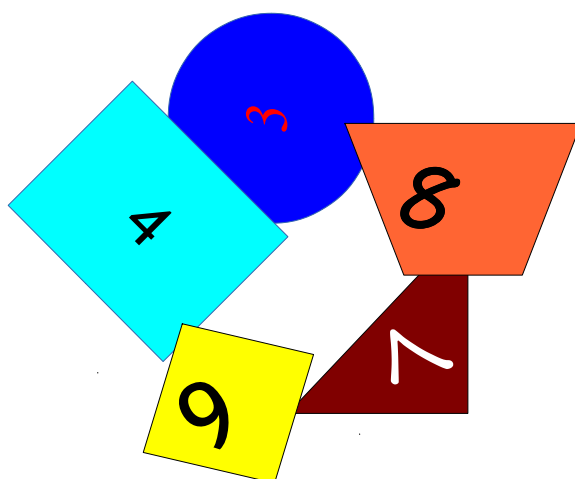


Number Puzzles

–

an assortment



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1 Introduction

Welcome to our free book with an interesting variety of number puzzles. Some puzzle types may be well familiar to you, others may be new even to experienced puzzlers.

There are some puzzle types which you are not likely to find here, even though they have to do with numbers. Sudoku and its many variants are one. Kakuro is another. The reason for the former is that you can walk into any bookshop and buy as many as you like. The reason for the second is that the puzzle type somehow doesn't appeal to me.

The puzzles that you will find in here may or may not fall in a well named puzzle category. Every puzzle has sufficient explanation the first time a puzzle of this category in this book is mentioned. Puzzle types are described into more detail in chapter 4. You may find some general hints for solving that type of puzzles there. You will also find some notes on the history of some puzzle types there.

Every puzzle has a number of asterisks indicating its level of difficulty, ranging from one star (*, easiest) to three (***, hardest)

For more number puzzles, visit the puzzle blog: <http://justpuzzles.wordpress.com>, which is all about puzzles in numbers, logic and patterns.

I wish you much fun solving these puzzles!

Teun Spaans

2 Puzzles

1) Swapped digits**

In this addition two pairs of digits have been swapped. Correct these swaps so that the addition is correct again!

$$\begin{array}{r} 187 \\ 430 \\ \hline 852 \end{array} +$$

2) Rowmix*

The numbers in each of the following 4 rows have been mixed. Restore the operations and numbers in each row to their original state, so that the calculations in every row and column are correct again.

	4	8	2	1	
2	x5	/4	+6	+2	9
7	x2	+4	+1	-10	3
10	x3	/2	+5	+2	22
3	/2	+4	+3	+2	6
	15	4	9	5	

3) What comes next?*

Determine the relation between the numbers to find the next number

5 8 16 12 6 9 18 14 7 ...

4) Pyramid*

Complete the pyramid: every cell contains the sum of the two cells below.

		38			37		
7			9				8

5) Ages*

A friend told me: 3 years ago, I was thrice as old as my granddaughter. 8 years before that, I was four times as old.

How old is my friend?

6) Futoshiki*

Every row and column contain the digits 1-5.

Some greater than / smaller than signals relationships between the numbers.

		>			1
		>		>	
	<		<		
V					
			>	>	

7) Skyline*

This town is filled with skyscrapers of different height. Every row and column contains skyscrapers of 4 different heights. The numbers outside the square indicate the number of skyscrapers which can be viewed from that position.

		2	2	1	3	
3						2
1						3
2						2
2						1
		2	2	3	1	

8) Make my number****

Make the number 21 by using the numbers 1, 5, 6 and 7 each exactly once. You may use the operators +, -, x, / and the brackets (and).

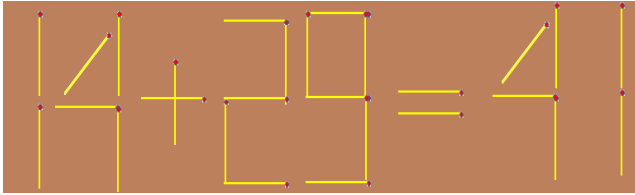
9) Alphametics**

Replace every letter with a different digit. What is the highest solution?

$$\begin{array}{r} \\ B B B B \\ B B B B \\ B B B B \\ \hline A C C C \end{array}$$

10) Matchsticks*

Create a correct equation by moving 2 matchsticks in each of the three number groups.



11) Swapped digits**

$$\begin{array}{r} 418 \\ 192 \\ \hline 803 \end{array} +$$

12) Rowmix*

	4	5	6	7	
4	/5	+4	+1	-5	5
5	x2	/2	+4	-2	5
6	/2	+5	+1	-4	5
7	/2	+4	+3	-4	5
	8	3	5	1	

13) What comes next?*

1 3 6 10 15 ...

14) Pyramid*

		33	34	35			
5							7

15) Ages*

Two men have ages where the digits are reversed (for example, if one is 26, the other is 62). The oldest man is 2 years younger than the tripled age of the youngest. What are their ages?

16 Futoshiki**

		2		<	
	V		V		
		4			2
	^				
		<			4

17) Skyline*

	3	2	1	2	2	
2						2
2						2
3						2
5						1
1						3
	1	3	2	3	2	

18) Make my number**

Using exactly 4 4's, make each of the numbers 0 to 10. You may use the operators +, -, x, / and brackets.

Example: $(4-4) \times (4-4) = 0$.

19) Alphametic**

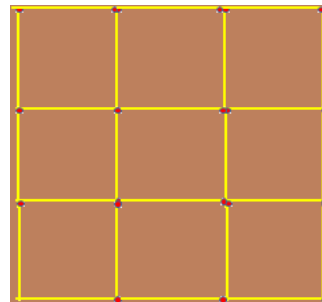
Consider the classic story where a student sent his father a cable:

$$\begin{array}{r} \text{SEND} \\ \text{MORE} \\ \hline \text{MONEY} \end{array} +$$

How much money did the father send?

20) Matchsticks*

Remove 8 matchsticks so that you have 3 squares left:



21) Swapped digits**

$$\begin{array}{r} 557 \\ 832 \\ \hline 751 \end{array} +$$

22) Rowmix*

	4	4	4	4	
5	x2	/2	+3	+1	12
5	+8	+5	+4	+2	24
5	x10	/5	/3	-7	1
5	/8	+3	+2	-3	0
	5	5	5	5	

23) What comes next?*

2 5 10 17 26 ...

24) Pyramid

		33	28	28			
		11		7			

25) Ages**

When Tom was as old as Tim was two years ago, he was twice as old as Tim. Next year, the sum of their ages will be 31. How old is Tom?

26) Futoshiki**

					2
V					
	>		<		>
Λ					
		V			
			Λ		
		<			1

27) Skyline*

	3	4	2	2	1	
3						1
2						2
1						4
2						3
2						3
	3	1	2	2	3	

28) Make my number

Use 4 4's to make the number 81.

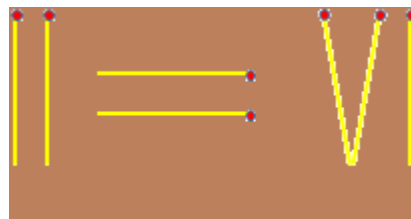
29) Alphametics**

Replace each letter with a digit and make the sum correct.

APPLE
APPLE
APPLE
APPLE
PEAR
PEAR
PEAR
PEAR
DATE
DATE
DATE
DATE
-----+
FRUIT

30) Matchsticks*

Move 1 matchsticks to obtain the same value on both sides of the equal sign.



3 Solutions

1) Swapped digits

$$\begin{array}{r} 387 \\ 415 \\ \hline 802 \end{array} +$$

8) Make this number

$$6/(1-5/7)=21$$

2) Rowmix

	4	8	2	1	
2	x5	+2	/4	+6	9
7	+4	-10	x2	+1	3
10	/2	x3	+5	+2	22
3	+3	+4	+2	/2	6
	15	4	9	5	

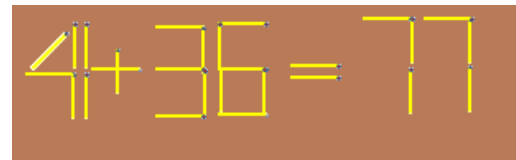
9) Alphametics

$$\begin{array}{r} 99999 \\ 99999 \\ 99999 \\ 30000 \\ \hline 300000 \end{array}$$

3) What comes next

5 8 16 12 6 9 18 14 7 10
+3 x2 -4 /2 +3 x2 -4 /2 must be followed by +3

10) Matchsticks



4) Pyramid

				153				
			77		76			
		38		39		37		
	18		20		19		18	
7		11		9		10		8

11) swapped digits

$$\begin{array}{r} 419 \\ 382 \\ \hline 801 \end{array} +$$

5) Ages.

He is 75. 3 years ago, he was 72 and his granddaughter 24. 8 years before that, he was 64 and his granddaughter 16.

12) Rowmix

	4	5	6	7	
4	+1	/5	+4	-5	5
5	x2	+4	/2	-2	5
6	/2	+1	-4	+5	5
7	+3	/2	+4	-4	5
	8	3	5	1	

6) Futoshiki

4	3	>	2	5	1		
1	5	>	4	>	3	>	2
5	2	3	1	4			
3	<	4	1	<	2	5	
V							
2	1	5	>	4	>	3	

13) What comes next?

21. Every difference is one more than the previous difference.

7) Skyline

	2	2	1	3	
3	1	3	4	2	2
1	4	2	3	1	3
2	2	4	1	3	2
2	3	1	2	4	1
	2	2	3	1	

14) Pyramid

				136				
			67		69			
		33		34		35		
	16		17		17		18	
5		11		6		11		7

15) Ages

Call the ages AB and BA. Then $10A+B = 3(10B+A)-2$.

Number puzzles – an assortment

Hence $10A+B=30B+3A-2$, and $29B-7A=2$.
Some trial and error will point out that $B=2$ and $A=8$
are the only solutions, so their ages are 82 and 28.

16) Futoshiki

1	4	2	3	<	5
	V		V		
4	3	5	2		1
3	1	4	5		2
	^				
2	5	1	4		3
5	2	<	3		1
					4

17) Skyline

	3	2	1	2	2	
2	2	1	5	3	4	2
2	4	5	1	2	3	2
3	3	4	2	5	1	2
5	1	2	3	4	5	1
1	5	3	4	1	2	3
	1	3	2	3	2	

18) Make my numbers

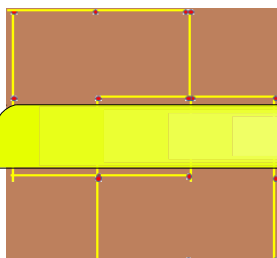
$(4-4)*(4-4) = 0$
 $(4+4)/(4+4) = 1$
 $4/4+4/4 = 2$
 $(4+4+4)/4 = 3$
 $(4-4)*4 + 4 = 4$
 $(4*4+4)/4 = 5$
 $4 + (4+4)/4 = 6$
 $4+4 - 4/4 = 7$
 $4+4+4-4 = 8$
 $4+4 + 4/4 = 9$
 $(44-4)/4 = 10$

Many numbers have multiple solutions.

19) Alphametic

$$\begin{array}{r} 9567 \\ 1085 \\ \hline 10652 \end{array} +$$

20) Matchsticks



21) Swapped digits

$$\begin{array}{r} 517 \\ 238 \\ \hline 755 \end{array} +$$

22) Rowmix

	4	4	4	4	
5	+1	/2	+3	x2	12
5	+5	+2	+8	+4	24
5	/5	x10	-7	/3	1
5	+3	/8	-3	+2	0
	5	5	5	5	

23) What comes next?

37: Every term is n^2+1 . That happens to coincide with a difference in consecutive terms which increases by 2.

24) Pyramid

				117				
			61	56				
		33	28	28				
	17	16	12	16				
8	11	5	7	9				

25) Ages

The first sentence makes clear that Tom is older than Tim. So we can say $\text{Tom} = \text{Tim} + d$, with d the difference between their ages.

Two years ago, Tim has age $\text{Tim}-2$. When Tom was $\text{Tim}-2$, Tim must have been $\text{Tim}-2-d$. At that time, Tom was twice as old as Tim, so $\text{Tim}-2 = 2(\text{Tim}-2-d)$, or $\text{Tim} = 2\text{Tim} - 2 - 2d$, or $\text{Tim} = 2+2d$. Next year the sum of their ages will be 31. So $\text{Tim} + d + \text{Tim} + 2 = 31$, or $2\text{Tim} + 2 + d = 31$. $2(2+2d) + 2 + d = 31$. $4+4d+d+2=31$. $5d=25$ $d=5$. So they differ 5 years in age, and $\text{Tim}=12$ and $\text{Tom} = 17$.

26) Futoshiki

4	5	1	3	2
V				
3	>	1	<	2
5		4	1	3
1	4	3	2	5
2	3	<	5	4
				1

27) Skyline

	3	4	2	2	1	
3	2	1	4	3	5	1
2	3	2	1	5	4	2
1	5	4	3	1	2	4
2	4	3	5	2	1	3
2	1	5	2	4	3	3
	3	1	2	2	3	

28) Make my number

$$(4-4/4)^4=81$$

29) Alphametics

15530

15530

15530

15530

5018

5018

5018

5018

4120

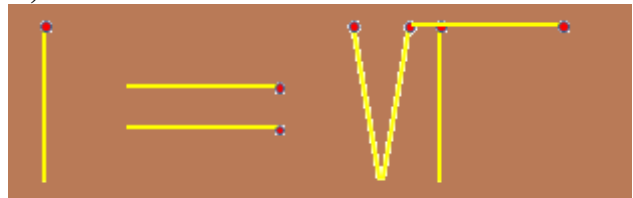
4120

4120

4120

98672 +

30) Matchsticks



4 Rules for puzzles

1) Swapped digits.

These sums are additions (usually) in which 2 pairs of digits have been swapped. Your task is to find the original correct addition by swapping a pair of digits, then swap another pair of digits.

Hints

No digit is swapped twice.

2) Rowmix

The operations in each row have been mixed up. Restore the original sequence in every row so that all calculations, both horizontal and vertical, are correct again.

Hints

- The result of swapping a + or – operation does not alter the outcome if there is no x or / in between.
- Using vthis, try to establish the possible combinations for rows with x and / first.

3) What comes next

The numbers listed have a pattern – Find the next number in the sequence which fits the pattern.

4) Pyramid

Complete the numbers in the Pyramid – each cell is the sum of the two cells beneath it.

5) Ages

Calculate the ages of the persons or objects involved.

6) Futoshiki

Every row and column of a 4x4 square contains each of the digits 1-4 exactly once. For a 5x5 grid, of course each row and column contain the digits 1-5. In addition, the grid indicates the bigger than (>) or smaller than (<) relation between the contents of adjacent cells. For example, 4>2 and 2<3.

Hints:

- The cell at the right side end of > can never be a 5, and its left side can never be a 1.
- If a 1 is already used in any row or column, it can not be used there again.

7) Skyline

You are presented with the top down view of a square city. In a 4x4 grid, there are skyscrapers with heights 1-4. Every row and column has exactly 1 skyscraper of height 1, one of height 2, and so on. At the border of the city the number of skyscrapers is mentioned that can be seen from that direction.

For example, if the skyscrapers are lined up 1 3 4 2, three skyscrapers can be seen from the left side, while 2 skyscrapers can be seen from the right.

Hints:

- If a 1 is placed alongside an edge, you know that the highest level should be placed there.
- If a 5 (in a 5x5 square) is placed along an edge, you can fill that entire row or column.
- In a 5x5 square, two 3's on opposing sides of a row or column means the 5 goes into the middle.

cell.

8) Make my number.

Make the number using the specified digits and the operators +, −, ×, / and the brackets (and).

9) Alphametics

In a calculation, digits are replaced by letters. A digit has always been replaced by the same letter and the same letter always represents the same digit.

10) Matchsticks

Remove or move the indicated number of matches.

See <http://justpuzzles.wordpress.com> for more puzzles like these