EDUCATIONAL ENGINEERING
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MULTIPLICATION MATRIX

The history of this matrix goes back to the '70's when my wife and I operated an individual learning center teaching reading, math, and English, K – adult. We used a lot of programmed-learning materials and audio-visual aids, computer, etc. Students beyond third-grade (even adults) were found to be shaky in their multiplication tables, which affected their insights into numerical relationships and their work in the higher operations. "The Matrix" became a standard drill until they could do one correctly in 2 minutes or less, three days in a row. (The 66 fill-ins take a bit over a minute just to write the numbers; the rest is thinking time.) Then it became optional. Some students continued for a while because of the way they could use it in other work:

The ground rules were that it was to be the first math activity, and once you had "done the Matrix" and had it checked by your teacher, you could use it as a crutch for any work that involved division, etc. <u>But you had to use today's Matrix, not one generated in a previous lesson</u>. As long as you felt the need, we encouraged them to use the first two minutes of school test time to draw one on scrap paper. And if a teacher objected, point out that it wasn't "cheating" because they brought it in via their brains, and scrap paper was for anything they needed it for. If the flak got to heavy, I'd call the teacher myself, which happened maybe twice in ten years.

The following suggestions are ways to help start a timid student approaching a blank matrix for the first time. Please refer to "DEMO 1" and look for the circled (1) under "start." Point out that this is the line that goes to the big "2," so it's for the table of 2, which virtually all could do. When he's reached 12 X 2, point out that the final digits follow a repeating pattern 2, 4, 6, 8, 0, and so do the final digits of 12's table which they can now fill in under the big 12. Urge them to print carefully as they're creating their own calculator! Next move to the big 5 (under circled [2]) and have him count by fives and write the 5's table, and the end of which he reaches the "0" in 60.

Next (refer to DEMO 2) go to the big 10 and have him count by 10's down 100 then over to 110 and 120 where he makes another connection. Now the 11's, which are all "doubles" until he connects with 110. Next the 9's; and it may help to show him the trick of doing the 9's table on his fingers. Anyway, the first digits of the 9's are just counting up to 8 of 81. Point out the digits in the 9's table always add up to 9, so he can just "count backwards" to pail up the second digits back up to 18 under the big 9.

Now that the patterns are becoming visible, go to the (6) and either do the 3's table, or just that 3 X 3 = 9, and 4 X 4 = 16, and 6 X 6 = 36, etc., and "look how much you've done." By this time the easy fill-ins like the 3's, 4's, 6's, and the early 12's leave him with maybe 12 boxes unfilled. And you can say,' If you did only this much in 2 minutes, otherwise 1 point off for every mistake and point off for every 5 seconds beyond the two minutes.

Eventually, ask him what's "special" about the numbers that form the diagonal: 1, 4, 9, 16, 25, 36, etc. If he doesn't see it, tell him they are important as being the results of a number multiplied by itself, called "perfect squares," and that he will encounter them many times.

Happy times! Charlie

Multiplication Matrix

Start
①

1	2	3	4	5	6	7	8	9	10	11	12	X
2	4	6	8	10	12	14	16	18	20	22	24	2
				15							6	3
				20							8	4
				25	30	35	40	45	50	55	60	5
											2	6
											4	7
											6	8
											8	9
											6	10
											2	11
											4	12

Date ________

Time ______ Score _______

Name Demo 1

Multiplication Matrix

5 3 4

6

1	2	3	4	5	6	7	8	9	10	11	12	X
2	4	6	8	10	12	14	16	18	20	22	24	2
		9		15				27	30	33	6	3
			16	20				36	40	44	8	4
				25	30	35	40	45	50	55	60	5
					36			54	60	66	2	6
								63	70	77	4	7
								72	80	88	6	8
								81	90	99	8	9
									100	110	120	10
											2	11
											4	12

Date ________

Time ______ Score _______

Name Demo 2

Multiplication Matrix

1	2	3	4	5	6	7	8	9	10	11	12	X
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12

Date ______

Time ______ Score _______

Name ____________________

Multiplication Matrix

1	2	3	4	5	6	7	8	9	10	11	12	X
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12

Date ______

Time ______ Score _______

Name ____________________

Multiplication Matrix

1	2	3	4	5	6	7	8	9	10	11	12	X
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12

Date ______

Time ______ Score _______

Name ____________________

Multiplication Matrix

1	2	3	4	5	6	7	8	9	10	11	12	X
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12

Date ______

Time ______ Score _______

Name ____________________

Multiplication Matrix

1	2	3	4	5	6	7	8	9	10	11	12	X
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12

Date _______

Time _______ Score ________

Name ________________________

Completed Multiplication Matrix Table
for Student Memorization

Multiplication Matrix

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**X**
2	4	6	8	10	12	14	16	18	20	22	24	**2**
		9	12	15	18	21	24	27	30	33	36	**3**
			16	20	24	28	32	36	40	44	48	**4**
				25	30	35	40	45	40	55	60	**5**
					36	42	48	54	60	66	72	**6**
						49	56	63	70	77	84	**7**
							64	72	80	88	96	**8**
								81	90	99	108	**9**
									100	110	120	**10**
										121	132	**11**
											144	**12**

Date _______

Time _______ Score ________

Name ________________________

Mr. Potter’s Complete Multiplication Tables
No Duplicates – With Products

2’s Table							
2 x 2 **4**	3 x 2 **6**	4 x 2 **8**	5 x 2 **10**	6 x 2 **12**	7 x 2 **14**	8 x 2 **16**	9 x 2 **18**
3’s Table							
3 x 3 **9**	4 x 3 **12**	5 x 3 **15**	6 x 3 **18**	7 x 3 **21**	8 x 3 **24**	9 x 3 **27**	
4’s Table							
4 x 4 **16**	5 x 4 **20**	6 x 4 **24**	7 x 4 **28**	8 x 4 **32**	9 x 4 **36**		
5’s Table							
5 x 5 **25**	6 x 5 **30**	7 x 5 **35**	8 x 5 **40**	9 x 5 **45**			
6’s Table							
6 x 6 **36**	7 x 6 **42**	8 x 6 **48**	9 x 6 **54**				
7’s Table							
7 x 7 **49**	8 x 7 **56**	9 x 7 **63**					
8’s Table			**9’s Table**				
8 x 8 **56**	9 x 8 **72**		9 x 9 **81**				

Mr. Potter's Complete Multiplication Tables
No Duplicates - Without Products

2's Table							
2 x 2	3 x 2	4 x 2	5 x 2	6 x 2	7 x 2	8 x 2	9 x 2
3's Table							
3 x 3	4 x 3	5 x 3	6 x 3	7 x 3	8 x 3	9 x 3	
4's Table							
4 x 4	5 x 4	6 x 4	7 x 4	8 x 4	9 x 4		
5's Table							
5 x 5	6 x 5	7 x 5	8 x 5	9 x 5			
6's Table							
6 x 6	7 x 6	8 x 6	9 x 6				
7's Table							
7 x 7	8 x 7	9 x 7					
8's Table			**9's Table**				
8 x 8	9 x 8		9 x 9				

Note from Internet Publisher: Donald L. Potter

October 18, 2008

Several years ago, when I was teaching fourth grade, Charlie Richardson sent me this *Multiplication Matrix*. He told me that he had used it for years and found it very helpful. Charlie's charts were hand-drawn. These charts were prepared with Microsoft Excel.

You can calculate the products per minute by divided 3960 (66 x 60) by seconds.

Charlie passed away last year after many years of fruitful service in helping the students on Long Island.

I highly recommend Dr. Samuel Blumenfeld's helpful little booklet, *How to Tutor*. Sam is one of the few people that I have read who is aware of the dangers of unit counting.

More information on good math programs can be found at my website: www.donpotter.net

I taught 21 years for the Ector County ISD, Odessa, TX. Upon retiring from the public schools, I taught for 13 years at the Odessa Christian School. I taught fourth grade my first year there, after that I taught many subjects including: Spanish, remedial reading, cursive handwriting, Bible, American History, Texas History, and spelling. I retired from the Christian School in order to dedicate more time to research, publishing, teacher-parent workshops, and private tutoring.

Here is a link to the Math page on my website.

http://donpotter.net/education_pages/math.html

My current tutoring location is 1329 Tanglewood Lane, Odessa, TX. 79761

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