Emerson High School Chalkboards Oklahoma (state) Multiplication +5

How does the multiplication wheel, that was discovered on old chalkboards at Emerson High School in Oklahoma, work?

This week, contractors removing old chalkboards at Emerson High School in Oklahoma City made a startling discovery: Underneath them rested another set of chalkboards, untouched since 1917. A wheel that apparently was used to teach multiplication tables appears on one board.
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Haunting chalkbo... (more)

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7 Answers

Tyler Hooks
139.8k Views

Here's my theory:

The equation on the right of the board, $19 + 10 = 29$, seems to indicate that this was most likely an elementary school class when perhaps the students were just learning multiplication, and since the factors only go to $8x$, I would presume that this was simply an exercise.

The teacher would go around the circle, and the children would answer. The numbers were disarranged to prevent students from simply memorizing the order in which they occur (such as $2x$ increasing by 2 each time), but instead actually having to memorize the factors. An example would be:

$3x$

- 3 = 9
- 8 = 24
- 7 = 21
- 4 = 12
- 12 = 36
- 7 = 21

The teacher points to one of the numbers, and the students give her the product.

There is one 2, three 3s, two 4s, two 5s, three 6s, four 7s, three 8s, two 9s, one 11, and one 12. There are no 1s or 10s, however, which are the easiest to multiply by. This is another reason this could be for exercises. If this was actually some kind of table, there should have been an accommodation for at least 10s. The lack of 1s and 10s and the multitude of 6s, 7s, and 8s (which are the most difficult factors to multiply by) further imply this theory.

There is no pattern from what I can tell, and I have tried making shapes and connecting numbers, but it does not add up (no pun intended).

Edit: The teacher actually seemed to have a pattern, at least in regards to the numbers, for a little while.

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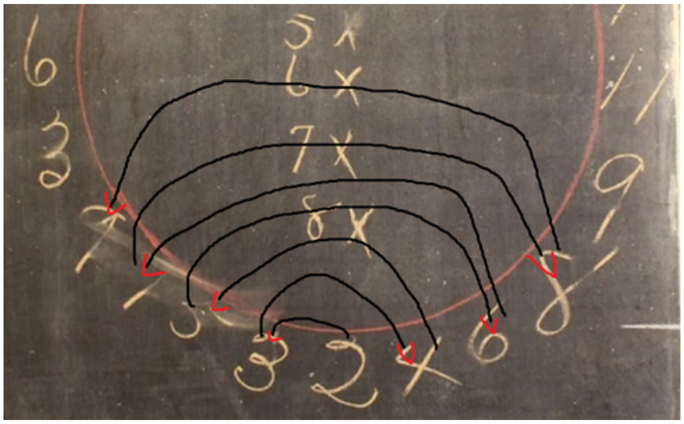
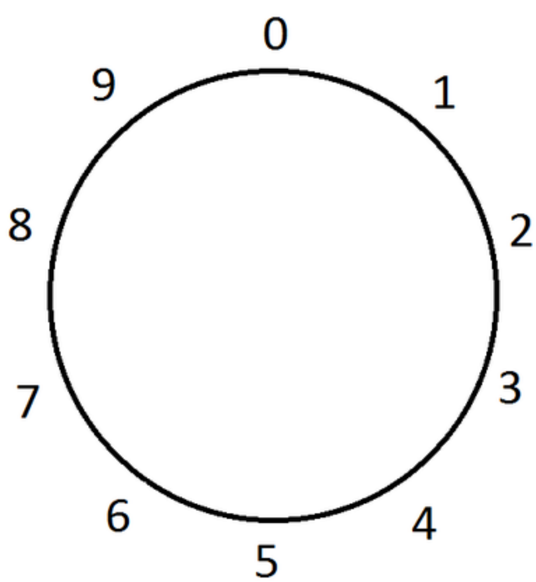


The bottom number started at 2, then $2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$, then the numbers seem to be random afterwards. It seems as though perhaps the teacher wrote this from the bottom up and alternated from 2 to 9 as so not to repeat numbers while avoiding listing them in order so that the students would memorize the factors ($3 \times 3 = 9$, $3 \times 9 = 27$) and not the patterns ($3, 6, 9, 12, 15,$ *etc*.), but then listed random numbers after 2 through 9 had been listed.

Edit #2: I looked into the Waldorf method, which was mentioned in another answer. This method basically makes geometric shapes using the multiplication wheel, which would explain the geometric shapes above the multiplication wheel in the picture. However, this method only makes pentagrams when you use the numbers 4 and 6 (other numbers produce different geometric shapes). This method also seems unlikely, as the number wheel is generally in order clockwise, begins with 0, and only goes up to 9 (this wheel goes to 12, and excludes 0).

For those curious as to how this method works, here is an example (please excuse the Paint skills).

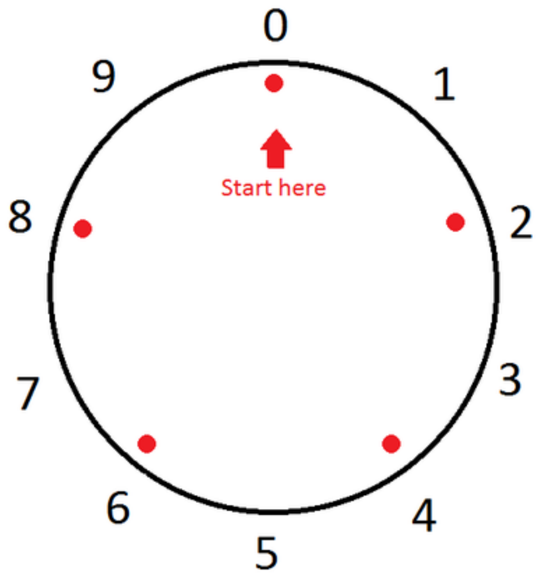
First, you need a poorly constructed multiplication wheel.



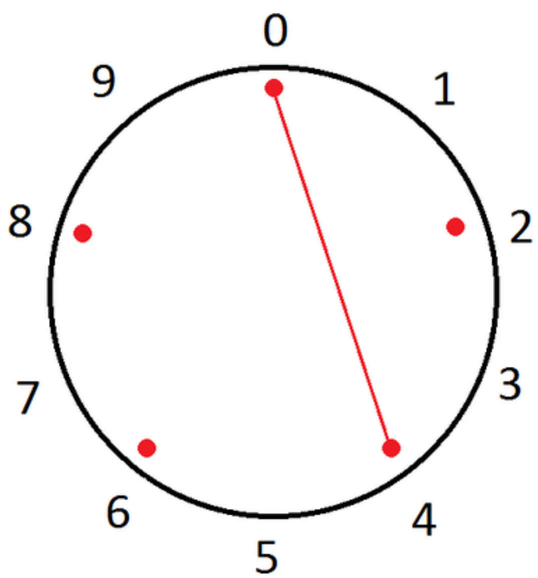
Since this method only works with 4 and 6, I will use 4 as an example.

Begin with 0.

$4 \times 0 = 0$



$4 \times 1 = 4$



$4 \times 2 = 8$

... (more)

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Edward Doolittle, Mathematician, problem solver, programmer

35.5k Views

As others have mentioned, it seems likely the purpose of the arrangement was to drill and practice multiplication tables, rather than as an aid to multiplication. Several features of the wheel support that notion:

- numbers around and inside the wheel don't include 0, 1, or 10 which would be trivial as multiplicands for a drill
- numbers around the circle seem to be "randomly" placed
- the distribution of numbers around the circle includes the easy multiplicands 2 and 11 only once; the hardest multiplicand, 12, once; 4, 5, and 9, twice; 3, 6 and 8, three times; and 7, the hardest single digit (in my experience), four times

- 11 and 12 seem out of place but I remember some multiplication tables going up to 12 when I went to elementary school in the 70s; we still had to learn about dozens back then, and there are clocks with 12 hours and feet with 12 inches so multiplying by 12 quickly was (is, in non-metric countries) a useful skill

There is another interesting feature of the circle: there are 22 numbers around the circle, and 7 numbers inside. GCD(22,7) = 1, so that the process of repeatedly moving one position around the circle and one position down the list in the center will eventually cover all combinations of positions and will really mix the questions.

So if we start 2x at the top of the list and 8 at the top of the circle, we get 2x8 = 16. Then we move down the list to 3x and around the circle to 7, we get 3x7 = 21. Next is 4x4=16, 5x12=60, 6x7=42, 7x11=77, 8x9=72, then we go back to the top of the list but continue around the circle for 2x8=16, 3x6=18, etc.

If the teacher worked his/her way through the class in some order, the pattern would be easy for the students to follow one after the other but it would be harder for students to figure out what their problem would be too far in advance.

One feature of the arrangement that works against my theory is that sometimes the same number is 7 places away around the circle, so the top 8 and the next 8 are 7 places apart; the two 4s are 7 places apart; and the two 5s are 7 places apart. So you get the problem 2x8 twice in 7 problems, and similarly for the 4 and 5 pairs. An explanation might be that the circle was casually constructed, or that the same circle might be used for sizes of inner list other than 7 entries, in which case it would be really hard to construct a circle that didn't have the repetition noted above.

Another issue with my theory is that some non-trivial products won't occur, namely 9x9, 9x11, and 9x12.

Another issue is that if the circle had 23 entries rather than 22, it could be used with a nice mixing effect with any single-digit list in the center, so why not use 23 entries?

Written Jun 14, 2015 • View Upvotes

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Dwight C Culver
79.1k Views

Wow, such sophisticated and technical answers. In the 1950's in West Texas our teacher used it as a memorization tool, a class-room challenge and kind of like a spelling bee. Only a multiplication bee.

We would stand in a row along the side of the room, the teacher using a long stick,(with a little hook on the end, used to pull down charts and maps hanging above the black board) with point at the multiplicand (7X) and say "Johnny" 7 times, she would then point out a multiplier (8) and Johnny would take a stab at the product. If Johnny got it right he remained standing. If he missed it every one would giggle, only to be hushed by the teacher, and Johnny would sit down. (No participation ribbons or trophies handed out)

The teacher then would go on to the next child in line. This was done in a rapid manner, if you were not ready it went very fast. It always ended up with the same two girls and the guy wearing glasses coming out in a draw.

Sometimes to mix things up the teacher would call out the class member's names in a random manner. This was even worse than being called in order. We were expected to know our multiplication tables up to the 12's by the end of the forth grade.

Written Jun 15, 2015 • View Upvotes

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Andrew Eberlein, UIUC, physics major, proud Catholic
23.2k Views

I don't think it was used to teach multiplication, at least there is no "trick" involved.

If there were some trick with the circle, then the numbers would be symmetric across the vertical to make an even circle. Not counting the 8 on top and the 2 on bottom, there are 11 numbers on the left side and about 9 numbers on the right. Only if the "12" were really "1" and "2" and the "11" were "1" and "1" would the circle be symmetric.

For this reason, I believe the teacher hastilly scratched those numbers randomly (or not so randomly on the bottom, just to get started with a 2 on left, 3 on right, 4 on left, 5 on right pattern) and therefore would likely be for drilling the students or something. We are drawn to believe it is some trick because of the perfect circle, but only the outline of the circle is perfect, not the numbers on it.

Jim Griminger, Life-long wisdom seeker and puzzle-solver.

I tend to agree that this was probably just an exercise tool, but oddly enough I think I may have found a pattern in the setting of the outside numbers:

Start at 2x and the top (12-o'clock position) outside 8: 2x8=16...

now add 2 numbers together starting at the 8 (clockwise) including your start number: 8+7=15...

now subtract 2 numbers starting at (and including) the 8 (clockwise), 8-7=1 (always subtract from your start number)...

now add your addition answer to your subtraction answer: 15+1=16 (just like 2x8!)

You can fairly easily check every 2x and see that it works, so moving on (random pick):

Next example: 4x the 6 near the 5-o'clock position: 4x6=24...

now add 4 numbers (4x) starting at that 6 (clockwise): 6+4+2+3=15...

now subtract 4 numbers starting at that 6 (always subtract from your start number) and including your start number, so you will be using 6,4,2 & 3: 6-4=2, 6-2=4, 6-3=3 and your subtraction total = 9 (2+4+3)...

your addition total (15) + your subtraction total (9) = 24 just like 4x6 and so on!

As you go, negative numbers will become involved.

Good exercise, took me about 20 minutes to figure it out back when I first saw it on the NPR news feed back on June 24. This was the answer I provided in their comments section. I haven't checked every scenario yet, but I also haven't found a combination where

Kimberly Wills

Someone on another site said they used this wheel as a math practice game. The teacher would call on a student and give them one of the numbers inside and they had to multiply it by all the numbers outside as quickly as possible. The outside numbers were written randomly by the teacher.

Tom Blundell

It looks like an exercise for the students. Perhaps it was done verbally with the class going around the circle firstly multiplying each number by 2 then around again multiplying by 3