | |
| **135** | 1 | 1 | 4 | |
| **136** | 2 | 2 | 6 | |
| **137** | 4 | 4 | 5 | |
| **138** | 1 | 1 | 5 | |
| **139** | 2 | 2 | 4 | |
| **140** | 4 | 4 | 5 | |

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| **141** | 1 | 1 | 7 | |
| **142** | 3 | 3 | 5 | |
| **143** | 2 | 2 | 5 | |
| **144** | 5 | 6 | 11 | |
| **145** | 2 | 2 | 5 | |
| **146** | 4 | 4 | 5 | |
| **147** | 2 | 2 | 5 | |
| **148** | 4 | 4 | 6 | |
| **149** | 3 | 3 | 5 | |
| **150** | 7 | 7 | 11 | |
| **151** | 3 | 3 | 6 | |
| **152** | 2 | 2 | 3 | |
| **153** | 2 | 2 | 3 | |
| **154** | 1 | 1 | 4 | |
| **155** | 2 | 2 | 5 | |
| **156** | 1 | 1 | 3 | |
| **157** | 1 | 1 | 4 | |
| **158** | 1 | 1 | 3 | |
| **159** | 1 | 2 | 4 | |
| **160** | 3 | 3 | 4 | |
| **161** | 1 | 1 | 3 | |
| **162** | 1 | 1 | 3 | |
| **163** | 1 | 1 | 3 | |
| **164** | 1 | 2 | 4 | |
| **165** | 1 | 1 | 3 | |
| **166** | 2 | 2 | 7 | |
| **167** | 1 | 1 | 4 | |
| **168** | 1 | 1 | 6 | |
| **169** | 2 | 2 | 3 | |
| **170** | 3 | 3 | 3 | |
| **171** | 1 | 1 | 4 | |
| **172** | 1 | 1 | 5 | |
| **173** | 1 | 1 | 4 | |
| **174** | 3 | 3 | 3 | |
| **175** | 2 | 2 | 6 | |
| **176** | 1 | 1 | 11 | |
| **177** | 1 | 1 | 3 | |
| **178** | 2 | 2 | 5 | |
| **179** | 1 | 1 | 3 | |
| **180** | 3 | 3 | 5 | |

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| **181** | 1 | 1 | 5 | |
| **182** | 2 | 2 | 4 | |
| **183** | 1 | 1 | 3 | |
| **184** | 1 | 1 | 5 | |
| **185** | 1 | 1 | 4 | |
| **186** | 1 | 1 | 4 | |
| **187** | 1 | 1 | 3 | |
| **188** | 2 | 2 | 5 | |
| **189** | 1 | 1 | 4 | |
| **190** | 2 | 2 | 5 | |
| **191** | 1 | 1 | 4 | |
| **192** | 2 | 2 | 4 | |
| **193** | 1 | 1 | 5 | |
| **194** | 1 | 1 | 4 | |
| **195** | 1 | 1 | 3 | |
| **196** | 1 | 1 | 4 | |
| **197** | 1 | 1 | 4 | |
| **198** | 2 | 2 | 5 | |
| **199** | 1 | 1 | 4 | |
| **200** | 3 | 3 | 12 | |
| **Σ** | **188** | **191** | **464** | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **201** | $\frac{4!!}{4\%}+\frac{4}{4}$ | $\sqrt{(4!!)!+\left(\frac{4}{.\overline{4}}\right)^{\sqrt{4}}}$ | $\frac{(4!!)!}{(4!!)!!}+(4!\times 4)$ |
| | $\frac{4}{.\overline{4}\times 4\%}-4!$ | $\frac{\left(4!!\times\Sigma(4)\right)+.4}{.4}$ | |
| **202** | $\frac{4!!}{4\%}+4-\sqrt{4}$ | $\sqrt{4}\times\left(\frac{4}{4\%}+\Gamma\left(\sqrt{4}\right)\right)$ | $\sqrt{(4!!)!+(4!!)!!+\frac{4}{4\%}}$ |
| | $\sqrt{4}\times\left(\frac{(4!!)!}{(4!!)!!}-4\right)$ | $\frac{\frac{\left(\Gamma(4)\right)!}{.\overline{4}}-4}{4!!}$ | |
| **203** | $\frac{4!!}{4\%}+\sqrt{\frac{4}{.\overline{4}}}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-4!-4$ | $\frac{(4!!)!}{(4!!)!!}+alog\left(\sqrt{4}\right)-\sqrt{4}$ |
| **204** | $\frac{4+4}{4\%}+4$ | $\frac{\left(4+\sqrt{4}\right)!}{4}+4!$ | $\left(\frac{(4!!)!}{(4!!)!!}\times\sqrt{4}\right)-\Gamma(4)$ |
| | $\sqrt{(4!!)!+\frac{4!\times 4!}{.\overline{4}}}$ | $\sqrt{4}\times\left(\frac{4}{4\%}+\sqrt{4}\right)$ | |
| **205** | $\frac{4!!}{4\%}+\frac{\sqrt{4}}{.4}$ | $\frac{(4!!)!}{(4!!)!!}+\frac{4}{4\%}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-4!-\sqrt{4}$ |
| **206** | $\frac{4!!}{4\%}+4+\sqrt{4}$ | $\left(\frac{(4!!)!}{(4!!)!!}\times\sqrt{4}\right)-4$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)-4!-\frac{4}{4}$ |
| **207** | $\left(4!-\Gamma\left(\sqrt{4}\right)\right)\times\frac{4}{.\overline{4}}$ | $\frac{4!!}{4\%}+4!!-\Gamma\left(\sqrt{4}\right)$ | $\left(\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)-4!\right)\times\frac{4}{4}$ |
| **208** | $\frac{4!!}{4\%}+4+4$ | $\left(\frac{(4!!)!}{(4!!)!!}\times\sqrt{4}\right)-\sqrt{4}$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)-4!+\frac{4}{4}$ |
| | $\left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)}-4-4$ | $\frac{asin\left(\Gamma\left(\sqrt{4}\right)\right)+\sqrt{4}+.\overline{4}}{.\overline{4}}$ | |
| **209** | $\frac{4!!}{4\%}+\frac{4}{.\overline{4}}$ | $\frac{4!!}{4\%}+4!!+\Gamma\left(\sqrt{4}\right)$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-4!+\sqrt{4}$ |
| **210** | $\frac{4!!}{4\%}+\frac{4}{.4}$ | $\frac{(4+4)!}{(4!!)!!}\times\sqrt{4}$ | $C(4!!,4)\times\sqrt{\frac{4}{.\overline{4}}}$ |
| | $\Sigma\left(4+\sqrt{4}\right)\times\frac{4}{.4}$ | $\left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)}-4-\sqrt{4}$ | $\frac{4\times\sqrt{4}}{4\%}+\Sigma(4)$ |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **211** | $4^4 - atan\left(\frac{4}{4}\right)$ | $\frac{4!!}{4\%} + 4!! + \Sigma\left(\sqrt{4}\right)$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right) - 4! + 4$ |
| | $\frac{\left(4 \times \Sigma\left(\Gamma(4)\right)\right) + .4}{.4}$ | | |
| **212** | $4^4 - 44$ | $\frac{4! \times 4}{.\overline{4}} - 4$ | $\frac{4!!}{4\%} + \frac{4!}{\sqrt{4}}$ |
| | $\sqrt{\sqrt{\sqrt{\left(4+\sqrt{4}\right)^{4!}}}} - 4$ | $\left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)} - \sqrt{4} - \sqrt{4}$ | $\sqrt{4} \times \left(\frac{4}{4\%} + \Gamma(4)\right)$ |
| **213** | $\frac{4! \times 4}{.\overline{4}} - \Sigma\left(\sqrt{4}\right)$ | $\frac{4!!}{4\%} + \Sigma(4) + \Sigma\left(\sqrt{4}\right)$ | $\frac{\Gamma(4+4)}{4!} + \Sigma(4)$ |
| | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right) - 4! + \Gamma(4)$ | | $\sqrt{(4!!)! + \Gamma(4!!) + \frac{4}{.\overline{4}}}$ |
| **214** | $\frac{4! \times 4}{.\overline{4}} - \sqrt{4}$ | $\sqrt{\sqrt{\sqrt{\left(4+\sqrt{4}\right)^{4!}}}} - \sqrt{4}$ | $\frac{4!!}{4\%} + 4!! + \Gamma(4)$ |
| | $\left(4! \times \Gamma(4)\right) + C(4!!, 4)$ | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%} + \frac{(4!!)!!}{\Gamma(4)}$ | $\frac{\Gamma(4+4)}{4!} + 4$ |
| **215** | $\frac{(4! \times 4) - .\overline{4}}{.\overline{4}}$ | $\frac{(4!!)!}{(4!!)!!} + alog\left(\sqrt{4}\right) - \Sigma(4)$ | $\left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)} - \frac{4}{4}$ |
| | $\frac{4}{.\overline{4} \times 4\%} - \Sigma(4)$ (see footnote 1) | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right) - (4 \times 4)$ | $atan\left(-\frac{4}{4}\right) + (\Sigma(4) \times 4!!)$ |

[1] There are at least four methods for creating 225 with three 4s, which is the basis for this particular solution for 215:

$$225 = \frac{4}{.\overline{4} \times 4\%} = \Gamma\left(\Gamma(4)\right) + \frac{(4!!)!}{(4!!)!!} = \left(\left(\frac{\sqrt{4}}{.4}\right)!!\right)^{\sqrt{4}} = \frac{\sqrt{4}}{.4} \times atan\left(\Gamma\left(\sqrt{4}\right)\right)$$

For efficiency, I usually use just the first method for developing complete solutions based on 225 for other integers and do not show the other three solutions. Similarly, when using numbers with multiple partial solutions (e.g. 12, 32, 64, etc.) to build complete solutions, I generally use only one partial solution per integer rather than create the additional similar solutions. Often the selection of one partial solution over another is based on similarity with other parts of the solution. For example, one solution for 75 is $\sqrt{C\left(\Sigma\left(\Gamma(4)\right), 4\right) - P(\Gamma(4), 4)} = \sqrt{5{,}985 - 360}$. Of the two two-4 partial solutions I have for 360, I chose here the one based on the Permutation Function because the only two-4 partial solution I have for 5,985 is based on the related Combination Function.

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **216** | $\frac{4!!}{4\%}+(4\times 4)$ | $\sqrt{\sqrt{\sqrt{\left(\sqrt{4}+\sqrt{4}+\sqrt{4}\right)^{4!}}}}$ | $\left(4+\sqrt{4}\right)^{\sqrt{4\div .\overline{4}}}$ |
| | $4\times\left(\frac{\sqrt{4}}{4\%}+4\right)$ | $\sqrt{4}\times\left(\frac{4}{4\%}+4!!\right)$ | $\Sigma(4!)-\left(\Sigma\left(4+\sqrt{4}\right)\times 4\right)$ |
| | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-\Sigma\left(\frac{\sqrt{4}}{.4}\right)$ | | |
| **217** | $\frac{(4!\times 4)+.\overline{4}}{.\overline{4}}$ | $\frac{4}{.\overline{4}\times 4\%}-4!!$ | $\left(\Gamma(4)\right)^{\Sigma(\sqrt{4})}+\frac{4}{4}$ |
| | $\sqrt{\sqrt{\sqrt{\left(4+\sqrt{4}\right)^{4!}}}}+\Gamma\left(\sqrt{4}\right)$ | $\Gamma\left(\Gamma(4)\right)+\frac{(4!!)!}{(4!!)!!}-4!!$ | |
| **218** | $\sqrt{\sqrt{\sqrt{\left(4+\sqrt{4}\right)^{4!}}}}+\sqrt{4}$ | $\frac{4!!}{4\%}+\frac{4!!}{.\overline{4}}$ | $4^4-\Sigma(4!!)-\sqrt{4}$ |
| | $\sqrt{4}\times\left(alog\left(\sqrt{4}\right)+\frac{4}{.\overline{4}}\right)$ | | |
| **219** | $\frac{4}{.\overline{4}\times 4\%}-\Gamma(4)$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-\frac{4!}{\sqrt{4}}$ | $\Gamma\left(\Gamma(4)\right)+\frac{(4!!)!}{(4!!)!!}-\Gamma(4)$ |
| | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)-4-4-4$ | | |
| **220** | $\frac{44\times\sqrt{4}}{.4}$ | $\sqrt{\sqrt{\sqrt{\left(4+\sqrt{4}\right)^{4!}}}}+4$ | $\frac{4!+.\overline{4}}{.\overline{4}}\times 4$ |
| | $\frac{\Sigma\left(\Sigma(4!!)\right)-4-\sqrt{4}}{\Sigma\left(\sqrt{4}\right)}$ | | |
| **221** | $\frac{4}{.\overline{4}\times 4\%}-4$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-\frac{4}{.4}$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)-4-4-\sqrt{4}$ |
| | $\frac{44+\sqrt{4\%}}{\sqrt{4\%}}$ | $\frac{asin\left(\Gamma\left(\sqrt{4}\right)\right)-\sqrt{4}+.4}{.4}$ | $\frac{C\left(\Sigma\left(\Gamma(4)\right),\Sigma\left(\sqrt{4}\right)\right)-4}{\Gamma(4)}$ |
| | $\left(\sqrt{4}\times\left(\frac{(4!!)!}{(4!!)!!}+4\right)\right)+\Sigma\left(\sqrt{4}\right)$ | | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| 222 | $\sqrt{\sqrt{\sqrt{\left(4+\sqrt{4}\right)^{4!}}}}+\Gamma(4)$ | $\frac{4!!}{4\%}+4!-\sqrt{4}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-\frac{4}{.\overline{4}}$ |
| | $\sqrt{(4!!)!+\Sigma\left(atan\left(-\Gamma\left(\sqrt{4}\right)\right)\right)-\left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)}}$ | | |
| 223 | $\frac{4}{.\overline{4}\times 4\%}-\sqrt{4}$ | $\Gamma\left(\Gamma(4)\right)+\frac{(4!!)!}{(4!!)!!}-\sqrt{4}$ | $\frac{\frac{4}{.\overline{4}\%}-4!!}{4}$ |
| | $atan\left(-\Gamma\left(\sqrt{4}\right)\right)+\frac{(4!!)!!}{\Gamma(4)}+4!$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-4-4$ | |
| 224 | $\frac{4+4}{4\%}+4!$ | $\frac{\frac{4}{4\%}-.\overline{4}}{.\overline{4}}$ | $\frac{\frac{4}{.\overline{4}\%}-4}{4}$ |
| | $\sqrt{(4!!)!+alog(4)-\left(4!\times\Gamma(4)\right)}$ | $4\times\left((4!!\times 4)+4!\right)$ | |
| 225 | $\frac{\sqrt{4}}{4\%}\times\frac{\sqrt{4}}{.\overline{4}}$ | $\frac{\sqrt{4}}{.4}\times atan\left(\frac{4}{4}\right)$ | $\frac{\Gamma(4)}{\left(4+\sqrt{4}\right)\times.\overline{4}\%}$ |
| | $\left(\frac{\sqrt{4}}{.4}\right)!+\frac{(4!!)!}{(4!!)!!}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-4-\sqrt{4}$ | |
| 226 | $\frac{4!!}{4\%}+4!+\sqrt{4}$ | $\frac{\frac{4}{4\%}+.\overline{4}}{.\overline{4}}$ | $\sqrt{\sqrt{\sqrt{\left(4+\sqrt{4}\right)^{4!}}}}+\Sigma(4)$ |
| | $\frac{\frac{4}{.\overline{4}\%}+4}{4}$ | $\frac{4}{.\overline{4}\times 4\%}+\Gamma\left(\sqrt{4}\right)$ | |
| 227 | $\frac{4}{.\overline{4}\times 4\%}+\sqrt{4}$ | $\Gamma\left(\Gamma(4)\right)+\frac{(4!!)!}{(4!!)!!}+\sqrt{4}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-\sqrt{4}-\sqrt{4}$ |
| | $\frac{(4!!)!!+C(4!!,4)}{\sqrt{4}}$ | $\frac{\frac{4}{.\overline{4}\%}+4!!}{4}$ | $\frac{4!!}{4\%}+\left(\Sigma\left(\sqrt{4}\right)\right)^{\Sigma\left(\sqrt{4}\right)}$ |
| 228 | $\frac{4!!}{4\%}+4!+4$ | $4^4-4!-4$ | $\sqrt{\sqrt{\sqrt{\left(\Gamma(4)\right)^{4!}}}}+\frac{4!}{\sqrt{4}}$ |
| | $\frac{4}{.\overline{4}\times 4\%}+\Sigma\left(\sqrt{4}\right)$ | | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **229** | $\frac{4}{.\overline{4}\times 4\%}+4$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)-4+\sqrt{4}$ | $4^4-\left(\Sigma\left(\sqrt{4}\right)\right)^{\Sigma\left(\sqrt{4}\right)}$ |
| | $\Sigma\left(\frac{4!!}{.\overline{4}}\right)+asec\left(\sqrt{4}\right)-\sqrt{4}$ | | |
| **230** | $\frac{4!!}{4\%}+\sqrt{\frac{4}{.\overline{4}\%}}$ | $\left(4!-\Gamma\left(\sqrt{4}\right)\right)\times\frac{4}{.4}$ | $4^4-4!-\sqrt{4}$ |
| | $\left(4!\times\Sigma(4)\right)-\frac{4}{.4}$ | $C\left(4!,\sqrt{4}\right)-44-\sqrt{4}$ | $\Sigma(4!)-C(4+4,4)$ |
| **231** | $\frac{4}{.\overline{4}\times 4\%}+\Gamma(4)$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)\times\frac{4}{4}$ | $\left(\Sigma\left(\Gamma(4)\right)\times\frac{4}{.4}\right)+\Sigma\left(\Gamma(4)\right)$ |
| | $\frac{asin\left(\Gamma\left(\sqrt{4}\right)\right)+\sqrt{4}+.4}{.4}$ | $\Sigma(4!)-C(4!!,4)+\Gamma\left(\sqrt{4}\right)$ | $\Sigma\left(\frac{4!!}{.\overline{4}}\right)+asec\left(\frac{4}{\sqrt{4}}\right)$ |
| **232** | $\left(\sqrt{4}+\sqrt{4}\right)^4-4!$ | $\sqrt{4}\times\left(alog\left(\sqrt{4}\right)+4^{\sqrt{4}}\right)$ | $\frac{4!!}{4\%}+\sqrt[.4]{4}$ |
| **233** | $\frac{4}{.\overline{4}\times 4\%}+4!!$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+4-\sqrt{4}$ | $\Sigma\left(\frac{4!!}{.\overline{4}}\right)+asec\left(\sqrt{4}\right)+\sqrt{4}$ |
| **234** | $4^4-4!+\sqrt{4}$ | $\frac{4!!}{4\%}+4!+\Sigma(4)$ | $\frac{\left(\sqrt{.\overline{4}}\times\Sigma\left(\Sigma(4!!)\right)\right)+4!}{\sqrt{4}}$ |
| **235** | $\frac{4}{.\overline{4}\times 4\%}+\Sigma(4)$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+\sqrt{4}+\sqrt{4}$ | $\frac{\sqrt{4}}{.4}\times\left(\left(\Gamma(4)\right)!!-\Gamma\left(\sqrt{4}\right)\right)$ |
| | $\Sigma(\Sigma(4)+4!!)+\frac{(4!!)!!}{\Gamma(4)}$ | $\Sigma\left(\frac{4!!}{.\overline{4}}\right)+asec\left(\sqrt{4}\right)+4$ | $\frac{alog\left(\sqrt{4}\right)+4.\overline{4}}{.\overline{4}}$ |
| **236** | $4^4-4!+4$ | $\left(\left(\frac{\sqrt{4}}{.4}\right)!\times\sqrt{4}\right)-4$ | $\left(\frac{4!}{.4}-\Gamma\left(\sqrt{4}\right)\right)\times 4$ |
| | $\Sigma(4!)-(4\times 4\times 4)$ | $\Sigma(4!)-C(4!!,4)+\Gamma(4)$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)+4+\frac{4}{4}$ |
| | $\frac{\left(\frac{4}{.\overline{4}}\right)!!-\Gamma\left(\sqrt{4}\right)}{4}$ | $\frac{4!!}{4\%}+\frac{4!}{\sqrt{.\overline{4}}}$ | $.4\times\left(\frac{4!}{4\%}-\Sigma(4)\right)$ |
| | $(4!!)!!-\frac{4}{4\%}-\left(\Gamma(4)\right)!!$ | $\frac{\left(\Gamma(4)\right)!-\frac{4!}{\sqrt{4}}}{\Sigma\left(\sqrt{4}\right)}$ | $C\left(4!,\sqrt{4}\right)-\Sigma(4!!)-4$ |
| | $\sqrt{\left(\frac{4!}{\sqrt{4}}\right)!!+alog(4)-(4!!)!!}$ | | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **237** | $\dfrac{\frac{\sqrt{4}}{.\overline{4}\%}+4!}{\sqrt{4}}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+4+\sqrt{4}$ | $\left(\Sigma\left(\Sigma(4)\right)+4!\right)\times\sqrt{\dfrac{4}{.\overline{4}}}$ |
| | $\Sigma\left(\dfrac{4!!}{.\overline{4}}\right)+asec\left(\sqrt{4}\right)+\Gamma(4)$ | | |
| **238** | $\dfrac{\frac{\sqrt{4}}{.4\%}-4!}{\sqrt{4}}$ | $\left(\left(\dfrac{\sqrt{4}}{.4}\right)!\times\sqrt{4}\right)-\sqrt{4}$ | $4^4-\dfrac{4!!}{.\overline{4}}$ |
| **239** | $\dfrac{(4!\times 4)-.4}{.4}$ | $\left(\left(\dfrac{\sqrt{4}}{.4}\right)!\times\sqrt{4}\right)-\Gamma\left(\sqrt{4}\right)$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+4+4$ |
| **240** | $4!\times\left(4+4+\sqrt{4}\right)$ | $4^4-4^{\sqrt{4}}$ | $\dfrac{4!\times 4.\overline{4}}{.\overline{4}}$ |
| | $\left(\dfrac{\sqrt{4}}{.4}\right)!\times\dfrac{4}{\sqrt{4}}$ | $(4+4)\times\sqrt{\dfrac{4}{.\overline{4}\%}}$ | $\dfrac{\left(4+\sqrt{4}\right)!}{\sqrt{4/.\overline{4}}}$ |
| | $\dfrac{\Sigma(44)-acsc\left(\sqrt{4}\right)}{4}$ | $\dfrac{(4!!)!!}{\sqrt{4}}+4!+4!$ | $\dfrac{(4!!)!!+(4!\times 4)}{\sqrt{4}}$ |
| **241** | $\dfrac{(4!\times 4)+.4}{.4}$ | $\left(\left(\dfrac{\sqrt{4}}{.4}\right)!\times\sqrt{4}\right)+\Gamma\left(\sqrt{4}\right)$ | $4^4-\left(\dfrac{\sqrt{4}}{.4}\right)!!$ |
| | $\dfrac{4!+4!+\sqrt{4\%}}{\sqrt{4\%}}$ | | |
| **242** | $\dfrac{\left(4!-\sqrt{4}\right)^{\sqrt{4}}}{\sqrt{4}}$ | $\left(\left(\dfrac{\sqrt{4}}{.4}\right)!\times\sqrt{4}\right)+\sqrt{4}$ | $4^4-\Sigma(4)-4$ |
| **243** | $\dfrac{4!+4!}{(.\overline{4})(.\overline{4})}$ | $\left(\sqrt{\dfrac{4}{.\overline{4}}}\right)^{\left(\frac{\sqrt{4}}{.4}\right)}$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)+4+4+4$ |
| **244** | $\dfrac{4!+.4}{.4}\times 4$ | $\dfrac{\frac{4}{.4\%}-4!}{4}$ | $\left(\left(\dfrac{\sqrt{4}}{.4}\right)!\times\sqrt{4}\right)+4$ |
| | $\dfrac{4!!}{4\%}+44$ | $4^4-\dfrac{4!}{\sqrt{4}}$ | $\left(4!\times\dfrac{4}{.4}\right)+4$ |
| | $\dfrac{alog\left(\sqrt{4}\right)+4!!+.\overline{4}}{.\overline{4}}$ | | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **245** | $\dfrac{\frac{4}{4\%}-\sqrt{4}}{.4}$ | $\dfrac{4!!}{4\%}+atan\left(\dfrac{4}{4}\right)$ | $\dfrac{\Sigma(44)-\Sigma(4)}{4}$ |
| **246** | $4^4-\dfrac{4}{.4}$ | $\dfrac{\Gamma(4)}{.\overline{4}\%}-\left(\Gamma(4)\right)!-(4!!)!!$ | $\dfrac{\Sigma(44)-\Gamma(4)}{4}$ |
| **247** | $4^4-\dfrac{4}{.\overline{4}}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+(4\times 4)$ | $\dfrac{\Sigma(44)-\sqrt{4}}{4}$ |
| **248** | $4^4-4-4$ | $\dfrac{4!!}{4\%}+4!+4!$ | $\dfrac{\Sigma(44)+\sqrt{4}}{4}$ |
| | $\left(\Gamma(4)\right)^{\Sigma\left(\sqrt{4}\right)}+(4!!\times 4)$ | $4\times\left(\sqrt{\sqrt{\sqrt{4^{4!}}}}-\sqrt{4}\right)$ | |
| **249** | $\dfrac{\frac{4}{4\%}-.4}{.4}$ | $4^4-4-\Sigma\left(\sqrt{4}\right)$ | $\dfrac{\Sigma(44)+\Gamma(4)}{4}$ |
| **250** | $4^4-4-\sqrt{4}$ | $\dfrac{\Gamma(4)}{.4\%\times\left(4+\sqrt{4}\right)}$ | $\dfrac{\Sigma(44)+\Sigma(4)}{4}$ |
| | $\sqrt{4\times\sqrt{\sqrt{\left(\frac{\sqrt{4}}{.4}\right)^{4!}}}}$ | $\left(\Sigma\left(\Gamma(4)\right)+4\right)\times\dfrac{4}{.4}$ | $\dfrac{\sqrt{4}}{.\overline{4}\%}-\dfrac{4!!}{4\%}$ |
| **251** | $4^4-\dfrac{\sqrt{4}}{.4}$ | $\dfrac{\frac{4}{4\%}+.4}{.4}$ | $\dfrac{\frac{\sqrt{4}}{.4\%}+\sqrt{4}}{\sqrt{4}}$ |
| | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)+(4\cdot 4)+4$ | | |
| **252** | $4^4-\sqrt{4}-\sqrt{4}$ | $\dfrac{\frac{4}{.4\%}+4!!}{4}$ | $(4!+4)\times\dfrac{4}{.\overline{4}}$ |
| | $\dfrac{4!\times\Sigma\left(4+\sqrt{4}\right)}{\sqrt{4}}$ | | |
| **253** | $4^4-\sqrt{\dfrac{4}{.\overline{4}}}$ | $\dfrac{alog\left(\Sigma\left(\sqrt{4}\right)\right)+\frac{4!}{\sqrt{4}}}{4}$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)+4!-\sqrt{4}$ |
| | $\dfrac{4!!}{4\%}+\Sigma\left(\Sigma(4)\right)-\sqrt{4}$ | $\dfrac{\Gamma\left(\Gamma(4)\right)-4!!+.\overline{4}}{.\overline{4}}$ | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **254** | $4^4 - 4 + \sqrt{4}$ | $\frac{\Gamma(4!!)}{4!} + 44$ | $\frac{\frac{\sqrt{4}}{.4\%} + 4!!}{\sqrt{4}}$ |
| **255** | $4^4 - \frac{4}{4}$ | $\frac{\frac{4}{4\%} + \sqrt{4}}{.4}$ | $\frac{4+4}{4\%} + \Sigma(\Sigma(4))$ |
| **256** | $4 \times 4 \times 4 \times 4$ | $4^4 \times \frac{4}{4}$ | $\left(\sqrt{4} + \sqrt{4}\right)^{(\sqrt{4}+\sqrt{4})}$ |
| | $\left(\left(\sqrt{4}^{\sqrt{4}}\right)^{\sqrt{4}}\right)^{\sqrt{4}}$ | $\sqrt{4} \times \sqrt{4} \times \sqrt{\sqrt{\sqrt{4^{4!}}}}$ | $(4+4) \times \sqrt[.4]{4}$ |
| **257** | $4^4 + \frac{4}{4}$ | $\frac{4!!}{4\%} + \Sigma(\Sigma(4)) + \sqrt{4}$ | $\Sigma\left(\Sigma(\Gamma(4))\right) + 4! + \sqrt{4}$ |
| **258** | $4^4 + 4 - \sqrt{4}$ | $\frac{\Gamma(4!!)}{4!} + 4! + 4!$ | $\frac{4 + (4!!)^{\Sigma(\sqrt{4})}}{\sqrt{4}}$ |
| **259** | $4^4 + \sqrt{\frac{4}{.\overline{4}}}$ | $\frac{4!!}{4\%} + \Sigma(\Sigma(4)) + 4$ | $\Sigma\left(\Sigma(\Gamma(4))\right) + 4! + 4$ |
| **260** | $4^4 + \sqrt{4} + \sqrt{4}$ | $\frac{\frac{4}{4\%} + 4}{.4}$ | $\left(4! + \sqrt{4}\right) \times \frac{4}{.4}$ |
| | $\frac{4!!}{4\%} + \frac{4!}{.4}$ | $\frac{\Gamma(\Gamma(4)) - 4 - .\overline{4}}{.\overline{4}}$ | |
| **261** | $4^4 + \frac{\sqrt{4}}{.4}$ | $\sqrt{\sqrt{\sqrt{\left(\Gamma(4)\right)^{4!}}} + atan\left(\frac{4}{4}\right)}$ | $\frac{alog\left(\sqrt{4}\right) + 4.4}{.4}$ |
| | $\Sigma\left(\Sigma(\Gamma(4))\right) + 4! + 4 + \sqrt{4}$ | | $\frac{4!!}{4\%} + \Sigma(\Sigma(4)) + \Gamma(4)$ |
| **262** | $4^4 + 4 + \sqrt{4}$ | $\frac{\frac{\sqrt{4}}{.4\%} + 4!}{\sqrt{4}}$ | $\frac{\Gamma(\Gamma(4))}{.\overline{4}} - 4 - 4$ |
| | $\frac{\Gamma(\Gamma(4)) - 4 + .\overline{4}}{.\overline{4}}$ | | |
| **263** | $4^4 + 4!! - \Gamma\left(\sqrt{4}\right)$ | $\frac{\Gamma(\Gamma(4))}{.\overline{4}} - 4!! + \Gamma\left(\sqrt{4}\right)$ | $\Sigma\left(\Sigma(\Gamma(4))\right) + 4! + 4 + 4$ |
| | $\frac{4!!}{4\%} + \Sigma(\Sigma(4)) + 4!!$ | | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **264** | $4^4+4+4$ | $\frac{4!!}{4\%}+\sqrt{\sqrt{\sqrt{4^{4!}}}}$ | $4!\times\frac{44}{4}$ |
| | $4\times\left(\frac{(4!!)!!}{\Gamma(4)}+\sqrt{4}\right)$ | $\frac{4!\times 4!}{\sqrt{4}}-4!$ | $\frac{4!\times 4}{.4}+4!$ |
| **265** | $4^4+\frac{4}{.\overline{4}}$ | $(4!!)!!-\Gamma(\Gamma(4))+\frac{4}{4}$ | $\Sigma\left(\Sigma(\Gamma(4))\right)+\sqrt[.4]{4}+\sqrt{4}$ |
| | $\frac{4!!}{4\%}+\Sigma(\Sigma(4))+\Sigma(4)$ | | |
| **266** | $4^4+\frac{4}{.4}$ | $\frac{4!!}{4\%}+\Sigma\left(4!!+\Sigma(\sqrt{4})\right)$ | $C(4!,\sqrt{4})-\frac{4}{.4}$ |
| **267** | $(4!!)!!-\Gamma(\Gamma(4))+\sqrt{\frac{4}{.\overline{4}}}$ | $C(4!,\sqrt{4})-\frac{4}{.\overline{4}}$ | $\Sigma\left(\Sigma(\Gamma(4))\right)+\sqrt[.4]{4}+4$ |
| | $\left(asin\left(\Gamma(\sqrt{4})\right)-\Gamma(\sqrt{4})\right)\times\sqrt{\frac{4}{.\overline{4}}}$ | | |
| **268** | $4^4+\frac{4!}{\sqrt{4}}$ | $C(4!,\sqrt{4})-4-4$ | $\frac{(4!!)^{\Sigma(\sqrt{4})}+4!}{\sqrt{4}}$ |
| | $4\times\left(atan\left(\Gamma(\sqrt{4})\right)+4!-\sqrt{4}\right)$ | | |
| **269** | $(4!!)!!-\Gamma(\Gamma(4))+\frac{\sqrt{4}}{.4}$ | $\Sigma\left(\Sigma(\Gamma(4))\right)+\sqrt[.4]{4}+\Gamma(4)$ | $\frac{4!!}{4\%}+atan\left(\Gamma(\sqrt{4})\right)+4!$ |
| | $\frac{alog(\sqrt{4})+4!!-.4}{.4}$ | $\frac{\left(\frac{\sqrt{4}}{.4}\right)!-.\overline{4}}{.\overline{4}}$ | |
| **270** | $\frac{\sqrt{.\overline{4}}}{.\overline{4}\%}+\left(\frac{\sqrt{4}}{.4}\right)!$ | $\frac{4!}{.4}\times\frac{\sqrt{4}}{.\overline{4}}$ | $\frac{4}{.\overline{4}}\times\sqrt{\frac{4}{.\overline{4}\%}}$ |
| | $\frac{4!!}{4\%}+C(4!!,4)$ | $\frac{4}{\sqrt{4}}\times atan\left(-\frac{4}{4}\right)$ | $\frac{\Gamma(4)}{.\overline{4}\%}\times\frac{.4}{\sqrt{4}}$ |
| **271** | $4^4+\left(\frac{\sqrt{4}}{.4}\right)!!$ | $\Sigma\left(\Sigma(\Gamma(4))\right)+4!+4^{\sqrt{4}}$ | $\Sigma(\Sigma(4)+4!!)+\frac{4}{4\%}$ |
| | $\frac{alog(\sqrt{4})+4!!+.4}{.4}$ | $\frac{\left(\frac{\sqrt{4}}{.4}\right)!+.\overline{4}}{.\overline{4}}$ | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **272** | $4^4 + (4 \times 4)$ | $4 \times \left(4 + \sqrt{\sqrt{\sqrt{4^{4!}}}}\right)$ | $\left(4! \times \Sigma(4)\right) + \sqrt[.4]{4}$ |
| | $C\left(4!, \sqrt{4}\right) - \sqrt{4} - \sqrt{4}$ | $\dfrac{\dfrac{\left(\Gamma(4)\right)!}{\sqrt{.\overline{4}}} + 4!!}{4}$ | $(4!!)!! - \Gamma\left(\Gamma(4)\right) + 4 + 4$ |
| **273** | $(4!!)!! - \Gamma\left(\Gamma(4)\right) + \dfrac{4}{.\overline{4}}$ | $4^4 + \Sigma\left(\Gamma(4)\right) - 4$ | $\dfrac{P\left(4!, \sqrt{4}\right) - \Gamma(4)}{\sqrt{4}}$ |
| **274** | $\Sigma(4! - 4) + 4^{\Sigma(\sqrt{4})}$ | $(4!!)!! - \Gamma\left(\Gamma(4)\right) + \dfrac{4}{.4}$ | $4^4 + \dfrac{4!!}{.\overline{4}}$ |
| **275** | $\dfrac{44}{.4 \times .4}$ | $\dfrac{\sqrt{4}}{.4} \times \Sigma\left(\dfrac{4}{.4}\right)$ | $\Sigma(4!) - 4! - \dfrac{4}{4}$ |
| | $C\left(4!, \sqrt{4}\right) - \dfrac{4}{4}$ | | |
| **276** | $4^4 + 4! - 4$<br>$\left(\Sigma(4) \times \sqrt{\dfrac{4}{.\overline{4}\%}}\right) - 4!$ | $4 \times \left(atan\left(\dfrac{4}{4}\right) + 4!\right)$<br>$\dfrac{\Sigma\left(\dfrac{4}{.4}\right) + \sqrt{4\%}}{\sqrt{4\%}}$ | $C\left(4!, \sqrt{4}\right) \times \dfrac{4}{4}$ |
| **277** | $C\left(4!, \sqrt{4}\right) + \dfrac{4}{4}$ | $\Sigma(4!) - 4! + \dfrac{4}{4}$ | $\dfrac{P\left(4!, \sqrt{4}\right) + \sqrt{4}}{\sqrt{4}}$ |
| | $(4!!)!! - alog\left(\sqrt{4}\right) - 4!! + \Gamma\left(\sqrt{4}\right)$ | | |
| **278** | $4^4 + 4! - \sqrt{4}$ | $\Sigma(4!) - 4! + 4 - \sqrt{4}$ | $\dfrac{P\left(4!, \sqrt{4}\right) + 4}{\sqrt{4}}$ |
| **279** | $(4 + 4)!! - \dfrac{(4!!)!}{(4!!)!!}$ | $\Sigma(4!) - 4! + \sqrt{\dfrac{4}{.\overline{4}}}$ | $\left(acsc\left(\sqrt{4}\right) + \Gamma\left(\sqrt{4}\right)\right) \times \dfrac{4}{.\overline{4}}$ |
| | $C\left(4!, \sqrt{4}\right) + \sqrt{\dfrac{4}{.\overline{4}}}$ | | |
| **280** | $(4! + 4) \times \dfrac{4}{.4}$ | $4 \times C(4 + 4, 4)$ | $\dfrac{4!!}{4\%} + (\Sigma(4) \times 4!!)$ |
| | $\dfrac{\Gamma\left(\Gamma(4)\right) + 4 + .\overline{4}}{.\overline{4}}$ | $\Sigma(4!) - \dfrac{4 + 4}{.4}$ | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **281** | $C\left(4!,\sqrt{4}\right)+\frac{\sqrt{4}}{.4}$ | $\Sigma(4!)-4!+\frac{\sqrt{4}}{.4}$ | $\frac{P\left(4!,\sqrt{4}\right)+\Sigma(4)}{\sqrt{4}}$ |
| | $\frac{\Gamma\left(\Gamma(4)\right)-4!!+.4}{.4}$ | | |
| **282** | $4^4+4!+\sqrt{4}$ | $\Sigma(4!)-(4\times 4)-\sqrt{4}$ | $\frac{\Sigma\left(\left(\Gamma(4)\right)!!\right)-4!-4!}{4}$ |
| **283** | $(4!!)!!-alog\left(\sqrt{4}\right)-\frac{4}{4}$ | $\Sigma\left(4!-\sqrt{4}\right)+\sqrt{\frac{4}{.\overline{4}\%}}$ | $\frac{\Sigma\left(\left(\Gamma(4)\right)!!\right)-44}{4}$ |
| **284** | $4^4+4!+4$ | $\frac{4!\times 4!}{\sqrt{4}}-4$ | $(4+4)!!-\frac{4}{4\%}$ |
| | $4\times\left(atan\left(\Gamma\left(\sqrt{4}\right)\right)+4!+\sqrt{4}\right)$ | $\left(\Gamma(4)\right)!-(4!!)!!-\left(\Gamma(4)\right)!!-4$ | |
| **285** | $(4!!)!!-alog\left(\sqrt{4}\right)+\frac{4}{4}$ | $\Sigma\left(4!-\sqrt{4}\right)+\sqrt[.4]{4}$ | $\frac{\Sigma\left(\left(\Gamma(4)\right)!!\right)-\Sigma(4+4)}{4}$ |
| **286** | $4^4+\sqrt{\frac{4}{.\overline{4}\%}}$ | $(4!!)!!-\frac{4}{4\%}+\sqrt{4}$ | $\frac{(4!\times 4!)-4}{\sqrt{4}}$ |
| **287** | $(4!!)!!-alog\left(\sqrt{4}\right)+\sqrt{\frac{4}{.\overline{4}}}$ | $\frac{(4!\times 4!)-\sqrt{4}}{\sqrt{4}}$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+\frac{(4!!)!}{\left(\Gamma(4)\right)!}$ |
| **288** | $4!\times(4+4+4)$ | $4!\times 4\times\sqrt{4/.\overline{4}}$ | $(4!!)!!-\frac{4}{4\%}+4$ |
| | $(4+4)!!-(4!\times 4)$ | $4^4+\sqrt[.4]{4}$ | $\sqrt{4}\times\left(alog\left(\sqrt{4}\right)+44\right)$ |
| | $\Sigma(4!)-(4+4+4)$ | $\frac{4!\times 4!}{4-\sqrt{4}}$ | $\frac{\left(\Sigma\left(\Sigma(4)\right)\times\Sigma\left(\Gamma(4)\right)\right)-\Sigma\left(\sqrt{4}\right)}{4}$ |
| **289** | $\frac{(4!\times 4!)+\sqrt{4}}{\sqrt{4}}$ | $\left(\left(\frac{\sqrt{4}}{.4}\right)!!+\sqrt{4}\right)^{\sqrt{4}}$ | $(4!!)!!-alog\left(\sqrt{4}\right)+\frac{\sqrt{4}}{.4}$ |
| | $\frac{\Gamma\left(\Gamma(4)\right)+4!!+.\overline{4}}{.\overline{4}}$ | $\frac{\Gamma\left(\Gamma(4)\right)-4-.4}{.4}$ | |
| **290** | $\frac{(4!\times 4!)+4}{\sqrt{4}}$ | $\frac{4!!}{4\%}+\frac{.4}{.\overline{4}\%}$ | $4^4+4!+\Sigma(4)$ |
| | $(4!!)!!-alog\left(\sqrt{4}\right)+4+\sqrt{4}$ | $\Sigma(4!)-4-4-\sqrt{4}$ | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **291** | $MOD\left(\Gamma(4!!),\left(\frac{4}{.\overline{4}}\right)!!\right)-4!$ | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+\frac{4!}{.4}$ | $\Sigma(4!)-4-4-\Gamma\left(\sqrt{4}\right)$ |
| | $\left(\Sigma\left(\Gamma(4)\right)-4\right)^{\sqrt{4}}+\sqrt{4}$ | $\frac{\Gamma\left(\Gamma(4)\right)-4+.4}{.4}$ | |
| | $(4!!)!!-asin\left(\Gamma\left(\sqrt{4}\right)\right)-\left(\Gamma(4)\right)!!+atan\left(\Gamma\left(\sqrt{4}\right)\right)$ | | |
| **292** | $\Sigma(4!)-4-\sqrt{4}-\sqrt{4}$ | $(4!!)!!-\Gamma\left(\Gamma(4)\right)+4!+4$ | $C\left(4!,\sqrt{4}\right)+(4\times 4)$ |
| | $\frac{(4!!)!}{\Gamma\left(\Gamma(4)\right)}-44$ | $\frac{(4!\times 4!)+4!!}{\sqrt{4}}$ | $.4\times\left(\left(\frac{4!}{4}\right)!+\Sigma(4)\right)$ |
| **293** | $\left(\Sigma\left(\Gamma(4)\right)-4\right)^{\sqrt{4}}+4$ | $(4!!)!!-\frac{.4}{.\overline{4}\%}-\Gamma\left(\sqrt{4}\right)$ | $C\left(4!,\sqrt{4}\right)+\Sigma\left(\Gamma(4)\right)-4$ |
| | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)+4^{\Sigma\left(\sqrt{4}\right)}-\sqrt{4}$ | | |
| **294** | $\Sigma(4!)-4-4+\sqrt{4}$ | $\frac{4!!}{4\%}+asin\left(\Gamma\left(\sqrt{4}\right)\right)+4$ | $C\left(4!,\sqrt{4}\right)+\frac{4!!}{.\overline{4}}$ |
| | $(4!!)!!-\frac{4}{4\%}+\Sigma(4)$ | $\frac{\left((4!!)!!-\left(\Gamma(4)\right)!!\right)^{\sqrt{4}}}{(4!!)!!}$ | $\frac{\left(\left(\Gamma(4)\right)!-(4!!)!!\right)^{\sqrt{4}}}{(4!!)!!}$ |
| **295** | $\Sigma(4!)-4-\frac{4}{4}$ | $\left(\Sigma\left(\Sigma(4)\right)+4\right)\times\frac{\sqrt{4}}{.4}$ | $\frac{\frac{4!}{4\%}-\Sigma(4)}{\sqrt{4}}$ |
| | $\sqrt{\sqrt{\sqrt{\left(4!!-\Gamma\left(\sqrt{4}\right)\right)^{4!}}}}-\left(\Gamma(4)\right)!!$ | $\left(\Sigma\left(\Gamma(4)\right)-4\right)^{\sqrt{4}}+\Gamma(4)$ | |
| **296** | $\Sigma(4!)-4-4+4$ | $\frac{4!!}{4\%}+(4!\times 4)$ | $4^4+\Sigma(4!!)+4$ |
| | $4^4+\sqrt{\frac{(4!!)!!}{(4!)\%}}$ | $\frac{\frac{4!}{4\%}-4!!}{\sqrt{4}}$ | $\sqrt{\frac{.4}{.\overline{4}\%\%}\times\Sigma(4)}-4$ |
| **297** | $\Sigma(4!)-4+\frac{4}{4}$ | $4^4+atan\left(\Gamma\left(\sqrt{4}\right)\right)-4$ | $\frac{\frac{4!}{4\%}-\Gamma(4)}{\sqrt{4}}$ |
| | $\left(\Sigma\left(\Gamma(4)\right)-4\right)^{\sqrt{4}}+4!!$ | $\left(acsc\left(\sqrt{4}\right)+\Sigma\left(\sqrt{4}\right)\right)\times\frac{4}{.\overline{4}}$ | $\frac{4!!}{4\%}+alog\left(\sqrt{4}\right)-\Sigma\left(\sqrt{4}\right)$ |
| | $\Sigma\left(\Sigma\left(4+\sqrt{4}\right)\right)+\Sigma\left(4!!+\Sigma\left(\sqrt{4}\right)\right)$ | $\Sigma\left(\Sigma\left(\Gamma(4)\right)\right)+4^{\Sigma\left(\sqrt{4}\right)}+\sqrt{4}$ | |

## SECTION III — SOLUTIONS 201–300

| | | | |
|---|---|---|---|
| **298** | $\Sigma(4!) - \frac{4+4}{4}$ | $4^4 + \Sigma(4!!) + \Gamma(4)$ | $\sqrt{\frac{.4}{.\overline{4}\%\%} \times \Sigma(4)} - \sqrt{4}$ |
| | $\sqrt{\sqrt{\sqrt{\left(4!! - \Gamma(\sqrt{4})\right)^{4!}}}} - atan\left(\Gamma(\sqrt{4})\right)$ | $\frac{atan\left(-\Gamma(\sqrt{4})\right) - \Sigma(\sqrt{4}) + .\overline{4}}{.\overline{4}}$ | |
| **299** | $4^4 + atan\left(\Gamma(\sqrt{4})\right) - \sqrt{4}$ | $\Sigma(4!) - \sqrt{4} + \frac{4}{4}$ | $\left(\Sigma(\Gamma(4)) - 4\right)^{\sqrt{4}} + \Sigma(4)$ |
| | $(4!!)!! - atan\left(\Gamma(\sqrt{4})\right) - \sqrt{\frac{(4!!)!!}{(4!)\%}}$ | $\Sigma\left(\Sigma(4 + \sqrt{4})\right) + asec(\sqrt{4}) + 4!!$ | |
| | $\Sigma\left(\Sigma(\Gamma(4))\right) + 4^{\Sigma(\sqrt{4})} + 4$ | | |
| **300** | $4^4 + 44$ | $\Sigma(4!) \times \frac{4}{4} \times \Gamma(\sqrt{4})$ | $\frac{4! + 4!}{.4 \times .4}$ |
| | $\frac{4!!}{4\%} + \frac{4}{4\%}$ | $\frac{4!}{.4} \times \frac{\sqrt{4}}{.4}$ | $\left(4! \times \Sigma(4)\right) + \frac{4!}{.4}$ |
| | $\frac{4}{4\%} \times \sqrt{\frac{4}{.\overline{4}}}$ | $\sqrt{\frac{.4}{.\overline{4}\%\%} \times \frac{4}{.4}}$ | $\left(\frac{4!!}{.\overline{4}}\right)^{\sqrt{4}} - 4!$ |
| | $\frac{\Gamma(4)}{.4\%} \times \frac{.4}{\sqrt{4}}$ | $(4!!)!! - \left(\Sigma(4 + \sqrt{4}) \times 4\right)$ | $P(\Gamma(4), 4) - \frac{4!}{.4}$ |

# Solutions History 201–300

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| 201 | – | 3 | 5 | |
| 202 | – | 3 | 5 | |
| 203 | – | 1 | 3 | |
| 204 | – | 2 | 5 | |
| 205 | – | 1 | 3 | |
| 206 | – | 1 | 3 | |
| 207 | – | 2 | 3 | |
| 208 | – | 2 | 5 | |
| 209 | – | 1 | 3 | |
| 210 | – | 1 | 6 | |
| 211 | – | 1 | 4 | |
| 212 | – | 3 | 6 | |
| 213 | – | 1 | 5 | |
| 214 | – | 2 | 6 | |
| 215 | – | 1 | 6 | |
| 216 | – | 2 | 7 | |
| 217 | – | 4 | 5 | |
| 218 | – | 1 | 4 | |
| 219 | – | 1 | 4 | |
| 220 | – | 3 | 4 | |
| 221 | – | 1 | 7 | |
| 222 | – | 1 | 4 | |
| 223 | – | 1 | 5 | |
| 224 | – | 3 | 5 | |
| 225 | – | 3 | 5 | |
| 226 | – | 3 | 5 | |
| 227 | – | 1 | 6 | |
| 228 | – | 1 | 4 | |
| 229 | – | 1 | 4 | |
| 230 | – | 2 | 6 | |
| 231 | – | 1 | 6 | |
| 232 | – | 1 | 3 | |
| 233 | – | 1 | 3 | |
| 234 | – | 1 | 3 | |
| 235 | – | 2 | 6 | |
| 236 | – | 3 | 13 | |
| 237 | – | 1 | 4 | |
| 238 | – | 2 | 3 | |
| 239 | – | 2 | 3 | |
| 240 | – | 5 | 9 | |

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| 241 | – | 2 | 4 | |
| 242 | – | 2 | 3 | |
| 243 | – | 2 | 3 | |
| 244 | – | 5 | 7 | |
| 245 | – | 2 | 3 | |
| 246 | – | 2 | 3 | |
| 247 | – | 1 | 3 | |
| 248 | – | 2 | 5 | |
| 249 | – | 1 | 3 | |
| 250 | – | 3 | 6 | |
| 251 | – | 2 | 4 | |
| 252 | – | 3 | 4 | |
| 253 | – | 1 | 5 | |
| 254 | – | 2 | 3 | |
| 255 | – | 2 | 3 | |
| 256 | – | 3 | 6 | |
| 257 | – | 1 | 3 | |
| 258 | – | 2 | 3 | |
| 259 | – | 1 | 3 | |
| 260 | – | 2 | 5 | |
| 261 | – | 2 | 5 | |
| 262 | – | 2 | 4 | |
| 263 | – | 1 | 4 | |
| 264 | – | 6 | 6 | |
| 265 | – | 2 | 4 | |
| 266 | – | 1 | 3 | |
| 267 | – | 2 | 4 | |
| 268 | – | 2 | 4 | |
| 269 | – | 1 | 5 | |
| 270 | – | 3 | 6 | |
| 271 | – | 1 | 5 | |
| 272 | – | 1 | 6 | |
| 273 | – | 1 | 3 | |
| 274 | – | 2 | 3 | |
| 275 | – | 1 | 4 | |
| 276 | – | 1 | 5 | |
| 277 | – | 2 | 4 | |
| 278 | – | 1 | 3 | |
| 279 | – | 2 | 4 | |
| 280 | – | 2 | 5 | |

| # | 1993 | 1998 | 2012 | |
|---|---|---|---|---|
| 281 | – | 1 | 4 | |
| 282 | – | 1 | 3 | |
| 283 | – | 1 | 3 | |
| 284 | – | 5 | 5 | |
| 285 | – | 1 | 3 | |
| 286 | – | 2 | 3 | |
| 287 | – | 2 | 3 | |
| 288 | – | 3 | 9 | |
| 289 | – | 3 | 5 | |
| 290 | – | 3 | 5 | |
| 291 | – | 2 | 6 | |
| 292 | – | 2 | 6 | |
| 293 | – | 2 | 4 | |
| 294 | – | 3 | 6 | |
| 295 | – | 1 | 5 | |
| 296 | – | 2 | 6 | |
| 297 | – | 1 | 8 | |
| 298 | – | 1 | 5 | |
| 299 | – | 1 | 6 | |
| 300 | – | 4 | 12 | |
| Σ | – | 190 | 469 | |