Quest 8: The Art of Connection

Quest 7 Quest 9

Part I

Story section

The rest of the journey to Stacktrace Sanctuary passes with a pleasant atmosphere of jovial exchanges with Veronica. Despite being young, the nerdmaster possesses impressive knowledge about magical creatures, particularly dragonducks. With each passing moment, her fascination with your presence seems to grow stronger.

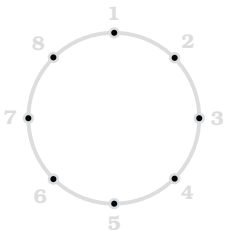
- Dragonducks are one of the rarest and most extraordinary creatures ever known - Veronica says passionately. - Each of you possesses a unique skill that defines who you are. But the most intriguing thing is that these skills develop you not only internally but also physically. - Veronica is pointing at you. - Let's take you as an example. Your skill is definitely solving puzzles. Look at yourself; you are already the size of an adult human, and from what I've read, young dragonducks are usually only slightly larger than normal ducks. You must be either exceptional or very hardworking!

You ponder her words. Your entire journey so far has been filled with riddles and puzzle-like challenges. Every solved task made you feel more confident, stronger... and taller. During the next stop, Veronica shows you another book filled with numerous diagrams and notes.

- In this book, I have gathered puzzles that were devised by dragonducks with skills similar to yours. These puzzles seem to be designed specifically for you to grow stronger! If you want, I can show you my favourite, which has even become a type of artwork practiced by many artists these days.

The artwork referenced in the book is called string-art. To create such a work, you need a wooden board, tiny nails, and a very long piece of thread. First, you need to draw a circle on the board. Next, hammer nails around this circle at equal distances. The more nails you use, the more details you will ultimately achieve. Once you've finished hammering, number the nails in a clockwise direction, starting from 1.

Assuming we only have 8 nails, it looks as follows:



The process of creating a string-art image involves threading a string between nails according to a specified sequence of numbers. You should execute the entire sequence with a single thread, connecting the nails with straight lines, without breaking the thread at any point.

The first part of the challenge allows you to verify your understanding of all the rules. Assuming you have 32 nails, construct string-art according to the given nails sequence (your notes) and count how many times the thread passes through the exact centre of the circle.

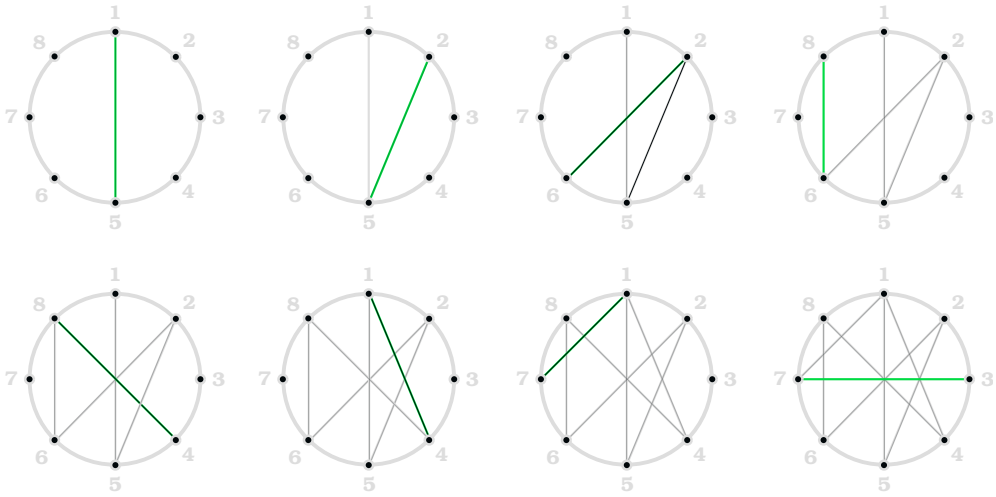
Example based on the following notes:

```
1,5,2,6,8,4,1,7,3
```

For the sake of the example, let's assume that you have only 8 nails, not 32.

According to the sequence, you start from nail number 1 and lead the thread to nail number 5, from there to nail number 2,

number 6, and so on. Showing the process of creating this string-art step by step looks as follows:



For the given example, the thread passes exactly through the centre of the circle 4 times, in the first, third, fifth, and eighth steps.

How many times does the thread from the given sequence pass exactly through the centre of the circle?

Your notes for this part:

Copy Open Download

Part 1 solved with answer: 55

Check your progress

Part II

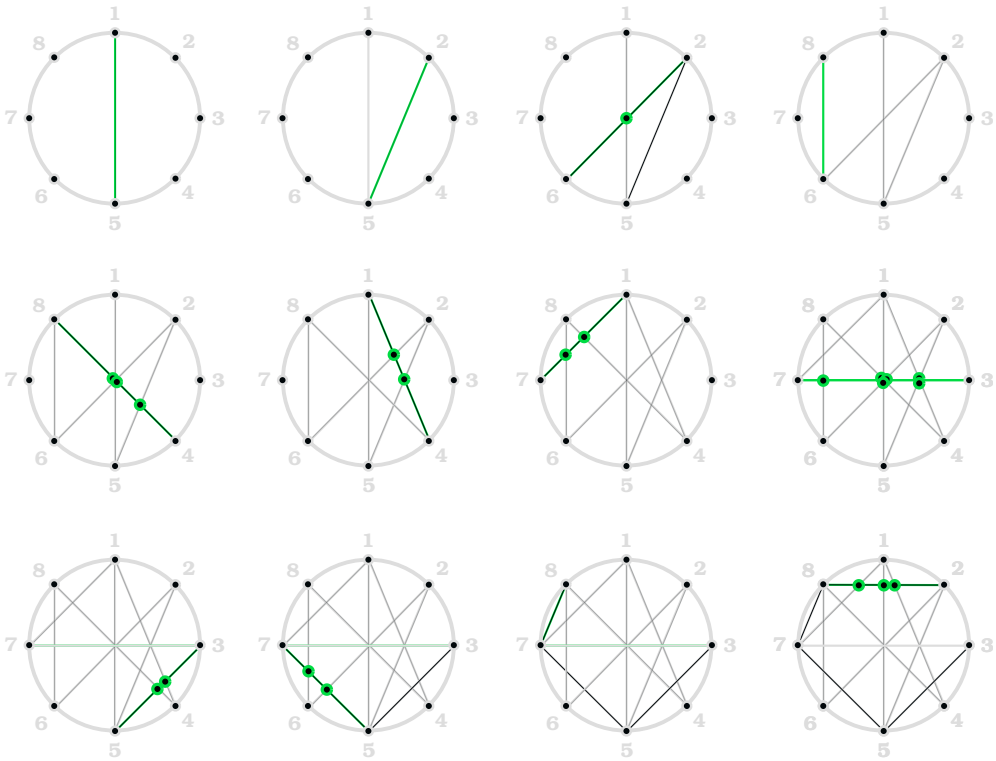
Very large string-art projects require additional stabilisation. If we cross the threads, we tie a knot. Even if several threads cross at exactly the same point, we need to tie a separate knot with each of them individually.

The next page presents a sequence for 256 nails (your notes). Construct the string-art and count how many knots need to be tied to complete the whole thing.

Example based on the following notes:

`1,5,2,6,8,4,1,7,3,5,7,8,2`

Assuming a simplified example with 8 nails, the places where one or more knots will be tied look as follows:



- The first two steps of the sequence do not require tying any knots.
- The third step requires tying 1 knot right in the centre of the circle.
- The fourth step does not require any knots.
- The fifth step requires tying 3 knots: two in the centre of the circle, and one between the thread connecting nails 2 and 5.
- The sixth and seventh steps each require tying 2 knots.
- The eighth step requires as many as 6 knots: three in the centre, two on the right, and one on the left.
- The ninth and tenth steps each require 2 knots.
- The eleventh step does not require any knots.
- The last, twelfth step requires 3 knots.

The number of knots needed to create the entire string-art above equals:
1 + 3 + 2 + 2 + 6 + 2 + 2 + 3 = 21.

How many knots need to be tied to create the given string-art?

Your notes for this part:

Copy Open Download

Part 2 solved with answer: 2919895

Check your progress

Part III

The art of string-art has also been adapted to create symbols with magical properties. With their help, for example, a special pattern can be marked on knights' shields, which, when stimulated in the right way, generates a shockwave.

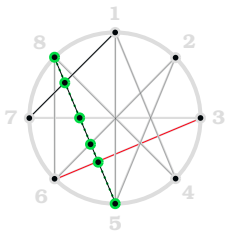
The knight can activate the spell at any moment by cutting through the symbol with a sword. He must do it in such a way that the cut passes through two nails on the circle. The more threads cut, the greater the effect of the spell.

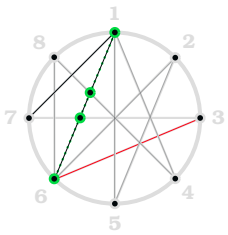
The next string-art has again 256 nails. Find the best strike to activate the symbol and count the number of threads that the sword cuts through at this activation.

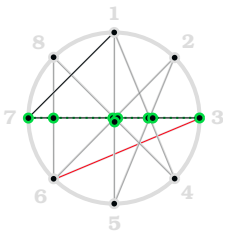
Example based on the following notes:

```
1,5,2,6,8,4,1,7,3,6
```

A few samples of possible cuts are shown below.







Striking the symbol between nails 8 and 5 would cut 4 threads, and striking between nails 6 and 1 would cut only 2 threads.

Striking the symbol between nails 3 and 7 would cut 7 threads, and this is the best way to activate the symbol. Note that the thread between nails 3 and 7 is also cut.

How many threads can be cut at most with a single sword strike between any two nails?

Your notes for this part:

Copy Open Download

Part 3 solved with answer: 2793

Check your progress

Puzzle solved! Don't stop now!

Post your solution, compare ideas, and help others grow on Reddit