THE MAGIC SQUARE

Some notes I hope you'll find useful

by Ian Rowland

The Magic Square

Obviously, I didn't create the Magic Square. In this short document, I just want to share a few notes about performing this item for laypeople, which I've been doing for many years. I hope these notes prove useful. I really want to share three things with you:

- People do like it!
- The method.
- Presentational thoughts.

People Do Like It!

For many years I knew how to create a Magic Square but I never used it in a show. I know there are lots of people — even very intelligent and successful ones — who don't like anything to do with numbers, hated 'maths' at school and will quite cheerfully admit they are clueless when it comes to arithmetic. Also, I wondered if it was really very 'magical' at all. Wouldn't most people see it as just a fancy 'show off' calculation stunt? What's magical about that?

This is all changed one evening when I happened to be in Chicago. I was staying with friends and had offered to perform a small 'at home' show for them and a few guests. Not having a great deal of 'magic stuff' with me, I just put together the best show I could… and decided I may as well try a Magic Square. I was pleasantly surprised by the reaction. That's when I discovered that most laypeople absolutely *love* the Magic Square!

It's true that they might appreciate it on several different levels. For some, sure, it's just a clever bit of mental calculation — but still rather delightful and impressive to see, plus they can't fathom how it's possible to do all of the calculations so quickly. (This impression is intensified if you use the second presentation that I'll share later.) But for other people it really does seem rather magical. How can all those numbers add up to the chosen total in so many ways? It just seems impossible.

Plus, people go away with a unique, personal souvenir of the occasion.

So, just in case you have the same doubts I had, yes, people *do* like this item and it's worth learning!

The Method

First of all, learn the pattern for a standard 4 x 4 Magic Square using the numbers 1 - 16. This adds up 34 every which way.

It shouldn't take you long to learn this. Just go over it a few times. Get used to how each group of four numbers dance around the square. It may help to remember that in each set of four numbers, you visit each row and column once.

	1		
			2
		3	
4			

	1		7
	8		2
5		3	
4		6	

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

14	1	12	7
11	8	13	2
5	10	3	16
4	15	6	9

14	1	12	7
11	8	13	2
5	10	3	16
4	15	6	9

Every row, column and diagonal adds up to 34.

So do the four numbers in each corner (e.g. 14 + 1 + 8 + 11), and the four corner squares (14 + 7 + 9 + 4) and the four in the middle (8 + 13 + 3 + 10).

The middle sides add up to 34: 1 + 12 + 15 + 6, and 11 + 5 + 2 + 16.

The 'broken diagonals' do the same: 1 + 11 + 16 + 6 and 12 + 2 + 5 + 15.

The middle groups of four also work:
1 + 12 + 13 + 8 // 13 + 2 + 16 + 3
10 + 3 + 6 + 15 // 11 + 8 + 10 + 5.

That's already 24 different combinations that all add up to 34. There are many, many more as well!

Creating The Square For Any Total

A spectator requests that the Magic Square adds up to a given target.

Mentally take away 30. Then divide by 4 to get your starting number, N.

Note any remainder, R.

Start filling in the square as normal, starting with N. When you get to the thirteenth square, add R to that number. Then finish off the square.

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Example: target = **61**. Minus 30 = 31.
Divide by 4 = 7 remainder 3.

So, you start with 7 and follow the usual pattern.

	7	18	13
17	14		8
11	16	9	
10		12	15

You've got to the thirteenth square. The next number in sequence is 19. Ah… but there was a remainder of 3. So, you add that on, getting 22. Then you just complete the pattern. And that's all there is to it!

23	7	18	13
17	14	22	8
11	16	9	25
10	24	12	15

Here's another worked example.

Target = 94. Minus 30 = 64.
Divide by 4 = 16 exactly. No remainder.

29	16	27	22
26	23	28	17
20	25	18	31
19	30	21	24

One more.

Target = 71. Minus 30 = 41.
Divide by 4 = 10 remainder 1.

24	10	21	16
20	17	23	11
14	19	12	26
13	25	15	18

Thoughts On Presentation

Standard Presentation

I'll describe how I present the Magic Square in a walkabout close-up situation, such as during a close-up show at the Magic Circle.

I start with a simple graphic as shown: a 4 x 4 grid with a box at the top in which to write the target. I have this on a clipboard with some spares in the pocket on the left. (Incidentally, as a mentalist, it's feels really strange to use a clipboard… *just* as a clipboard and not to achieve any sneaky stuff!)

During the interval at the show, I mingle with the guests and ask if anyone would like a free, unique, magical souvenir to take home. Not surprisingly, there are always several people who say yes. Having chosen a spectator to work with, I invite her to choose a number from 1–100. If the number is 33 or lower, then the calculation gets strange and involves negative numbers, so I really want it to be between 34–100. I could just *request* a number from 34-100, but to me this sounds a bit clunky.

So, I say, "Please give me any number you like between 1 and a 100. If it's a number that means something to you, or that has some special significance for you, all the better — and, by the way, I won't ask you what the significance is unless you're happy to tell me. But it doesn't *have* to be a number that means something. You could just choose any random number from 1–100.

"What I will say is that if it's quite a large number, towards the higher end of the scale, then (a) what I'm going to do is harder for me, and I know you'd like to see me work hard, and (b) I think you'll find it more magical and impressive."

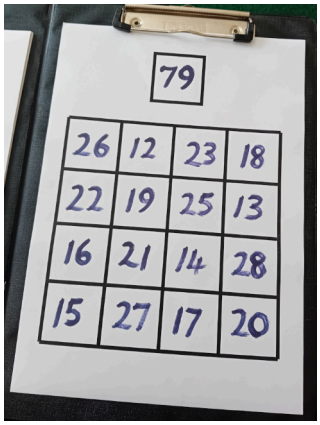
At this point, 99% of spectators will be happy to give me a number in the range I want, 34–100. On rare occasions, if I get someone who stubbornly insists on an awkwardly low number, I simply say, "Great! Let's work with that." Then I turn to someone else present and say, "And you?", and get a number from them as well. I add to two together and work with this *combined* total!

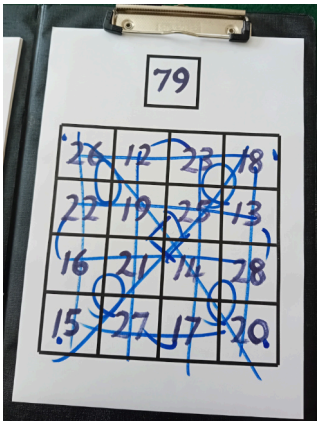
I write the total in the box at the top and say, "Now, give me just a few seconds and I'll try to do something very difficult for you. You know, sometimes magic looks a lot like someone trying to do 48 calculations in his head all at once."

I do the calculations and create the square as quickly as I can while checking that it's right as I go along. I'd rather sacrifice a bit of speed for the sake of accuracy.

Once I've created the square, I show it to the spectator(s) and start explaining what I've done. I'll use '79' as the total in this example.

This is where I'd like to make an important point about presenting the Magic Square. I've seen quite a few performers present this item who like to scribble lots of lines all over the square as they explain the various permutations. They do this in quite a fun, manic, energetic way: "And these four here! And down here too! And look… the diagonals!" and so on. As a result, the square ends up covered in messy, scrawled lines as shown. I understand that this approach suits some performers very well and there's nothing wrong with it. It can be very funny and entertaining.





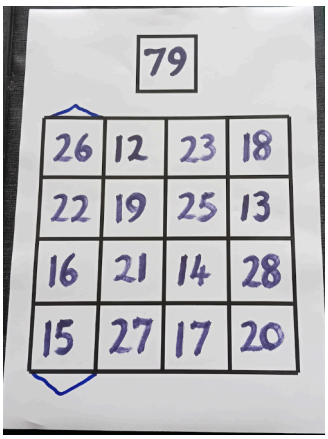
Personally, I like to take a different approach that I think is *slightly* more elegant and makes a nicer souvenir for the spectator to take away.

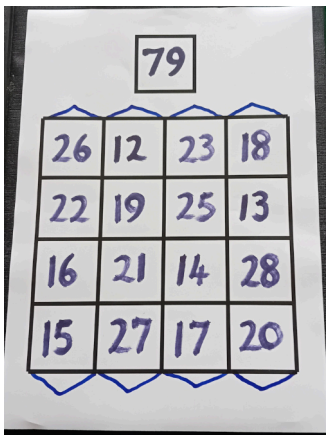
"Let me explain what I've done for you. I tried to think of a few numbers that add up to your chosen total, 79. Such as these numbers here."

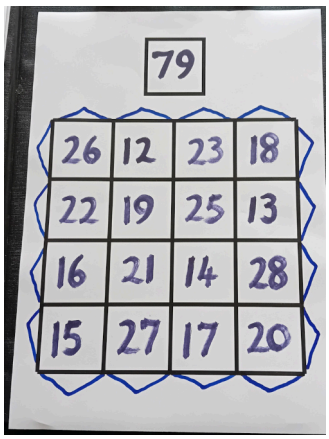
I indicate the numbers in the first vertical column (26 + 22 + 16 + 15) and, with a red or blue marker, add two small chevrons to mark the start and end of this column. Then I show that the other three columns *also* add up to 79 and mark them in the same way.

"But I didn't think that was enough for you. You deserve more. So, at the same time, I tried to make sure that you can add up the numbers *sideways* too. Let me show you."

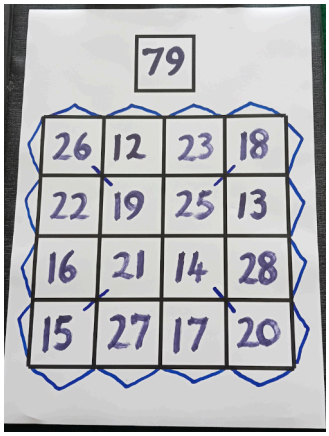
I start with the top row (26 + 12 + 23 + 18) and, using small chevrons as before, mark the start and end of each row.



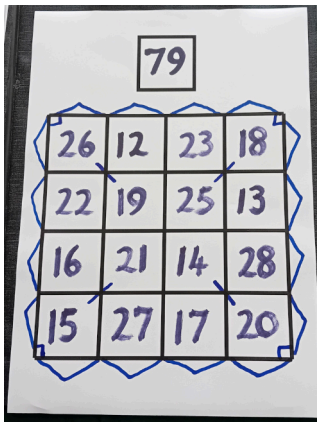




"And that's normally where I'd stop. But for you, I felt like going the extra mile. So I tried to arrange everything so that the diagonals would also total 79." I add short slanting lines to mark the diagonals.

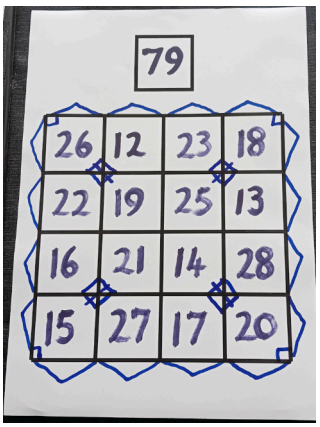


"Is that good enough? Wait… there's more. You see, at the same time, I wanted to make the four corner numbers *also* add up to your special number. Which, as you can see, they do." I mention the four corner numbers (26 + 18 + 20 + 15) and add small boxes in the corners of the grid to mark them.



"And for many people, that's where I'd stop. But not for you! You're so special, I felt you deserved more. So, I made sure that the four numbers in each corner group also add up to 79!"

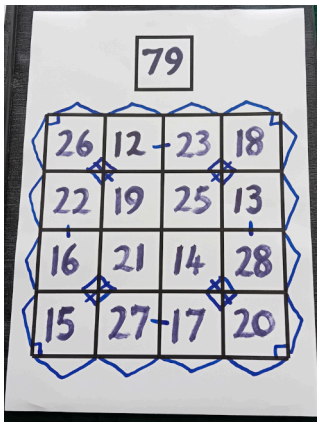
I mention each of these four corner groups (e.g. 26 + 12 + 19 + 22) and mark each one with a small diamond shape in the centre.

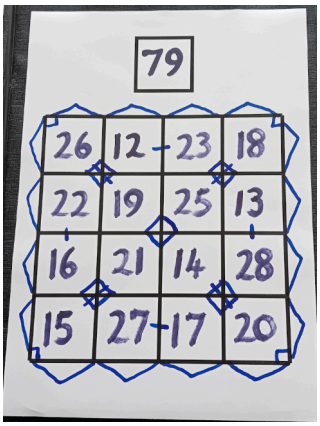


"And then I thought, why stop there? You deserve the very best. So I also made sure that these middle pairs along each side added up to 79 for you. So side to side we have 22, 16, 13 and 28, and top to bottom we have 12, 23, 27 and 17." I add short lines to mark these two sets of pairs.

"And that's about as magical as I can make it. Well, *usually* it is. But just because it's you, and you are *so* special, I thought I'd try something a bit harder. I thought I'd see if I can get the four numbers in the middle to add up to 79. And I think I managed it." I draw a diamond shape in the middle of 19, 25, 14 and 21.

"So, that's a headache for me and a souvenir for you." I remove the completed square from the clipboard, sign and date it at the bottom and add a note that I made this at The Magic Circle. Then I hand it over to the spectator, perhaps adding my business card as well.





Of course, you can adapt this idea to suit yourself, in terms of which features of the square you mention and how you mark them in a fairly decorative way. I'm not saying the result is a work of art. Also, you may not think I've illustrated the idea very well (I am creating this document in a *tremendous* rush!) You may be able to make the end result look *much* nicer and more attractive!

All I'm suggesting is that you can bring out the features of the completed square, and mark them up, in a way that looks elegant and results in a nice giveaway souvenir.

Advanced Presentation

I'd like to share just one more idea. Let's say I'm working with a corporate group and that I want to emphasise motivational themes such as *'believe in yourself'* and *'you can do more than you realise'*.

I work with whatever visual aids are available at the time: flipchart, PowerPoint slides, digital display etc.

"I want to show you something interesting. In fact, one of you is going to perform a miracle *and* have a potentially life-changing moment! Sounds crazy, I know, but bear with me. This is actually going to happen, right here, right now.

"I'm going to show you something with numbers. And don't worry if numbers aren't your thing. The *less* you like anything mathematical, the more you'll love this. Who know what we mean by 'squaring' a number? [A few people respond] Yes… it's really simple. It just means multiplying a number by itself.

So, let's take baby steps. What's the square of 2? Yes, it's just 2 x 2. Equals 4."

I write all the numbers out as I go along.

"Easy! What's the square of 3? You've got it… 3 x 3. Equals 9. You guys are sharp. Now.. you're not allowed to get your phones out and use your calculator for this. Just doing it all in your head, who can tell me what 95 squared is? Who knows 95 x 95?"

Obviously, no one will know.

"Show of hands. Who can do this calculation in their head? 95 x 95 purely by mental arithmetic? [most or all hands go up] And who is absolutely positive they *can't* do it and could *never* do it?"

I choose one spectator who feels sure he could never do this calculation in his mind. Let's call him John.

"Let me show you a little trick. Look at this problem.
25 x 25.

Three steps. Take the first number.
2

Add 1.
3

Multiply them (2 x 3).
6

Stick 25 on the end.
625

And that's it! That's the answer. 25 x 25 = 625.

Let's try it again. Just so you see the pattern.
35 x 35.

Take the first number.
3

Add 1.
4

Multiply them (3 x 4).
12

Stick 25 on the end.
1225

That's the answer! 35 x 35 equals 1225!

"Now, John. It's your turn. Try to do this yourself but the people near you will help if you ask them to."

Using the flipchart or screen, I display the same problem I mentioned earlier: 95 x 95. Using the simple steps I've just explained, John shouldn't have much difficulty arriving at the correct answer: 9025. I make sure everyone claps and cheers as if he has just won an Olympic gold medal.

"Look what happened. John was *sure* he couldn't do this. But I just gave him a sort of mental key, a different way of thinking about the problem, and he could do it!"

At this point, I can mention any additional 'motivational' points that fit in with the theme of the talk. Then…

"Now, that was *one* calculation, and we saw there was a way to do it in your head. I'm going to take it to the next level and try about 48 calculations in my head at the same time. This may take me up to 30 seconds. Can someone give me a number from 1–100?"

Then I proceed with my standard Magic Square demonstration.

I've often used this presentation, combining the 'squaring a number ending in 5' trick with the Magic Square. I find this significantly enhances the impact of the Magic Square and makes it seem even more impressive than usual. Because the audience have had a small taste of performing mental arithmetic, they tend to believe that when I create the Magic Square I must be performing a great many calculations in my head, all at the same time. In the patter I mention '48 different calculations' but this is just a made-up number intended to sound plausible yet impressive.

I hope you have enjoyed these notes on the Magic Square and that you get some value from them.

Credits

I first learned about magic squares by reading Martin Gardner's 'Mathematical Games' columns in 'Scientific American'.

I learned the specific method for creating the 4 x 4 square featured in this booklet from my friend Mark Stuart Farrar. His book, simply entitled 'Magic Squares', is brilliantly written and widely acknowledged as the definitive work on the subject. Mark was also kind enough to help me with the preparation of this booklet. You can buy his book here:

https://MagicSquaresBook.com/

Mark tells me *he* got started by reading Orville Meyer's, 'Master Memory And Magic Square Demonstration'.

I learned the trick for squaring numbers ending in 5 from my friend Arthur Benjamin, the 'mathemagician'. If you're interested in this field, his books on mental arithmetic and magic with numbers are essential reading.