The young man's book of amusement

Halifax, 1848

Magical Properties of Figures

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MAGICAL PROPFRTIES OF FIGURES.

The Magical Square.

THE Chinese have discovered mystical letters on the back of the tortoise, which is the common magical square, making each way 15, viz.

2	9	4
7	5	3
6	1	8

Writing in Cipher.

A cipher, consisting of nine radical characters, (those, for instance, composing the well-known figure †† with one, two, three, or more points at pleasure, ⸸⸸ above, below, or in the body of the figure,) is sufficient to compose a great enough variety of secret symbols for any purpose.

The Number Nine.

The following discovery of remarkable properties of the number 9 was accidently made by Mr. V.

Green, more than fifty years since, though, we believe, not generally known.

```
 9
 1
——
 9...9
   2
  ———
  18...1+8=9
        3
       ———
       27...2+7=9
             4
            ———
            36...3+6=9
                  5
                 ———
                 45...4+5=9

   9
   6
  ———
  54...5+4=9
        7
       ———
       63...6+3=9
             8
            ———
            72...7+2=9
                  9
                 ———
                 81...8+1=9
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Ingenious Problem.

Place ten halfpence in a row upon a table; then taking up any one of the series, place it upon some other, with this proviso, that you pass over just one penny. Repeat this until there are no single halfpence left.

SOLUTION.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, halfpence.

Place 4 upon 1, 7 upon 3, 5 upon 9, 2 upon 6, and 8 upon 10.

Another.

The sum of four figures in value shall be
Above seven thousand nine hundred and three;
But when they are halved, you'll see very plain,
The sum shall be nothing—the mystery explain?

SOLUTION.

The sum is 8, 8, 8, 8, which should be written down; then by wiping off the upper or lower part of each of the figures, there will remain 0, 0, 0, 0 = to nothing.

A countrywoman carrying eggs to a garrison, where she had three guards to pass, sold at the first half the number she had, and half an egg more; at the second the half of what remained, and half an egg more; and at the third, the half of the remainder and half an egg more; when she arrived at the market-place, she had three dozen still to sell, how was this possible, without breaking any of the eggs?

SOLUTION.

It would appear on the first view, that this problem is impossible; for how can half an egg be sold without breaking any; The possibility of it however will be evident when it is considered, that by taking the greater half of an odd number, we take the exact half †½. It will be found, therefore, that the woman, before she passed the last guard, had 73 eggs remaining, for by selling 37 of them at that guard, which is the half†½, she would have 36 remaining. In like manner, before she came to the second guard, she had 147; and before she came to the first, 295.

To place Four Poles in the Ground, precisely at an equal distance from each other.

Let three of the poles be placed at equal distances, so as to form a triangle; when, imagining a mound of earth in the shape of a pyramid to be raised on that triangle as a base, having one of its slant sides equal to the distance between any two poles, then placing the fourth pole on the apex of the pyramid, the puzzle is answered.

Magic Squares.

The magic square is a square figure formed of a series of numbers, in mathematical proportion, so disposed in parallel and equal ranks as that the sums of each row taken either perpendicularly, horizontally, or diagonally, are equal.

The several numbers which compose any square number (for instance, 1, 2, 3, 4, 5, &c. to 25 inclusive, which compose the square number 25) being disposed after each other, in a square figure of 25 cells, each in its cell—if, then, you change the order of these numbers, and dispose them in the cells in such a manner, as that the five numbers which fill an horizontal rank of cells being added together, shall make the same sum with the five numbers on any other rank of cells, whether horizontal or vertical, and even the same number with the five in each of the two diagonal ranks: this disposition of numbers is called a magic square, in opposition to the former disposition, which is called a natural square.

Natural Square.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Magic Square.

11	24	7	20	3
4	12	25	8	16
17	5	13	21	9
10	18	1	14	22
23	6	19	2	15

Suppose a square of cells, whose root is uneven, for instance , 7, and that its 49 cells are to be filled magically with numbers, for instance, the first 7, on the one side take the first seven numbers, beginning with unity and ending with the root 7, and on the other 7 and all its multiplies to 49 exclusively; and as these only make six numbers, add 8, which makes this an arithmetical progression of seven terms as well as the other, 0, 7, 14, 21, 28, 35, 42. This done with the first progression repeated, fill the square of the root 7 magically: in order to do this, write in the first seven cells of the first horizontal rank the seven numbers proposed, in what order you please, for that is perfectly indifferent; and it is proper to observe here, that those seven numbers may be ranged in 5040 different manners in the same rank. The order in which they are placed in the first horizontal rank, be what it will, is that which determines their order in all the rest. For the second horizontal rank, place in its first cell either the third, the fourth, the fifth, or the sixth number, from the first number of the first rank, and after that write the six others in order as they follow. For the third horizontal rank, observe the same method with regard to the second that you observed in the second with regard to the first, and so of the rest. For instance, suppose the first horizontal rank filled with the seven numbers in their natural order, 1, 2, 3, 4, 5, 6, 7, the second horizontal rank may either commence with 3, with 4, with 5, or with 6, but in this it commences with 3.

1	2	3	4	5	6	7
3	4	5	6	7	1	2
5	6	7	1	2	3	4
7	1	2	3	4	5	6
2	3	4	5	6	7	1
4	5	6	7	1	2	3
6	7	1	2	3	4	5

The third rank, therefore, must commence with 5, the fourth with 7, the fifth with 2, the sixth with 4, and the seventh with 6. The commencement of the ranks which follow, the first being thus determined, the other numbers, as we have already observed, must be written down in the order wherein they stand in the first, going on to 5, 6, and 7, and returning to 1, 2, &c., till every number in the first rank be found in every rank underneath, according to the order arbitrarily pitched upon at first. By this means, it is evident, that no number whatever can be repeated twice in the same rank; and, by consequence, that the seven numbers, 1, 2, 3, 4, 5, 6, 7, being in each rank, must, of necessity, make the same sum.

Ingenious artists, how may I dispose
Of five-and-twenty trees, in just twelve rows;
That every row five lofty trees may grace,
Explain the scheme—the trees completely place.

SOLUTION.

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

To distribute among three persons 21 casks of wine, 7 of them full, 7 of them empty, and 7 of them half full; so that each of them shall have the same quantity of wine, and the same number of casks.

SOLUTION.

This problem admits of two solutions, which may be clearly comprehended by means of the two following tables:

	Persons.	full casks.	empty.	half full.
I	1st.	2	2	3
	2nd.	2	2	3
	3rd.	3	3	1

	Persons.	full casks.	empty.	half full.
II	1st.	3	3	1
	2nd.	3	3	1
	3rd.	1	1	5

Singular Property of the Figure Nine.

Take the difference between any number, and the same reversed, then the said difference is always divisible by 9, without a remainder. Thus—

Number.... 86342983
Reversed .. 38924368

9)47418615

5268735

It is not necessary that they be reversed, but placed in any order, provided the lesser sum is at the bottom, and the same figures used. Thus—

739165248
562841793

9)176323455(19591495

If you take any number with three figures in it only, and reverse it, and take the difference, it will be divisible by 9, without a remainder, and the figures in the quotient will read backwards and forwards the same. Thus—

961	957	785	397
169	752	587	397
9)792(88	9)198(22	9)198(22	9)396(33

If you take more than three figures to the number, the case will still be the same, if the first two or three figures of the number you take do not exceed the last two, or last three figures, more than 9 in the difference, when each are added up and subtracted. Thus,—

6	1	625121
2	2	121526
5	1	
		9)503595
13	4	
4		55955

The Difference 9

A row of any number of figures, whose sum is any of the multiplies of 9, may be divided by 9 without a remainder.

Place in a row 9 different figures, the sum of which shall be 45, directly under these place another row of 9 different figures, the sum of which shall also be 45. Subtract the lower from the upper line, and the remainder will always consist of nine different figures, the sum of which will be also 45.

A ship was in a situation with a hole in one of her planks of twelve inches square, and the only piece of plank that could be had, was sixteen inches long by nine inches broad. Required to know how this said piece must be cut into four pieces, so as to repair the hole perfectly and without waste.

SOLUTION.

Cut off four inches from the narrow end of the given piece, and divide the piece so cut off into three equal pieces by cuts in the shortest direction. When arranging these three pieces lengthways on the top of the remainder, a square of twelve inches will be formed.

To name five weights, which added together, make 121 pounds; by means of which may be weighed any intermediate weight, excluding fractions.

SOLUTION.

The five weights, which, added together, make 121, and by means of which may be weighed any intermediate weight, are, 1, 3, 9, 27, 81,=121.