International Journal of Mathematics Trends and Technology
ISSN: 2231-5373/ https://doi.org/10.14445/22315373/IJMTT-V71I8P102
Volume 71 Issue 8, 9-13, August 2025
© 2025 Seventh Sense Research Group®

Original Article

Some Work to Approach The Solution in NERDLE

Swastika Dey

Indian Statistical Institute, Mstat 1st Year, Kolkata, India.

Received: 10 June 2025 Revised: 16 July 2025 Accepted: 02 August 2025 Published: 13 August 2025

Abstract - *Recently, I started playing an online game, NERDLE, which appears as a one-day challenge on a website, and we had to guess a mathematical equation of 8 figures from zero knowledge in 6 tries.*

Here, in my work, I have proved that it is possible to find out the right operations, digits and right position of '=' in the first 2 tries and right positions of the operations in the first 3 tries in NERDLE.

Till now, I have won this game every time I played using this strategy, which I have mentioned here.

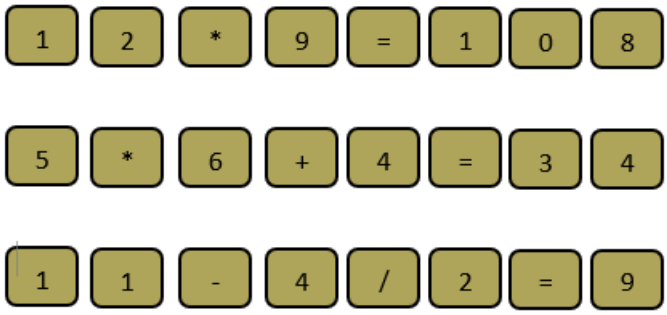
Keywords - *Zero-knowledge, Mathematical Equation, Operations, Digits, Colors.*

1. Introduction: What Is the NERDLE Game?

Nerdle is an online game, where we have to guess an equation of 8 characters (digits, operations and '=' in 6 tries starting from zero-knowledge. On the right side of '=', there cannot be any operations. All operations must be present on the left side of '='. The digits are 0,1,2,3,4,5,6,7,8,9, and operations are '+' , '-' , '*' and '/' can be used. Digits or operations can be repeated. The desired equation follows the BODMAS rule (but guesses need not follow it). '0' cannot be a single entry on the left side of '='.

No entries in the left side of '0' can start with '0' (i.e., 01+2+4=7 is not valid). Also, + and * are commutative operations here if you allow commutative operations in settings. (i.e., 4*45=360 is same as 45*4=360) . Here are some examples of valid equations.

Examples:



Now, after entering an equation and submitting it, the tiles become Black, Pink or Green. A black tile indicates that the digit or operation contained in it is not present in the desired equation. A pink tile indicates that the digit or operation contained in it is present in the desired equation but not in that position. A green tile indicates that the digit or operation contained in it is present in the desired equation at exactly that position. To know more about Nerdle, visit https://nerdlegame.com. Now I will describe some observations first.

2. 1st Observation

'=' must be present in every equations. Now, the '=' sign cannot be placed in the 8th column, as ∃ at least one digit is on the right side of '='. Also, ∃ at least one operation is on the left side of '=', so there must exist at least 3 columns to the left of '=' (i.e., 2 digits and one operation).

This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

Now, for this case, the maximum of R.H.S. can be 81 (9 * 9 = 81), which is a two-digit no.
Columns left blank on the right side of '='. , so 2
So, we cannot place '=' before the 5th column. So, we can place the '=' in three places-
(i) 5th column
(ii) 6th column
(iii) 7th column

3. 2nd Observation

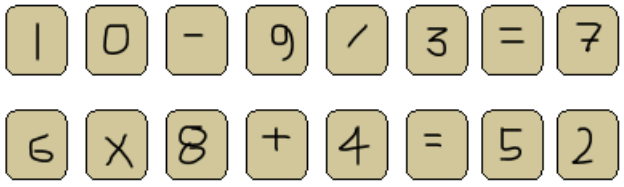
Observe that there exists at least one column on the right side of '=', so we can have 6 columns to use on the left side of '=' at maximum.
So, we cannot use more than 2 operations.
So, the number of operations can be
(a) one
(b) two

Now I will discuss a method that will lead us to get all the correct operations and digits used and right position of '=' in 2 tries.

4. Method To Get All Digits and Operations in First 2 Tries:

We have two operations at maximum. Try to put the first equation with '=' at 6th (or 7th) column and 2 distinct operations and 5 distinct digits, such that we can make another equation placing '=' at 7th (or 6th) column with the remaining 2 distinct operations and remaining 5 distinct digits.

Now, someone may ask, is it possible to make such two simultaneous equations?
The answer is yes, as I can give an example of such a pair –



Decision

By this strategy, we can get all operations and digits of the desired equation in 2 tries. Also, the right position of '=' can be predicted as we have checked for two positions, so if none of them are green, then certainly the remaining position (i.e., the 5th column is the right position of it.

Now, after getting all operations, the digits used in the desired equation and the right position of '='we have observed other things.

5. 3rd Observation

As ∃ '=' sign and at least one operation, the number of digits in the equation can be at most 6. There are these 5 cases possible -

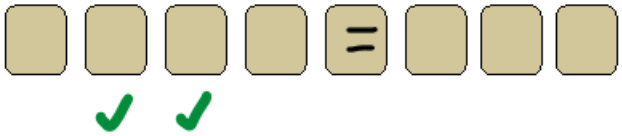
- 6 Digits and One Operation is Selected: In this case, it is certain that only one operation is used once, and digits are not repeated.
- 5 Digits and 2 Operations are Selected: In this case, it is clear that exactly 2 operations and exactly 5 digits are used without any repetition.
- 2 Operations and Less Than 5 Digits are Selected: In this case, operations cannot be repeated, but some digits must be repeated in the desired equation.
- 5 Digits and One Operation is Selected: In this case, either one operation is used with one repeated digit (total6 digits), or that operation is repeated twice with 5 distinct digits in the desired equation.
- One Operation and Less Than 5 Digits are Selected: In this case, either the digits are repeated (6 digits in total) and only that operation is used once, or the operation is repeated twice with repeated digits (5 digits in total) in the desired equation. Now I will prove how it is possible to get the right positions of the equations in the 3rd try.

6. Right Positions of The Operations Used

Claim :
I can guarantee the number of operations used and their right position in 3 tries, certainly.
Proof :

6.1. CASE-1

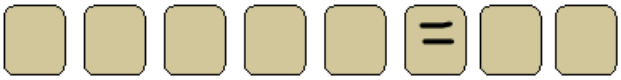
The right position for '=' is the 5th column.



In this case, we must get only one operation selected by the system after 2 tries, and we cannot use that more than once, also this must hold that the system had selected either + or *, as with the operations - or / we cannot get a three-digit number in R.H.S. Now, the + or * (the one which is selected) must be at 2nd or 3rd column and +, * being commutative placing it in 2nd column is equivalent to placing it in 3rd column. So, we already know it is in the right position. Hence, case 1 is proved.

6.2. CASE-2

The right position for '=' is the 6th column.



In this case,
(a) If two operations are selected by the system after 2 tries, then they must be placed in the 2nd and the 4th column

(i) If both operations are already selected in green in the first 2 tries, then they are in the right position already.

(ii) If one of the operations is green in the previous 2 tries, then it must be in the 2nd (or 4th) column, just put the other operation at the 4th (or 2nd) column along with selected digits, making a valid equation in the 3rd try, and it must become green.

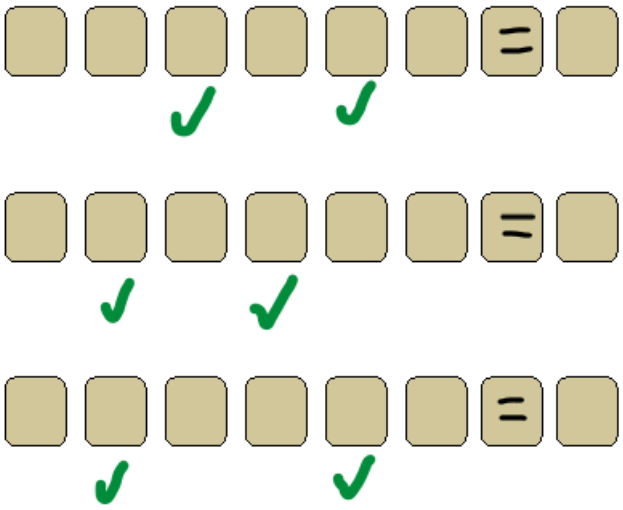
(iii) If both of the operations selected in 2 tries are pink, then if any of them was placed in 2nd (or 4th) column, then replace that operation with 4th (or 2nd) and put another operation in the 2nd (or 4th) column, then they must be green and if none of them were in the 2nd or 4^{th} column in the first 2 tries, then just randomly place one of them in the 2nd column and another at 4th column, along with selected digits, making a valid equation in the 3rd try. Now, either both will become pink or both will be green. If both are green, then they are in the right position; if both are pink, then switching their place is enough. So, we can make a decision about their right position in 3rd try.

(b) If one operation is selected by the system after 2 tries, then place it at both the 2nd and 4^{th} column along with selected digits, making a valid equation in the 3rd try (irrespective of whether it was pink or green in the first 2 tries to check if it was repeated or not.
If both are green, then they are repeated and rightly placed.
If one is green and the other is black, then it means it is not repeated and rightly placed.
If one is pink and the other is black, then it means it is not repeated and wrongly placed, so the only option to place it is 3rd column.

(**NOTE-1**: Here, in case of non-repetition, the 3rd column is in the right position if + or - was selected in the first 2 tries, as the product of 2 2-digit no. Cannot give a 2-digit no and a two-digit no. Divided by a 2-digit no. Cannot give a 2-digit result. And if the right position is the 4th column (for non-repetition of operation), then only - or / must be selected in the previous 2 tries. Also, we can guarantee that if * is selected, then the operation must be repeated, and when – or / is selected, then the operation can never be repeated. So, we have to check the repetition if + is selected. Otherwise, we already know whether repetition happens or not. For / just put it in 4th column, along with selected digits, making a valid equation, and it must be green and put it in the 3rd column along with selected digits, making a valid equation. If it is pink, just switching it to the 4th column will give the right position and for *, it must be green in both the 2nd and 4th column.)
So, here we are also able to make a decision about the right positions of the operation.

6.3. CASE-3

The right position for '=' is the 7th column.



(a) Suppose 2 operations are selected by the system.
We can place the operations in the following 3 ways if two operations are selected
(1) If both operations were green in the first 2 tries, then we already know their right position.
(2) If one operation is green and another is pink, then we have got one right position, now just put the other operation according to the above model.

So,

- If an operation is green in the 2nd column, then put another operation in the 4th (or 5th) column alongwith selected digits, making a valid equation in the 3rd try. If it becomes green in the 4th (or 5th) column then we are done, and if it is pink in the 4th (or 5th) column, then it is certain that the 5th (or 4th) column is the right position for it.
- If an operation is green in the 3rd column, then the right position for another operation is the 5th column.
- If an operation is green in the 4th column, then the right position for another operation is the 2nd column.
- If an operation is green in the 5th column, then put another operation in the 2nd (or 3rd) column along with selected digits, making a valid equation in the 3rd try. If it becomes green in the 2nd (or 3rd) column, then we are done, and if it is pink in the 2nd (or 3rd) column, then it is certain that 3rd (or 2nd) column is in the right position for it.

(3) If both operations are pink, then put them in other places following the BODMAS rule, along with selected digits making a valid equation in 3rd try in the columns where none of them were placed in the first 2 tries.

- If both are still pink, then we are sure that their right positions are just the switched position that they have in the first 2 tries. (This cannot happen when both were pink in consecutive tiles)
- If one is pink and the other one is green, then we are sure that the place left to check for that operation is the right position for it.
- If both are green, then we already got the right positions for both operations.

(b) Suppose the system selects one operation.
If 6 digits are not selected, then we have to check if the operation is repeated or not.

(**NOTE-2 :**
For repetition of one operation twice, this structure is impossible.
Proof :
(a) Suppose + is repeated, a 2-digit no. added with 2 one-digit no. cannot give a one-digit no. as an answer.
(b) Suppose - is repeated, a 2-digit and a one-digit no.
The result must be negative, which is a contradiction.
is subtracted from a one-digit no, so

(c) Suppose * is repeated, a 2-digit no. multiplied by 2 one-digit no. cannot be given a one-digit no. as an answer. (d) Suppose/ is repeated, a one-digit no. divided by a 2-digit no. and a one-digit no. cannot give an integer, so it is impossible. Hence, proved.

NOTE-3 :

For repetition of one operation twice, this structure is also impossible.
(a) Suppose + is repeated, a 2-digit no. added with 2 one-digit no. cannot give a one-digit no. as an answer.
(b) Suppose - is repeated, a 2-digit and a one-digit no. The result must be negative, which is a contradiction. Is subtracted from a one-digit no., so
(c) Suppose * is repeated, a 2-digit no. multiplied by 2 one-digit no. cannot be given a one-digit no. as an answer.
(d) Suppose/ is repeated, a one-digit no. divided by a 2-digit no. and a one-digit no. cannot give an integer, so it is impossible. Hence, proved.)

So, for repetition of one operation twice, we can place the operations in the following way -+ or * can't be selected by the system if '=' is in 7th column. (+ or * applied to one 2-digit no. and 2 one-digit no. cannot give a one-digit no. as an answer. Even if + or * applied only once, it does not work as the result is a one-digit no.) So, now we will discuss what happens if the only operation selected is - or /.

If the operation was green in the first 2 tries, in the 4th column, then we can confirm it is not repeated. Otherwise, place that operation at the 3rd and 5th column along with selected digits, making a valid equation in the 3rd try.

- If both will become green, it means it is repeated.
- If one becomes green and another becomes black, it means the operation is not repeated, and we have found the right position. But observing carefully, we can see that this is also impossible as in the 3rd column gives a negative answer, and the 5th column will give more than one-digit answer, similarly / the 3rd column gives a non-integer answer, and in the 5th column gives more than one-digit answer, so it is impossible.
- If one becomes pink and another becomes black, it means the operation is not repeated and not in the right place, so either the 2nd column or the 4th column is the right position for this. Now, if it were in the 2nd column, we get a negative answer (for -) or a non-integer answer (for /). So, we can conclude that the operation must be placed in the 4th column to get a valid result. Thus, we completed the proof of our claim that we are able to make a decision about the right position of operations in 3 tries.

7. Conclusion

In this work, I have demonstrated a structured and logical strategy to consistently get the right operations, digits and right positions of all Figures in the NERDLE game within three tries. By carefully analyzing constraints on the placement of the '=' sign, the number of operations and digits, and utilizing positional color feedback, we can deduce all necessary elements of the target equation, including operations, digits, and their correct positions. The method not only enhances gameplay efficiency but also reveals an elegant interplay of logic and mathematical reasoning embedded in the game.

References

[1] FAQ's About Nerdlegame. [Online]. Available: https://www.nerdlegame.com/faqs.html?faq=commutativity&loaded=1
[2] Garry Ariel, Some Mathematical Analysis on Nerdle Game, 2022. [Online]. Available: https://medium.com/@garryarielcussoy/some-mathematical-analysis-on-nerdle-game-2d524ecc6469