

Road Sign Math

3rd Edition Rules, Revision B (November 2006)

Going on a road trip soon? Brush up on the rules for Road Sign Math and you can fill your trip with hours of entertainment. Bring your digital camera and a GPS (optional) so you can capture the sign and send it in to RoadSignMath.com. The rules of Road Sign Math are divided into two sections. The first section defines the parameters around a valid roadsign. The second section specifies some requirements around the math used to solve the sign.

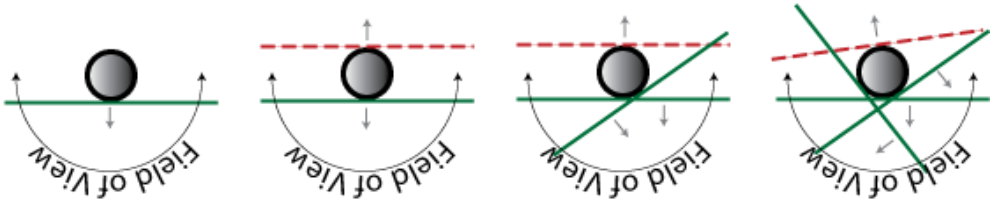
Sign Qualifying Rules

1. **Only Permanent, Official Signs Qualify** You may only use signs that are permanently mounted. Temporary signs such as road construction, detours or other special event signs are not eligible. Additionally, only signs installed by an official governmental organization are valid. Commercial billboards for example are not eligible. If a permanent, official sign has a non-governmental sign attached to it, you may disregard the ineligible sign and use the rest of the sign.
2. **All Signs Must Be Used** If there are several signs attached to one post, all signs must be used. Any connection connecting multiple signs together requires the use of all signs. This includes gantries that span highways with several signs connected, as well as multiple signs attached to a single overpass or bridge.
3. **Only Natural Numbers Allowed** Valid signs may only contain natural numbers. Any fraction or decimal number (or any other non-natural number) appearing on any sign makes the entire sign (including all signs on the same support as implied by rule #2) ineligible.
    a. In certain cases, particularly where a number appears vertically, a decimal point may be implied but not present. This is not considered a natural number and is thus invalid.
4. **All Numbers Must Be Used** Any number appearing on the sign, in any location, must be used exactly the same number of times that it appears on the sign.
    a. Numbers that have letters added to them must be used but you can disregard the letter. For example, 35W becomes 35 and E96 becomes 96.
    b. Numbers with hyphens are treated as two separate numbers. For example, 12-345 is used as 12 and 345. Additionally, a phone number such as 555-1212 would be used as 555 and 1,212. A height of listed like 14' 8" (meaning 14 feet and 8 inches) is used as 14 and 8. A time listed as 8:15am is used as 8 and 15.
    c. The only exception to this rule are extremely small numbers that are used by the highway department to identify the sign type, or as a serial number of record for the sign. These numbers are typically not readable without examining the sign close up.
    d. A sign must contain two or more numbers. Any sign with only one number is not valid.
5. **No Splitting or Joining Numbers** You may not split or join a number into new numbers, unless you do it with valid math. For example, 258 cannot become 25 and 8 or 2, 5 and 8. In reverse, 2, 5 and 8

cannot become 25 and 8 or 258.

   a. This is particularly relevant for numbers that appear vertically. These numbers are included as the sign designer intended it.

6. **Field of View** It is possible for one road sign structure to have signs that face in opposite directions. These double-sided signs pose a challenge since you do not see all the numbers at once. As such, you must use all the signs and numbers that are present in the "field of view" for the sign. This is defined as a 180 degree section of the sign. Any sign which exposes any of its front within that field of view must be used. The diagrams below show collections of signs, the green signs are included and the red dashed signs are excluded.



7. **No Electronic Signs** No sign can be used that has an electronic display or may change the content of it's display in any other way, regardless of how infrequently that content may actually change.
8. **Sign Groupings** It is possible to have several signs within a small area that all contain the same numbers. For example, several no parking signs. In this case, only one sign in this group is eligible. You may not have multiple signs within a 1 mile radius that use the same set of numbers, regardless of differences in the provided math solution.
9. **Excluded Sign Types** The following types of signs are not allowed for use.
   a. *ONLY Street Signs* You cannot use combinations that only include street signs because they are far too predictable and allow a player to simply pre-calculate winning sign combinations. This goes against the spirit of the game. However, as long as a sign contains additional signs with numbers, and is not only street signs, it can be used.
   b. *No Parking Signs* These signs are almost always winners because of their symmetrical blocking of time. Typically you cannot park for 2 hours in the morning, and 2 hours at night. This makes almost all of these signs winners.
   c. *Carpool Signs* These signs are excluded for the same reason as No Parking Signs in 9b.

Math Specifications

1. **Base 10 Required** All math used to solve signs must be done in base 10.
2. **Decimals Cannot Be Forced Out** You cannot use mathematical functions that simply ignore the decimals present in the solution. For example, you cannot round or truncate numbers in any part of your solution. Additionally, you cannot use functions like modulo since it has the same effect.
3. **Tautologies Not Allowed** The right- and left-hand sides of the equals sign may not be the same. You must have some operator besides equals.
4. **Number Pairs** If a sign contains no numbers other than sets of paired numbers (e.g., 4 & 4, 56 & 56) it is invalid. All signs that contain nothing other than pairs of numbers have a mathematical relationship

and are not allowed in submission.

5. **Non-Trivial Math** You cannot use any mathematical operator that returns the same number input. The square root of 1 is invalid since it returns 1. You cannot take a factorial of 1 or 2, since 1! = 1 and 2! = 2. Additionally, when using summation, product or integral functions the minimum and maximum bounds in the case of summation and product, and the endpoints in the case of integral, must have a difference of more than two. Summation from 2 to 4 is invalid, summation from 2 to 5 is valid.
6. **Disallowed Math** Certain functions are disallowed from the game because of their mathematical implications.
   a. Trigonometry functions sine, cosine and tangent are disallowed in all forms. The reason for this is the unusual value of 6! being 720. This is an exact multiple of 360, and as a result you can combine factorial to any number of 6 or more to make it zero or 1.
   b. Logarithm and Natural Logarithm are also disallowed as they make constant signs to easy to attain.

Please be aware that all sign submissions are ultimately subject to approval by the Road Sign Math administrators.

Unary Operators

When you first play Road Sign Math you will find that you frequently limit yourself to the numbers that are present on the sign only. However, there are a handful of unary operators that allow you to have new numbers to use in your equations. The most commonly used unary operator is the square root function. This function allows you to turn any number into other numbers for your equation. You can also do this multiple times. For example:

$$\sqrt{16} = 4 \quad \sqrt{\sqrt{16}} = 2$$

By using the square root function the 16 found on the sign is easily used as a 4 or even a 2. Math purists could argue that this is inappropriate since there is an assumed 2 present in the square root function, however, since it is never written with it you can use it as a pure unary operator. If you wish to use a cube root however, you must have a 3 present on the sign to use in the root function.

Grandfathering Conventions

Road Sign Math is a vibrant and evolving game. As such, it is understood that from time-to-time the rules of the game may be altered. All signs that are submitted are judged by the rules that exist at the time of posting the sign (not the time of submission). If in the future, the rules of Road Sign Math change in such a way that would make a previously posted winner invalid, that winner will be grandfathered in under the rules that existed at that time. Scoring however is handled differently. In order to keep the scoring fair over all signs ever submitted, any changes made to scoring in the future will be retroactively applied to all signs that have ever been submitted.

Special Designations

First in Region

The first sign found in a region is a special sign. These signs are designated with a gold star. The region boundaries vary by country. In the US it is specified at a state level. In other countries it is the first sign for that country.

Exemplary Sign

These signs are chosen by the editors of Road Sign Math in conjunction with a voting panel to identify signs that are special for either their use of math, elegance or other reasons.

Sign Scoring

Not all mathematically significant road signs are created equal. Some signs are simply more interesting and exciting than others. Signs are scored in two categories, technical and elegance. High scores in either category are desired, and a total score is computed by adding the technical and elegance scores together. To aid in interpretation scores are provided for all the example signs below. **Please Note!** Signs are scored using the formula supplied with the sign submission. If after review, or posting on the website, a new formula with a higher point value is determined it is not allowed to replace the original. The originally submitted formula, and appropriate score, is permanent.

Technical Score

There is an entire branch of road signs that focus on the arcane. These signs bring in numerous functions, dozens of numbers, and produce extremely interesting results. These signs will score high in technical merit. To score a sign you get points for each occurance of different operators. The point values for operators are given below.

1 Point

$$+ \quad - \quad \times \quad \div$$

---

2 Points

$$\sqrt{x}$$

---

3 Points

$$\sqrt[z]{y} \quad x^y$$

Variable

The following mathematical operators are scored dependent upon the numbers input to them.

- $x!$ yields x points based. For example, $3!$ will result in 3 points, and $6!$ will result in 6 points. You can receive up to a maximum of 8 points with a factorial.
- $\sum_{n=x}^{y}$ is given a point value of the difference between the upper bound of summation, y, and the lower bound of summation, x. You can receive up to a maximum of 5 points with this function.
- $\prod_{n=x}^{y}$ is given a point value of the difference between the upper bound of the product, y, and the lower bound of the product, x. You can receive up to a maximum of 5 points with this function.
- $\int_{x}^{y}$ is given a point value of the difference between the endpoints of the integral. You can receive up to a maximum of 5 points with this function.
- $\begin{pmatrix} a & b \\ x & y \end{pmatrix}$ is given a point value equal to the count of the numbers in the matrix multiplied by two. In this example, it would yield 8 points.

Elegance Score

While technical signs are very interesting, the genesis of Road Sign Math came not from the technical branch, but from the elegant branch. Signs that have amazingly simple mathematics that just jump right out and slap you in the face. These are the signs that you will spot just driving by and think "wow!". The point value for every integer in the sign is determined using the following function.

$$f(x) = \ln(x) \div 1.25$$

This value is then rounded to the tenths, summed with all the other numbers **and divided by** the technical score for the sign, rounding the final value to the tenths to produce the elegance score.

Bonus Points

Under certain conditions signs may receive bonus points. Signs will receive 2 bonus points for being first in region, and an additional 2 bonus points for being selected as an editors choice sign.

Penalized Math

The use of certain math operations, notably canceling operations, will result in a penalty to your overall score. For example, if you divide two equals numbers in your solution to return a 1, this will result in a 50% deduction. Multiplying by 1 results in a 25% deduction. Below are some examples. Due to the complexity of math, not all possibilities are listed here and final submissions will be judged as they are received. **These deductions are cumulative.**

$$\frac{x!}{(x-1)!} = x \rightarrow 90\%$$

$$\frac{x}{x} = 1 \rightarrow 50\%$$

$$x - x = 0 \rightarrow 50\%$$

$$x \times 1 = x \rightarrow 25\%$$

Special Scoring for Series and Numerology Signs

Series and numerology signs by definition have no operators, and as a result have no technical score. To account for this, numerology signs are given a 1.5 multiplier to their elegance score, which is then rounded to the tenths, to determine the overall score.

Ranking Based on Score

The scoreboard ranks signs based on overall score. When signs have the same scores the tie is broken using a balance principle. The highest scoring sign, with the least disparity in technical and elegance scores will rank higher. So, for example, if you have two signs that score 12 and one is a 1, 11 and the other is a 5, 7, the 5, 7 sign will rank higher since it is more balanced. If multiple signs have the same score, and the same balance, then the newest sign ranks highest.

Sign Types

There are five distinct types of signs that can be played in Road Sign Math. The type of sign is determined by the math used to build the relationship. Sign types will also impact scoring due to special conditions of certain sign types.

Basic Math

These signs are the easiest to identify and almost always (perhaps always) require 3 or more numbers on the sign. A basic sign uses addition, subtraction, multiplication and division to tie all the numbers together. Examples of basic math signs include.



$$15 + 34 = 49$$



$$16 \times 34 = 544$$

Even basic signs can get very complicated though.



$$\frac{315}{45} + 14 = 21$$

Advanced Math

Once you've graduated from the basic signs, you can cut your teeth on some of these significantly more sophisticated functions. Advanced signs, with unary operators, are particularly useful when working with signs that only have two numbers.



$$\sqrt{81} = 9$$



$$5! = 120$$

Signs can get infinitely more complex in this category. Below are examples of signs using sumation functions, trigonometry and even matrix mathematics!



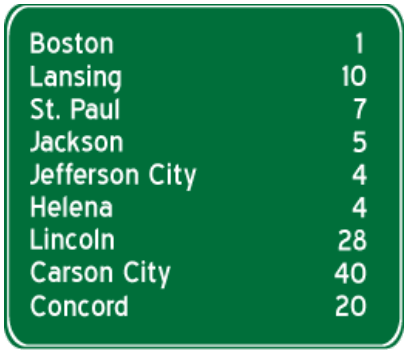
$$\sum_{n=4}^{10} n = 49$$





$$65 + \frac{\cos 120^\circ}{\sin 30^\circ} = 64$$

Please note, as of April 19, 2006 trigonometry functions are no longer allowed in solutions as stated in rule E1.



$$\begin{pmatrix} 1 & 5 \\ 7 & 10 \end{pmatrix} \times 4 = \begin{pmatrix} 4 & 20 \\ 28 & 40 \end{pmatrix}$$

Constants

Constant signs are unique to Road Sign Math because you do not have to have the resulting number in the sign. You simply need to have all the numbers in the formula, and then the result (which is almost always not a natural number) is an approximation of a special constant. **Constants present a judging challenge since different levels of exactness are required for different constants. As a result, please use the reference table for constant matches to determine eligibility.** Below is an example of a very elegant constant match finding pi with no digits left over.



$$3 + \frac{14}{100} \equiv \pi$$

Alternatively, division can be used to find a close appromiation of pi.



$$\frac{173}{55} \equiv \pi$$

Here is a similar strategy, but this time resolving to e.



$$\frac{424}{156} \equiv e$$

Series

Series signs contain an in-order segment of a well known series of numbers. For example, signs that contain a set of numbers out of the Fibonacci Numbers.



$$F(7), F(8), F(9)$$

You could also have a series of squares.



$$6^2 \quad 7^2 \quad 8^2 \quad 9^2$$

Road Sign Math references the On-line Encyclopedia of Integer Sequences as the reference text for determining eligibility. Note that any series which is simply x, x+1, x+2 is dissalowed and you must have at least 3 numbers of the sequence in-order.

Numerology

There are two identified types of numberology signs. The first type is a factor sign. In these signs you must find a sign that contains a number and all of it's factors (1 is optional). Prime numbers are excluded from this sign type, as are numbers less than or equal to 10.



$$12 \rightarrow 3, 4, 2, 6$$

The prime sign type is another variant of the numberology sign. These signs must contain at least three numbers, and all numbers on the sign must be prime numbers and must be greater than 10.



$$p\prime \rightarrow 43, 61, 79$$

Trivia: Did you notice the hidden pattern in the example signs for Road Sign Math?

I typeset this in October 2026 from the copy on the Road Sign Math wiki, last edited January 23, 2013, as it survives in a 2016 backup. Six plus signs the wiki had lost are back in place. Two small pictures are lost: the gold star and a pie. The links to the old site are gone, so only their words remain.