

Sudoku and Shidoku

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October 15, 2012

Teacher: “How much do we get if we cut eight into two halves?”

Student: “Two threes, if we cut vertically; and two zeros, if we cut horizontally.”

Class Discussion

Calculate the number of Shidoku squares. The number of Sudoku squares: 6,670,903,752,021,072,936,960. Equivalent squares: relabeling digits, permuting rows/columns in a band/pillar, permuting bands/pillars, rotations and reflections. Fundamentally different Sudoku squares: 5,472,730,538.

Warm-Up

Exercise 1. Exactly three of the following statements are true:

- Al is older than Bob
- Carl is younger than Bob
- Al is exactly the average age of Bob and Carl.
- Carl is older than Al

Who is the youngest?

Exercise 2. A large rectangle is made out of several small rectangles of the same size: 1 by 5. Prove that one of the sides of the large rectangle is divisible by 5.

Exercise 3. What is the sum of two numbers, if it is bigger than the first number by 3 and the second number by 4?

Exercise 4. The sum of the minuend, the subtrahend and the difference is 2012. What is the minuend?

Competition Practice

Exercise 5. MAML 2008. A two-digit number is multiplied by the product of its digits, forming a three-digit YYY where Y is the units digit of the original number. Find the three digit number YYY .

Exercise 6. MAML 2008. Five men agreed to meet on April 1st for lunch. Thereafter, each of them wanted to continue to have lunch together. Al said he would show up every second day. Bob said he would appear every third day. Charles said he would come every fourth day, Dan said he would come every fifth day, and Elton agreed to come every sixth day. During the next one hundred days, there were K days when only three men showed up. Find the value of K .

Exercise 7. MAML 2008. A computing machine is designed to multiply whatever real number is fed into it by $2N$ and then to add $2N$ to the product. This number is then reported. The number 4 is fed into the machine and the number reported by the machine is x . The number x is then fed back into the machine. The machine now reports the number 42. What are the possible values of N ?

Challenge Problems

Sudoku puzzles are from the book “Taking Sudoku Seriously”, by Jason Rosenhouse and Laura Taalman.

Exercise 8. Fill in the grid so that every row, column, and block contains 1-9 exactly once. In addition, each worm must contain entries that increase from tail to head. For blue worms you must figure out yourself which end is the head. See Figure 1.

Exercise 9. Fill in the grid so that every row, column, and block contains 1-9 exactly once. In addition, for neighbors A and B we have $A \in B$ if A divides B . For example, $2 \in 4$ and $2 \in 8$. Note that *all* possible “divided by” relationships are marked in the puzzle. Also, there are a few $<$ and $>$ symbols. As always, these indicate greater than/less than relations. See Figure 2.

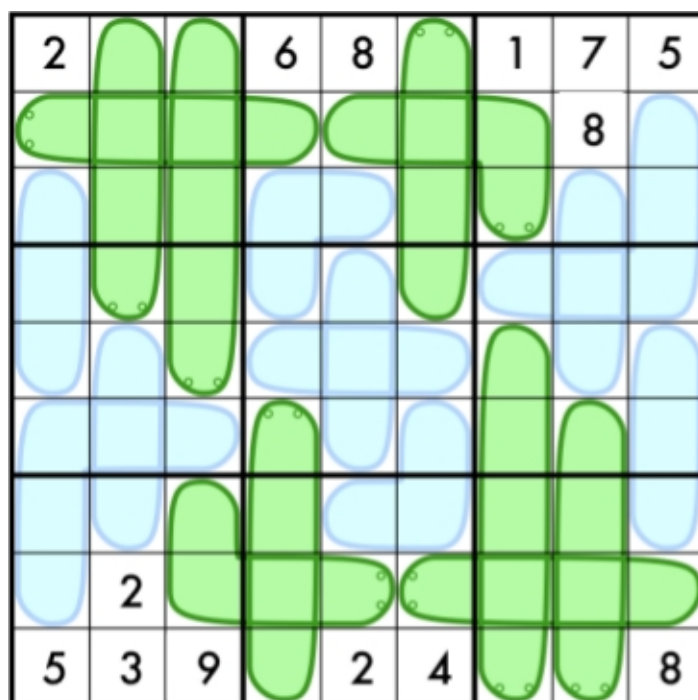


Figure 1: Worms Sudoku

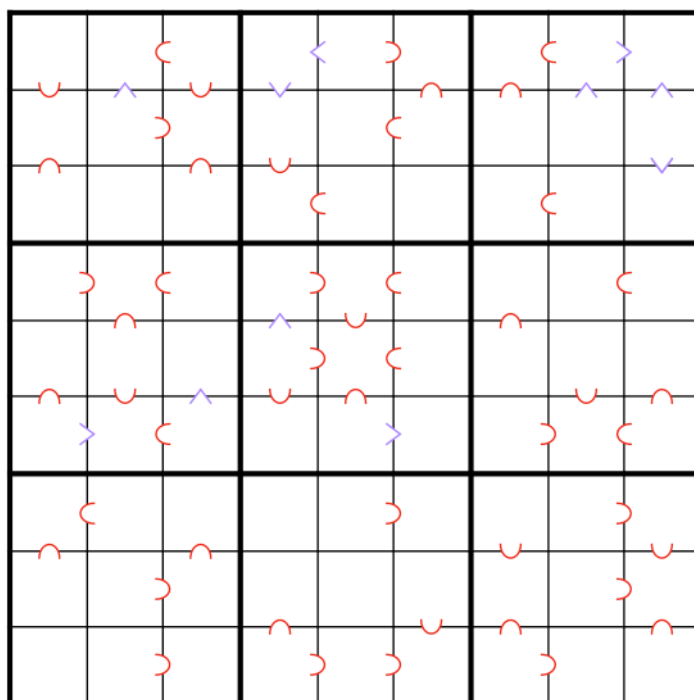


Figure 2: Divides Sudoku