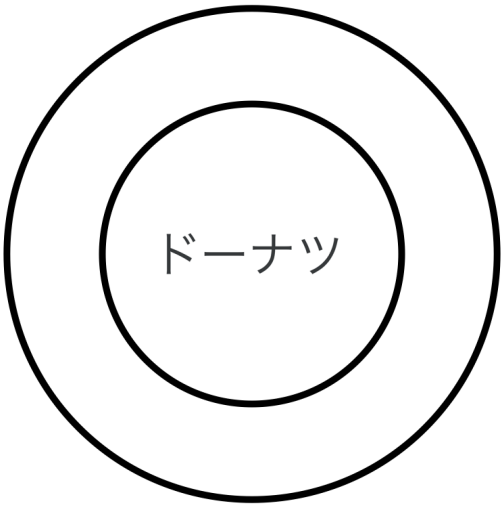
Donatsu Puzzles – The First Glut

Puzzles by HR3

Art by The Painting Fool

Text by Simon Colton



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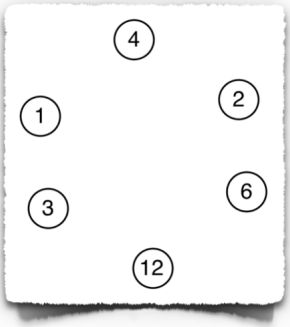
Donatsu Puzzles

Welcome to the first ever compendium of Donatsu puzzles. The puzzles in this book are deceptively easy to describe, but provide a significant challenge to complete. Your job is to start at any point in the ring and go clockwise from one number to the next, using just normal arithmetic of adding, subtracting, multiplying and dividing, keeping a running total along the way. If you get back to the number you started with, then you have completed the puzzle for that starting point. If you do this for all the six starting points, then you have beaten the puzzle! There are only two rules: your running total should never go below 1 and you should never calculate a fractional number. That's all there is to it!



Take for instance, the puzzle on the right here. If we start at the top with the number 4 and go clockwise, then we can add, subtract, multiply or divide 4 by the next number 2. If we choose to subtract, then the current total is 4 - 2 = 2. Moving on to the next number, a 6, we might next choose to multiply our total of 2 by this next number, giving us 6 $\times$ 2 = 12 as our running total. The next number is also 12, so we can divide our total by 12 without getting a negative number or fraction, to make the running total 1. Continuing round, if we add the 3, our total becomes 4, and if we multiply by the final 1, we get back to the 4 we started with. So, our solution for this starting point is: $4 - 2 \times 6 \div 12 + 3 \times 1 = 4$. There are a few solutions to the puzzle starting at 4, for instance, this is also a good way to get back to 4: $4 + 2 \div 6 \times 12 \div 3 \times 1 = 4$.

Donatsu comes from the Japanese for doughnuts. There are six different flavours of Donatsu puzzles for you to try out here, and they range in difficulty levels. Each puzzle in the book has been designed to have a single correct answer, and you can check whether you have solved the puzzle correctly by looking at the solutions in the back of the book.

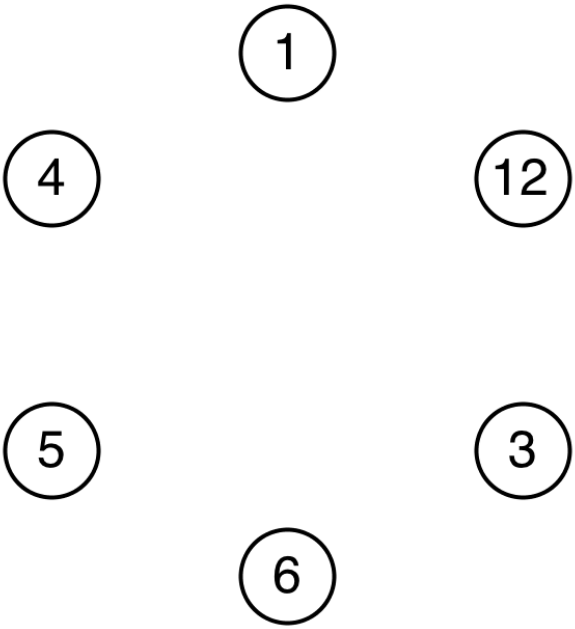
I hope you enjoy this first glut of doughnut puzzles. Happy Puzzling!

Prof. Simon Colton
Falmouth, UK, November 2016.

1. Uninatsu

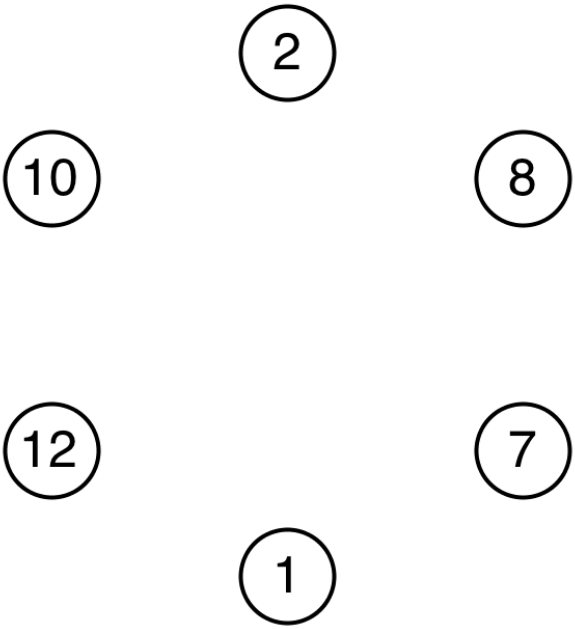
Find an arithmetic path from each of the six numbers back to itself.

Uninatsu: Solved Example



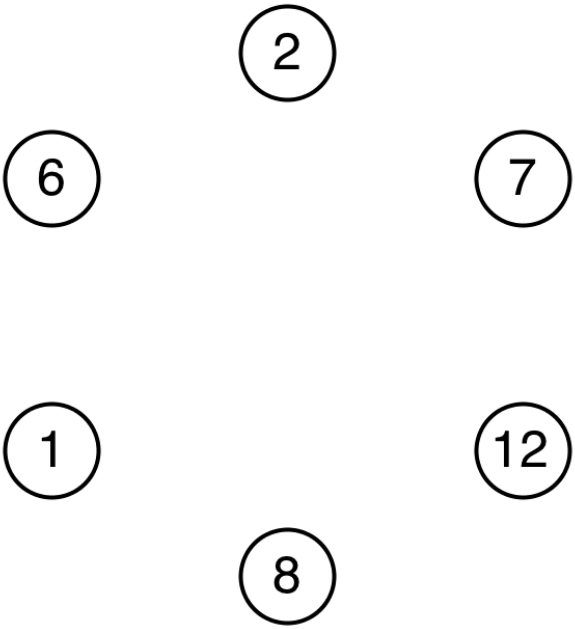
1	+	12	+	3	-	6	-	5	-	4	=	1
12	-	3	-	6	×	5	-	4	+	1	=	12
3	+	6	-	5	×	4	-	1	-	12	=	3
6	+	5	+	4	-	1	-	12	×	3	=	6
5	×	4	+	1	+	12	÷	3	-	6	=	5
4	+	1	+	12	-	3	+	6	÷	5	=	4

Puzzle 1



2		8	-	7		1		12		10	=	2
8		7		1		12		10	÷	2	=	8
7	-	1		12		10		2		8	=	7
1	+	12		10		2		8		7	=	1
12		10		2		8		7	×	1	=	12
10		2		8		7	+	1		12	=	10

Puzzle 2

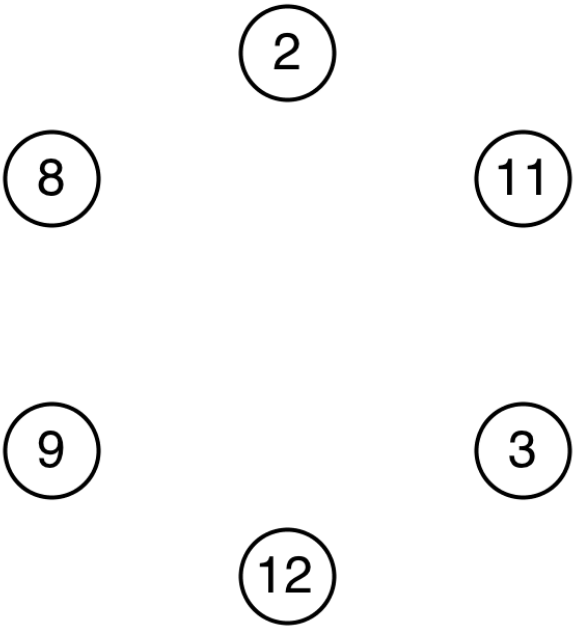


2		7		12		8		1		6	=	2
7		12		8	×	1		6		2	=	7
12		8	÷	1		6		2		7	=	12
8		1		6		2	-	7		12	=	8
1		6	×	2		7		12		8	=	1
6		2	-	7		12		8		1	=	6

2. Chromanatsu

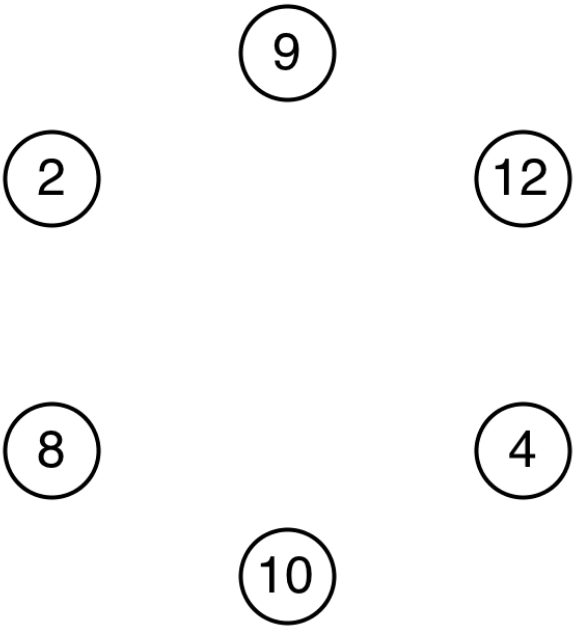
Operators of the same type are found in boxes of the same colour.

Chromanatsu: Solved Example



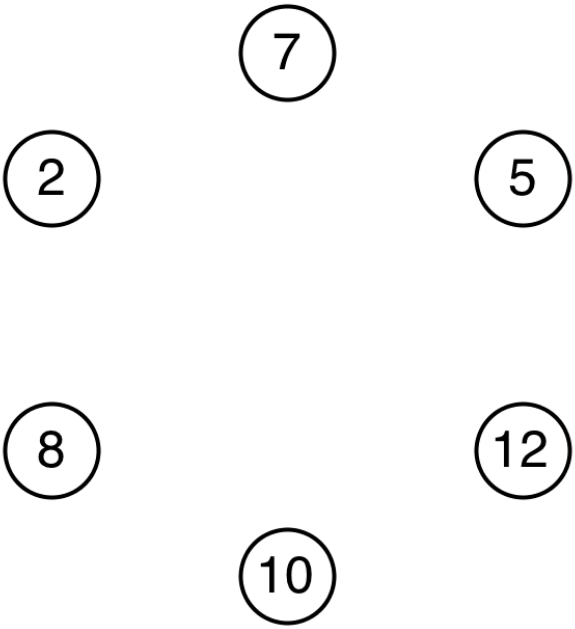
2	×	11	-	3	-	12	+	9	÷	8	=	2
11	×	3	+	12	÷	9	+	8	-	2	=	11
3	+	12	+	9	-	8	-	2	-	11	=	3
12	+	9	-	8	×	2	-	11	-	3	=	12
9	×	8	+	2	-	11	÷	3	-	12	=	9
8	÷	2	+	11	÷	3	+	12	-	9	=	8

Puzzle 8



9		12		4		10		8		2	=	9
12		4		10		8		2		9	=	12
4		10		8		2		9		12	=	4
10		8		2		9		12		4	=	10
8		2		9		12		4		10	=	8
2		9		12		4		10		8	=	2

Puzzle 9

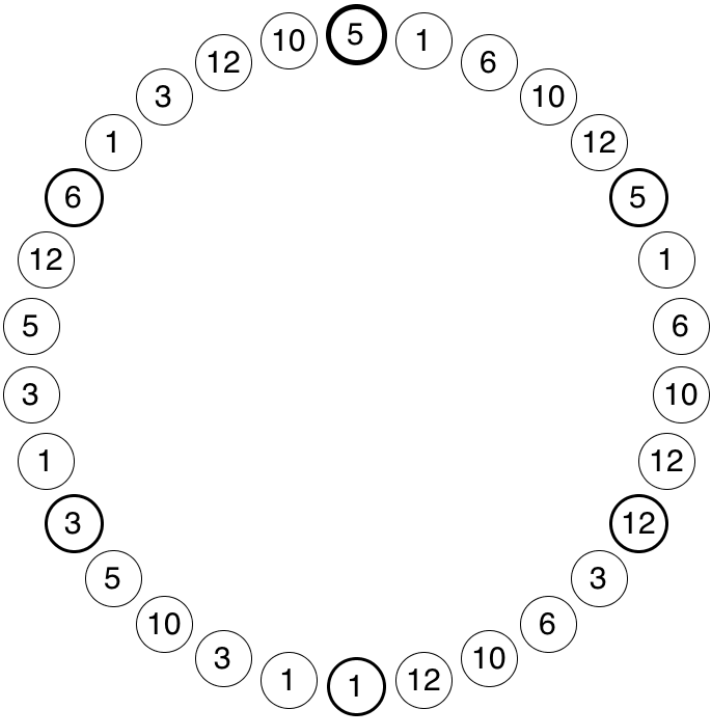


7		5		12		10		8		2	=	7
5		12		10		8		2		7	=	5
12		10		8		2		7		5	=	12
10		8		2		7		5		12	=	10
8		2		7		5		12		10	=	8
2		7		5		12		10		8	=	2

6. Maxinatsu

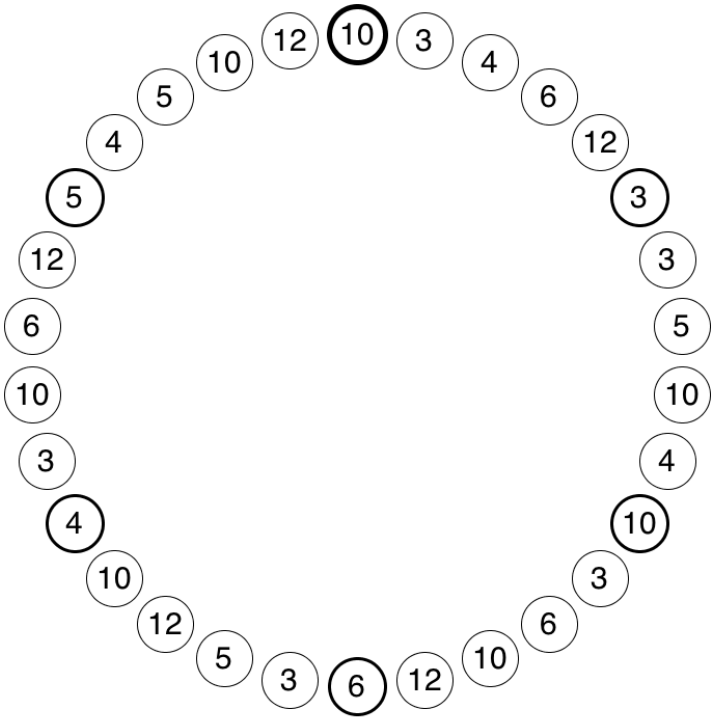
Go all the way around, never calculating a number greater than 50.
There's only one way through each of the waypoints.

Maxinatsu: Solved Example



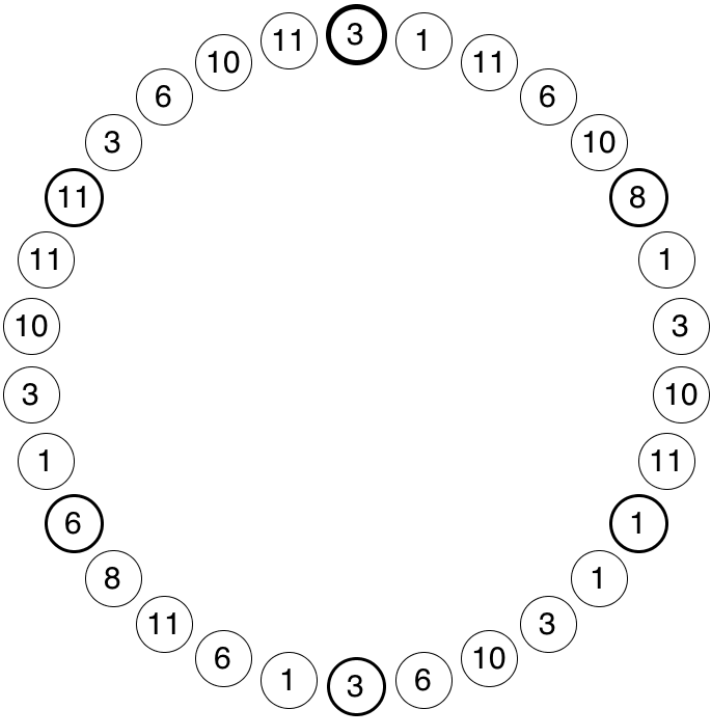
5	×	1	×	6	÷	10	+	12	÷	5
	+	1	+	6	÷	10	×	12	÷	12
	+	3	+	6	÷	10	×	12	÷	1
	+	1	+	3	-	10	×	5	÷	3
	+	1	-	3	-	5	×	12	÷	6
	×	1	-	3	+	12	-	10	=	5

Puzzle 31



10		3		4		6	×	12	÷	3
	+	3		5		10		4	÷	10
		3		6		10	×	12	÷	6
		3		5		12	×	10	÷	4
		3		10	÷	6		12	÷	5
		4		5		10	-	12	=	10

Puzzle 32

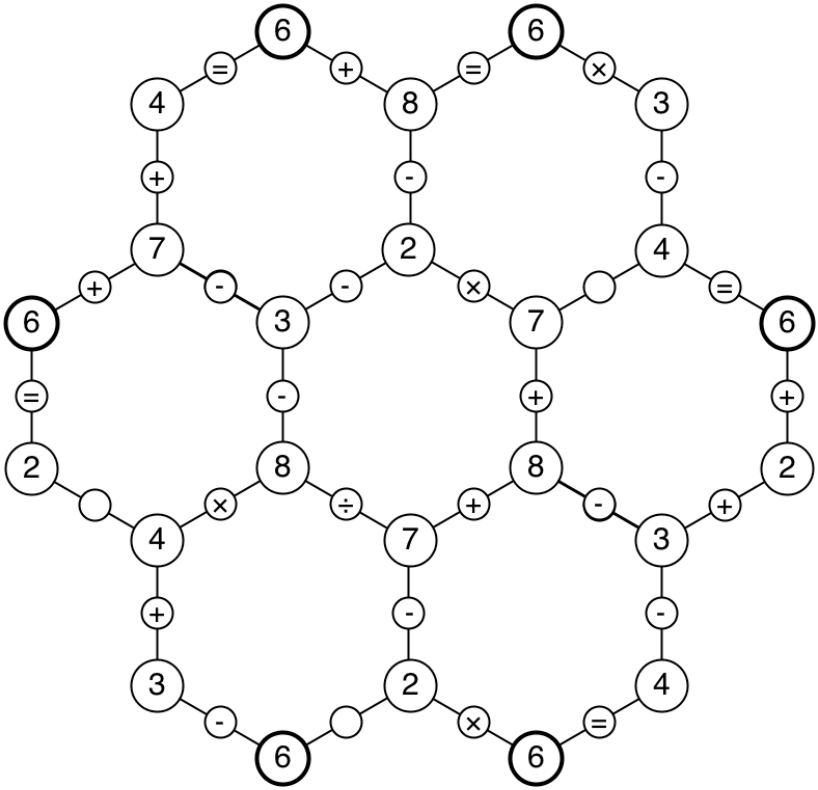


3		1		11		6		10	÷	8
		1		3		10	×	11	÷	1
	+	1		3		10		6	÷	3
		1		6		11	×	8	÷	6
		1		3		10	-	11	÷	11
		3		6	-	10		11	=	3

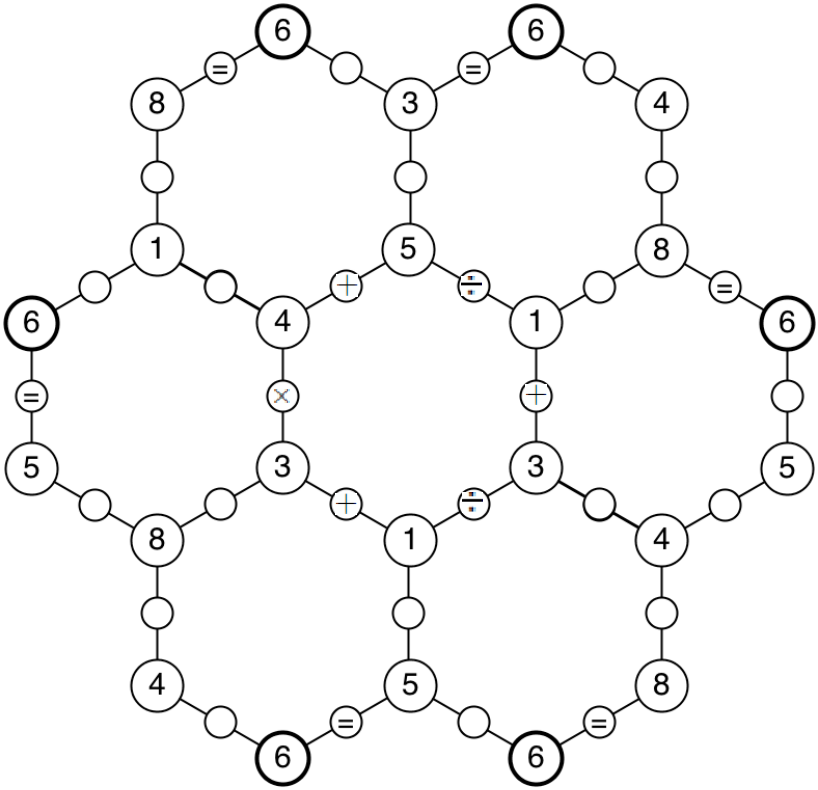
8. Hexanatsu

Go clockwise starting from the bold circles.
And return to your starting point.

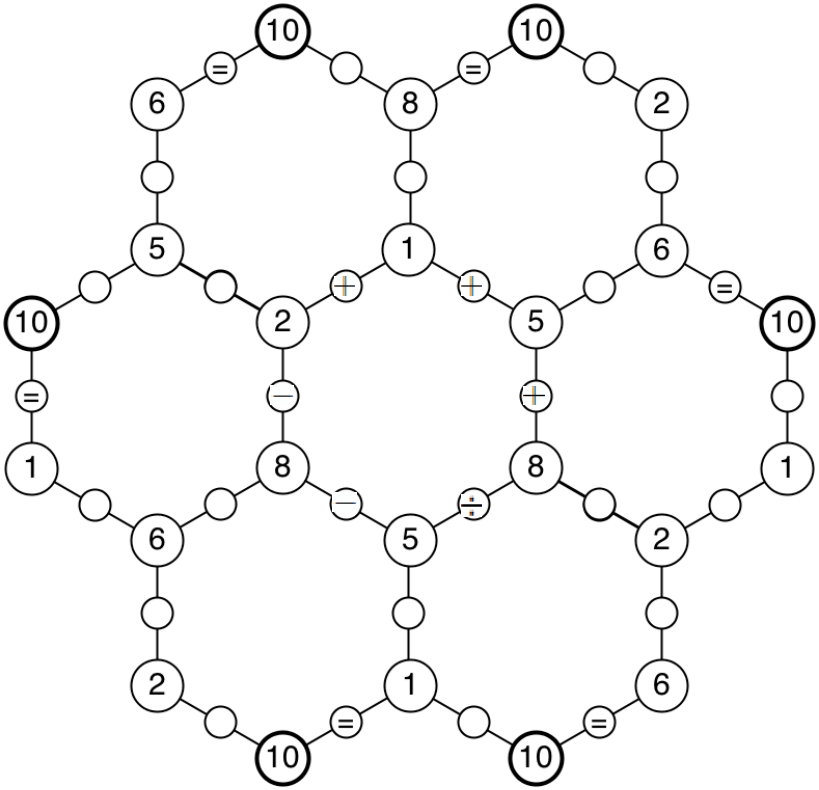
Hexanatsu: Solved Example

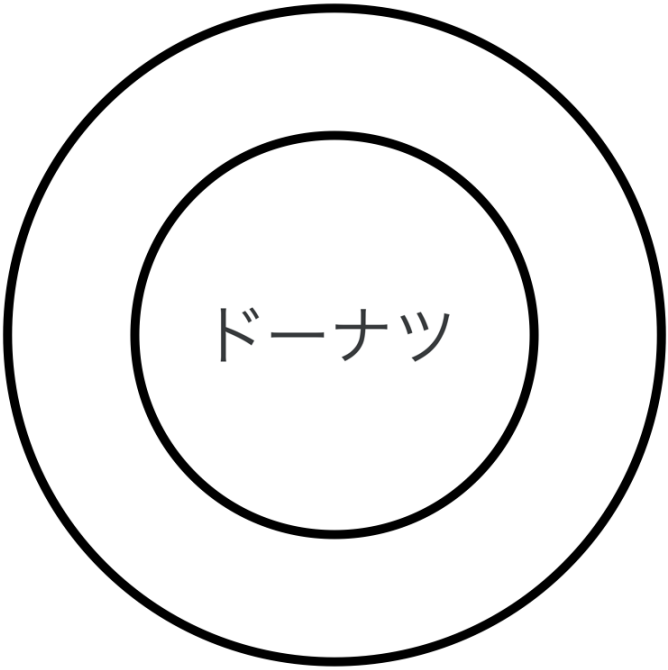


Puzzle 43



Puzzle 44

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