

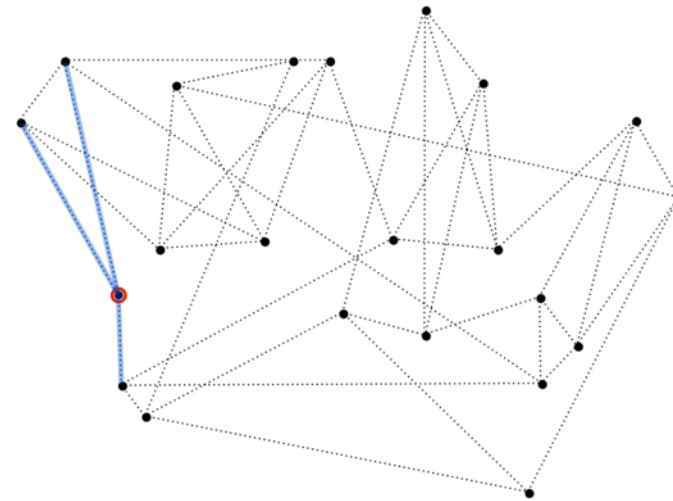
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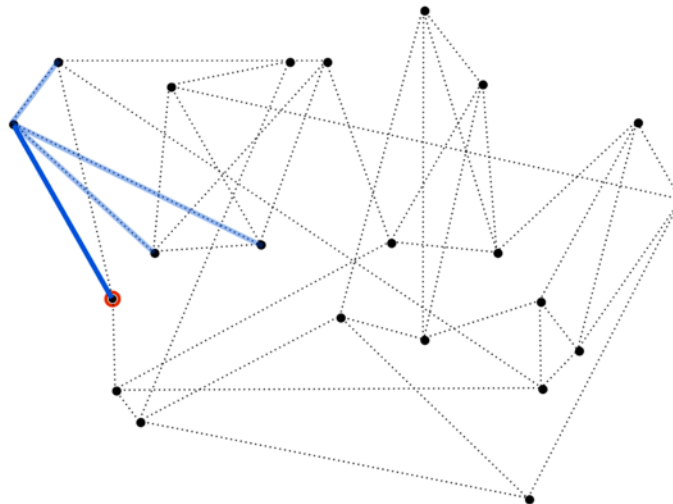


DOT-TO-DOT MIDDLE PATH PUZZLES

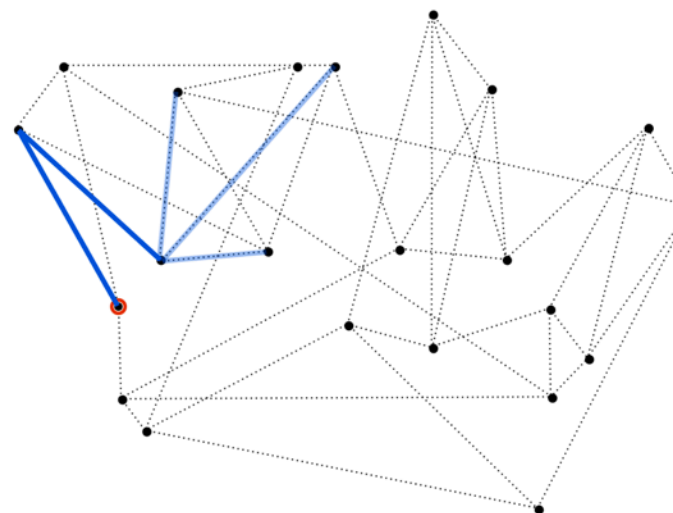
Start at the red circled point. You have three choices of new points to travel to. Do not choose the furthest or closest. Choose the middle path.



Draw a line to this new point (dark blue in figure). You will again be offered three unexplored paths (light blue).



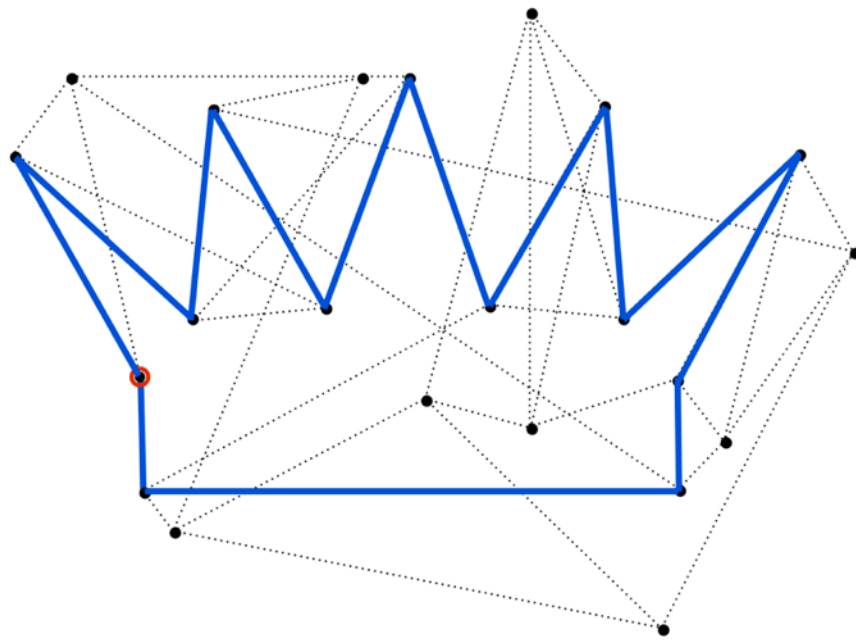
Again, choose the middle path. Repeat till you return to the starting point.



To see the completion of this puzzle see pages 6-21.

This puzzle is dedicated to Dr. Kin Lo of the University of British Columbia whose generosity kept MathPickle going in its early years.

For the Teacher...



A good level of chaos:

The worksheets for Dot-to-Dot Middle Path are organized according to difficulty. Everyone starts with the same easy puzzle (puzzle Y or H). Whenever the first few fast groups start celebrating that they have solved that puzzle - immediately shut them up by quietly placing a medium difficulty sheet on their table. This allows you to tell slower groups that they are the first ones to get another easy puzzle.

The objective is that you have enough chaos in your classroom so that your slow students do not know that they are slow. The celebration of speed is overblown. Many excellent thinkers are not particularly fast.

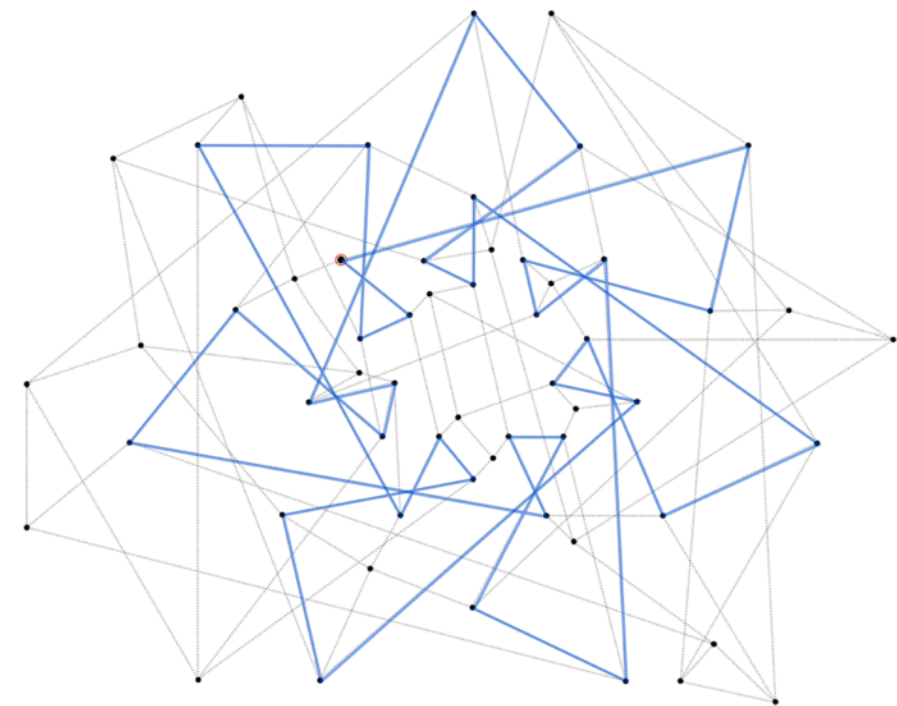
Ponderous thinkers are to be nurtured.

How to introduce a new puzzle like Dot-to-Dot Middle Path:

Instead of introducing a new puzzle by explaining rules to the class, just jump in and ask students to contribute which of the three points they should visit next **WITHOUT KNOWING THE RULES**. Get all students to contribute - systematically going around the class. Students do not raise their hands... We want all students to contribute.

When a student fails to choose the correct new point - show them the correct one, but don't tell them why it is correct. Repeat until most students understand that they need to travel the middle path.

This strategy efficiently engages more students than going through the rules at the start. Students get engaged when they contribute. They also enjoy the tongue-in-cheek failure.



Standards for Mathematical Practice

All MathPickle puzzle designs, including **DOT-TO-DOT MIDDLE PATH PUZZLES**, are guaranteed to engage a wide spectrum of student abilities while targeting the following Standards for Mathematical Practice:

MP1 Toughen up!

This is problem solving where our students develop grit and resiliency in the face of nasty, thorny problems. It is the most sought after skill for our students.

MP3 Work together!

This is collaborative problem solving in which students discuss their strategies to solve a problem and identify missteps in a failed solution. MathPickle recommends pairing up students for all its puzzles.

MP6 Be precise!

This is where our students learn to communicate using precise terminology. MathPickle encourages students not only to use the precise terms of others, but to invent and rigorously define their own terms.

MP7 Be observant!

One of the things that the human brain does very well is identify pattern. We sometimes do this too well and identify patterns that don't really exist.

Common Core State Standards

DOT-TO-DOT MIDDLE PATH PUZZLES target the following grade 2 & 3 Common Core State Standards:

CCSS.MATH.CONTENT.2.MD.A.1

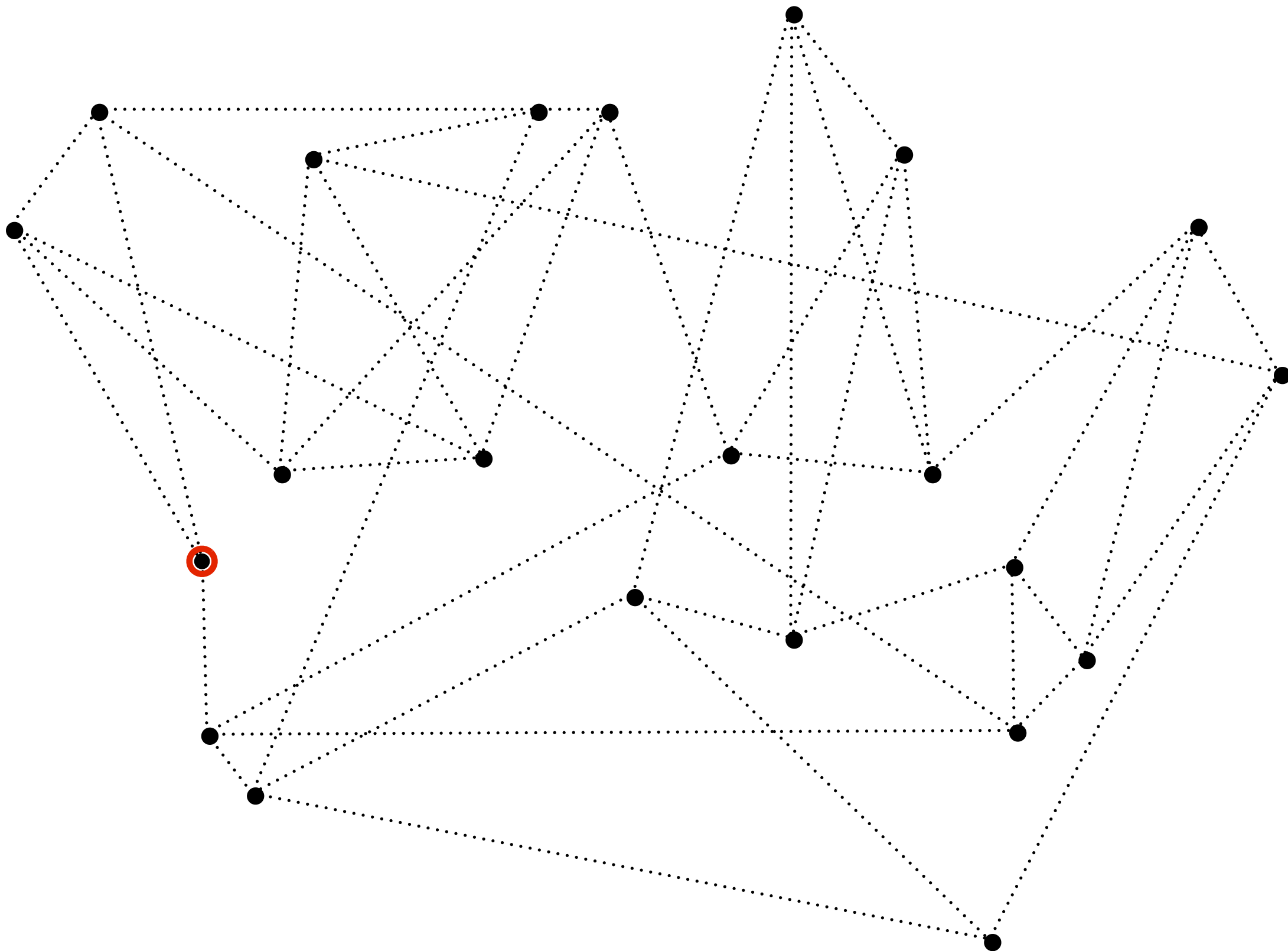
Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

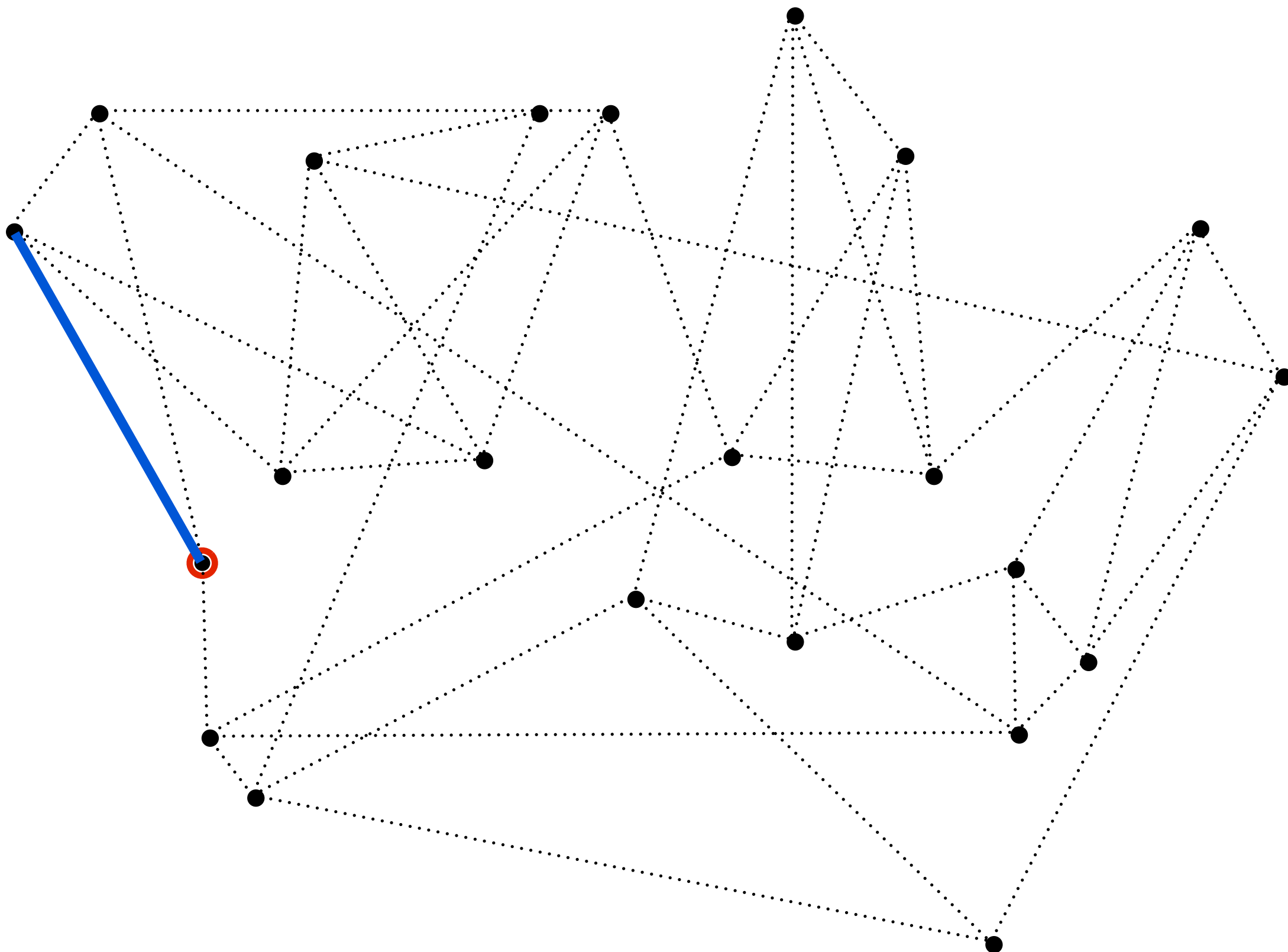
CCSS.MATH.CONTENT.2.MD.A.4

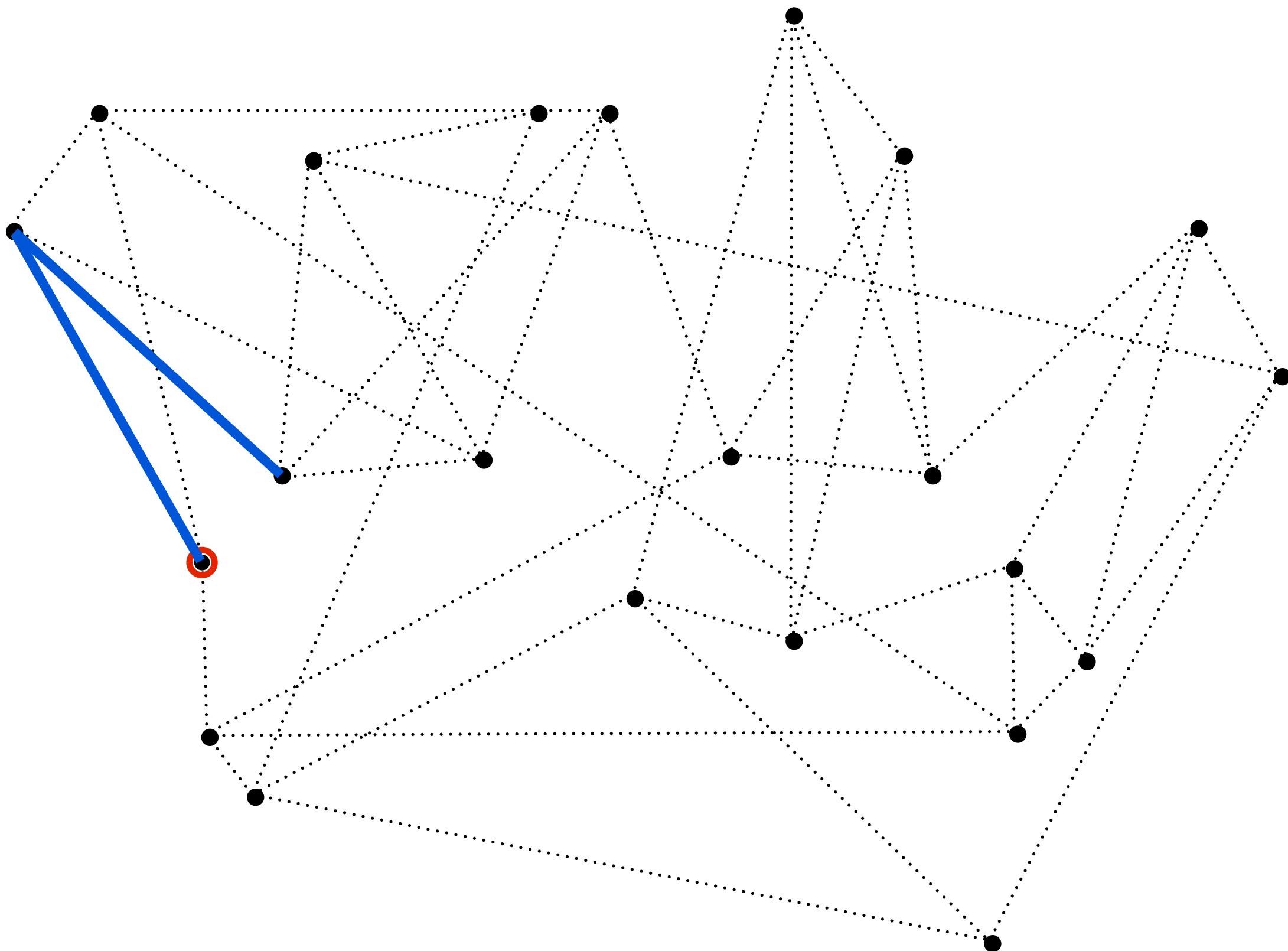
Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

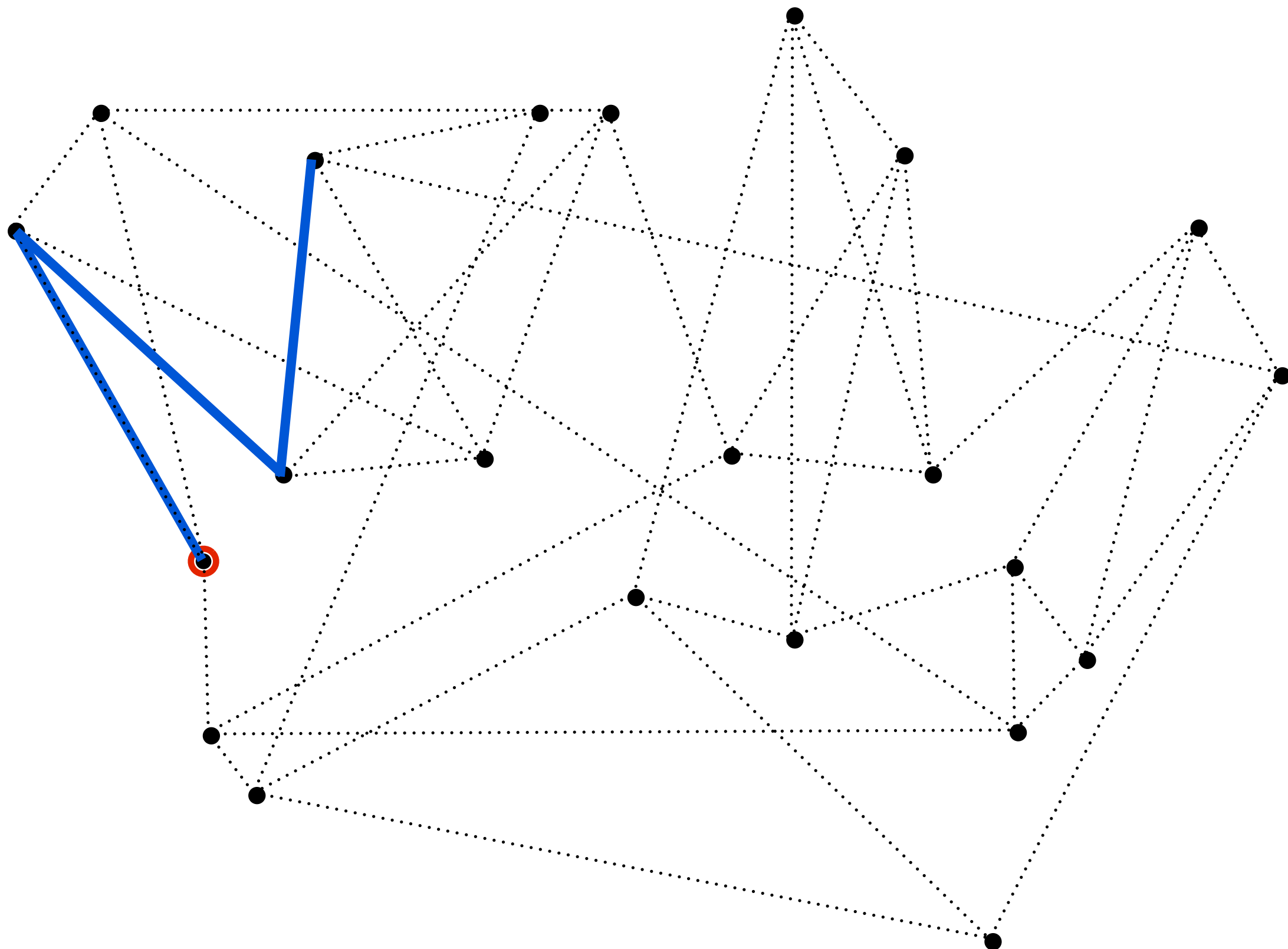
CCSS.MATH.CONTENT.3.MD.D.8

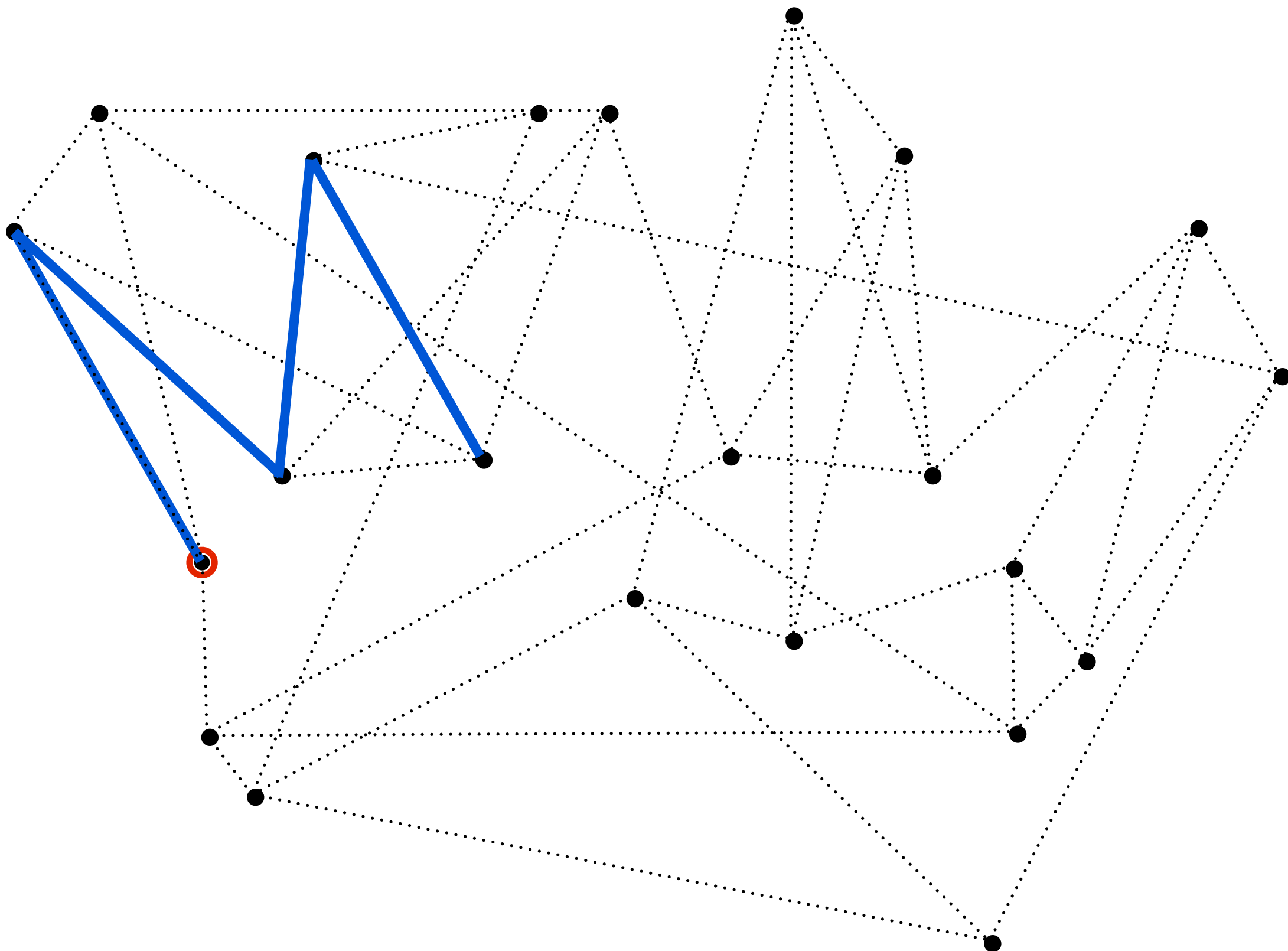
Solve real world and mathematical problems involving perimeters of polygons

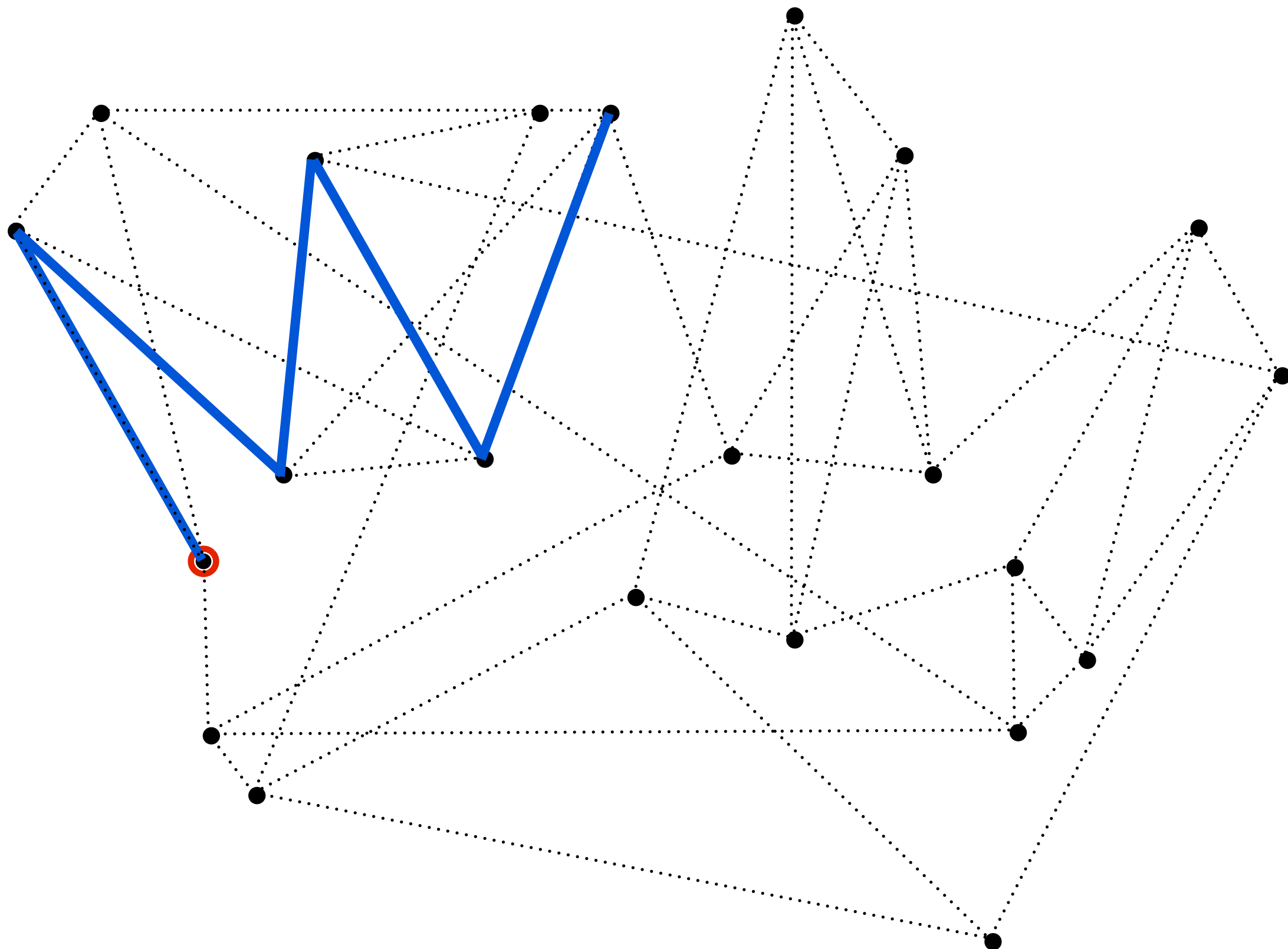


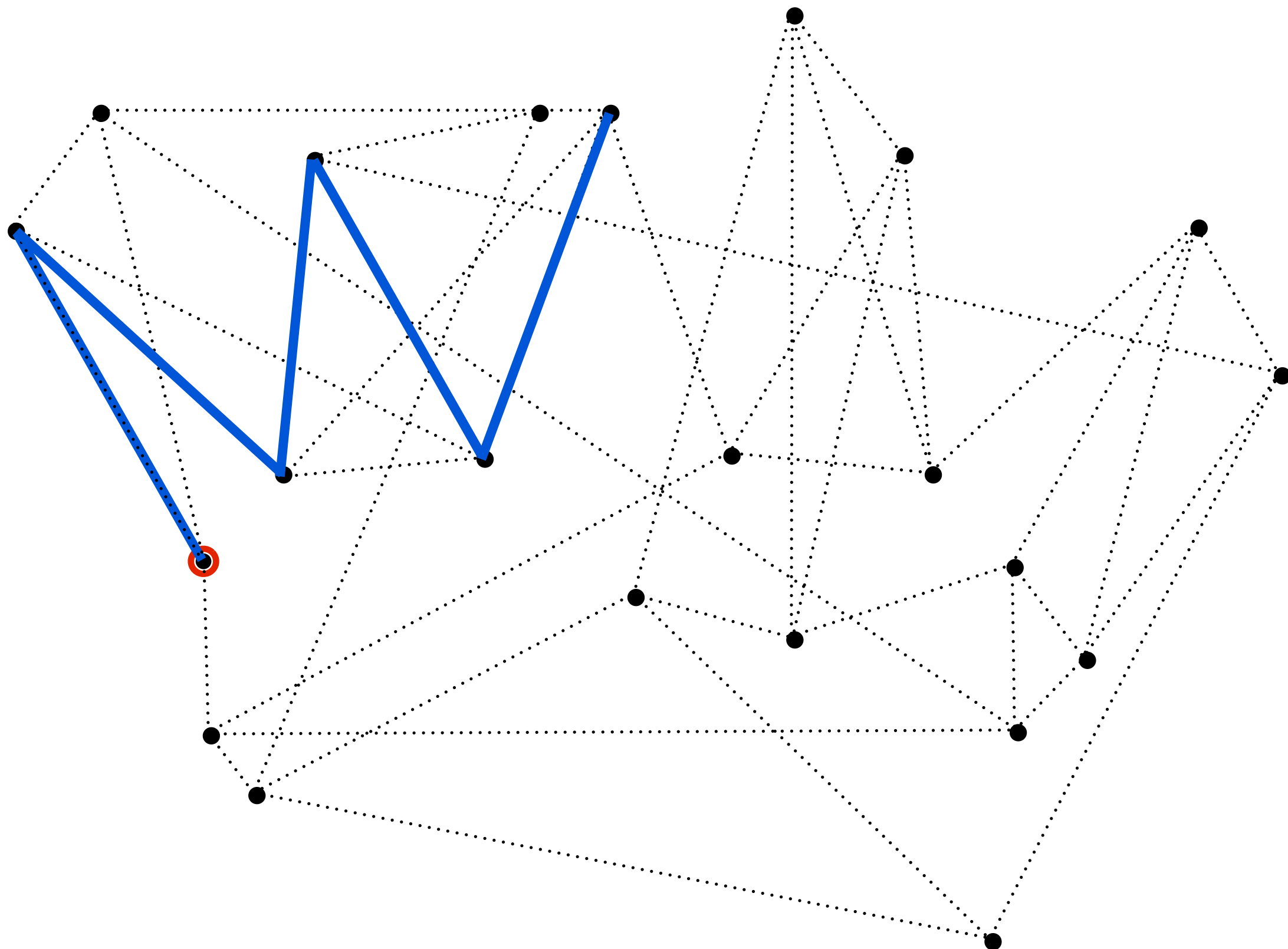


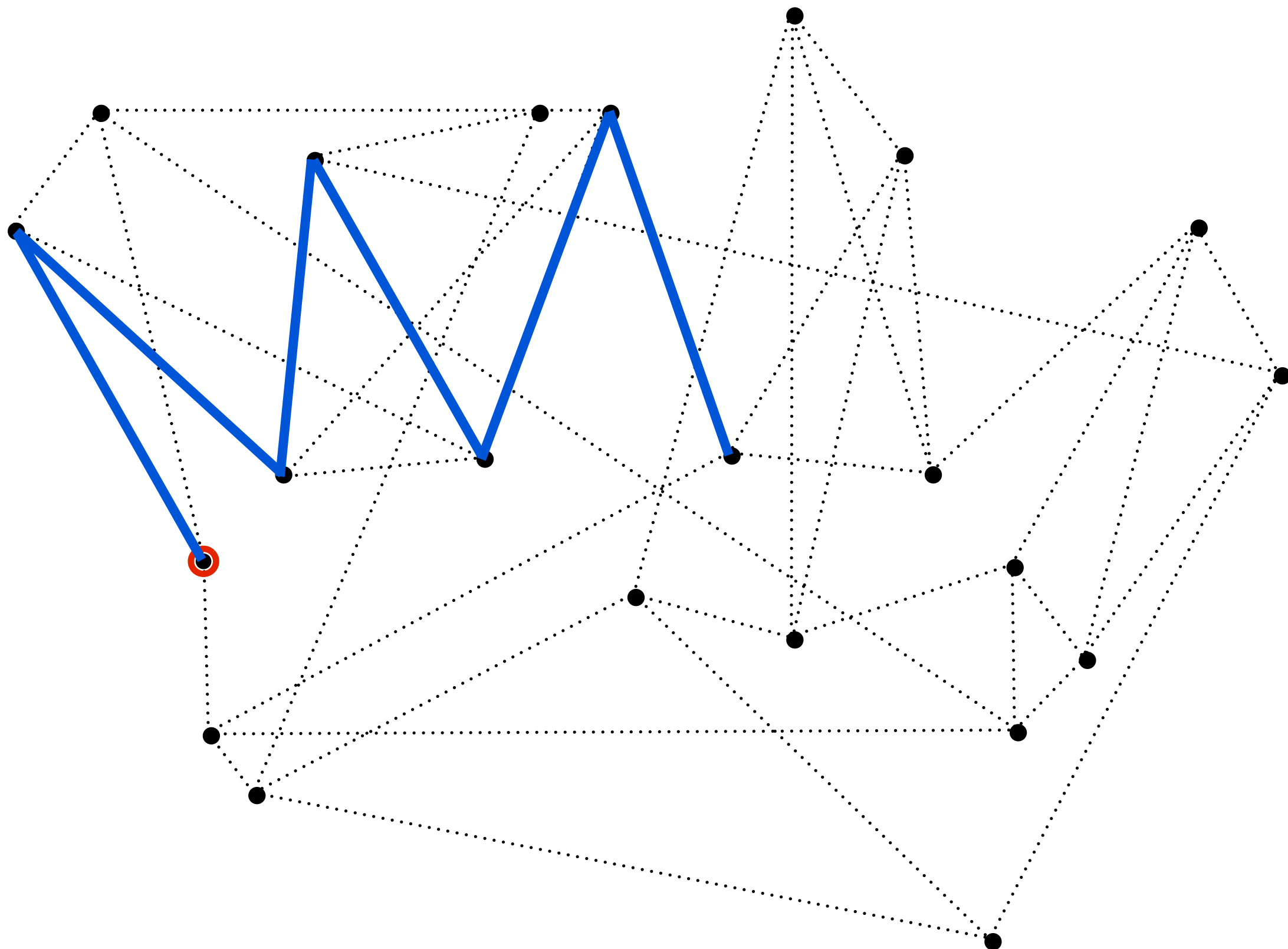


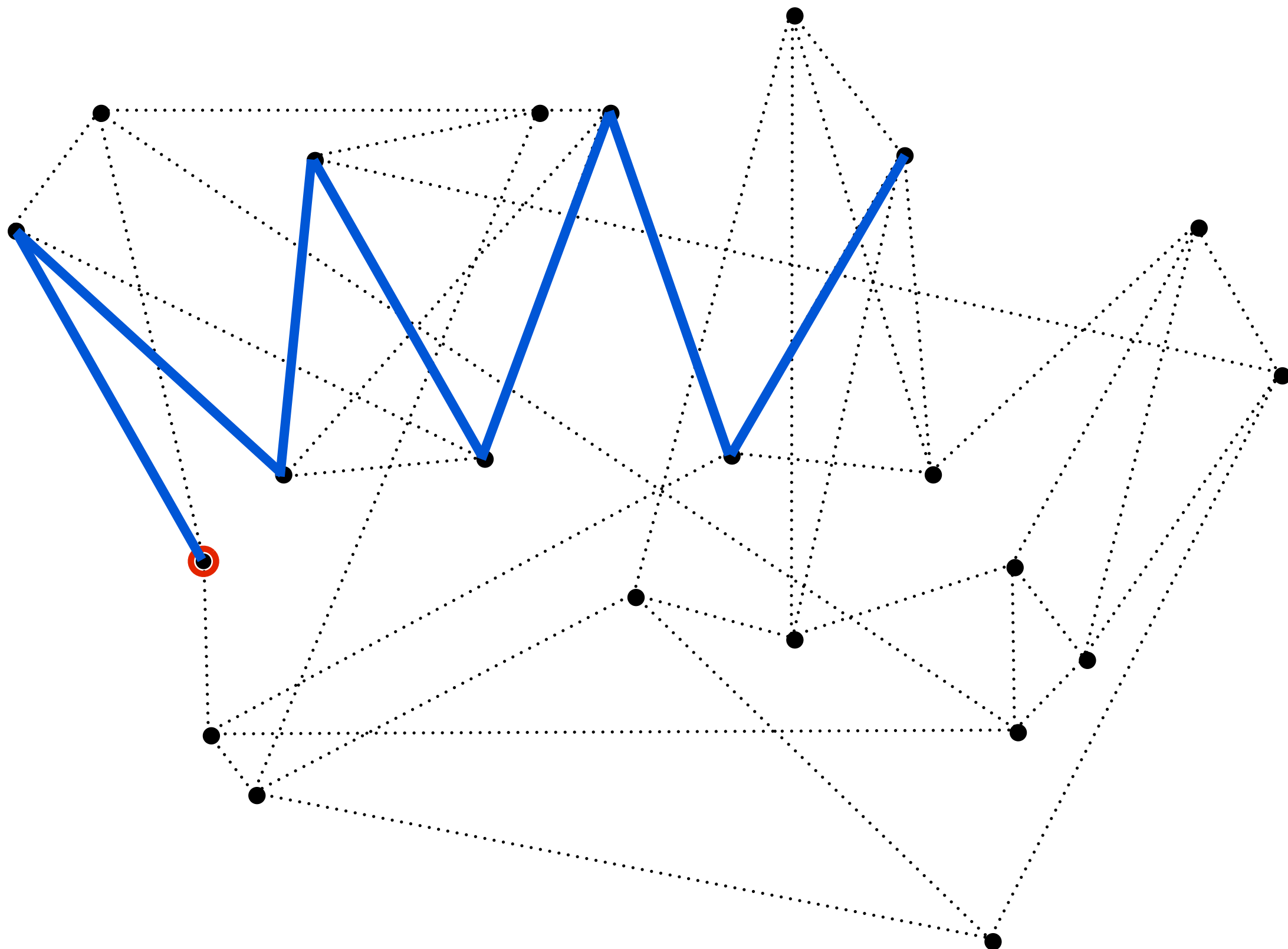


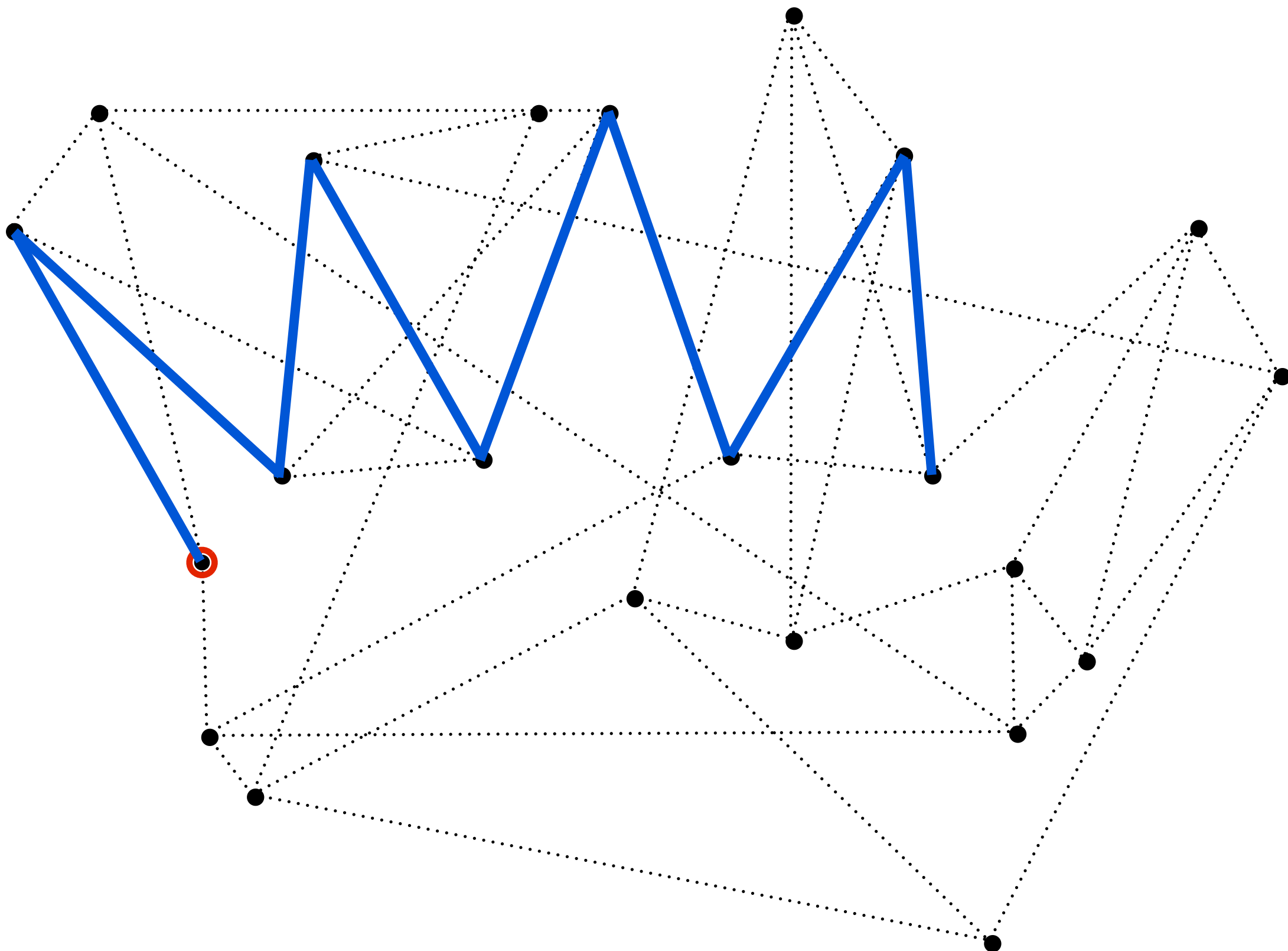


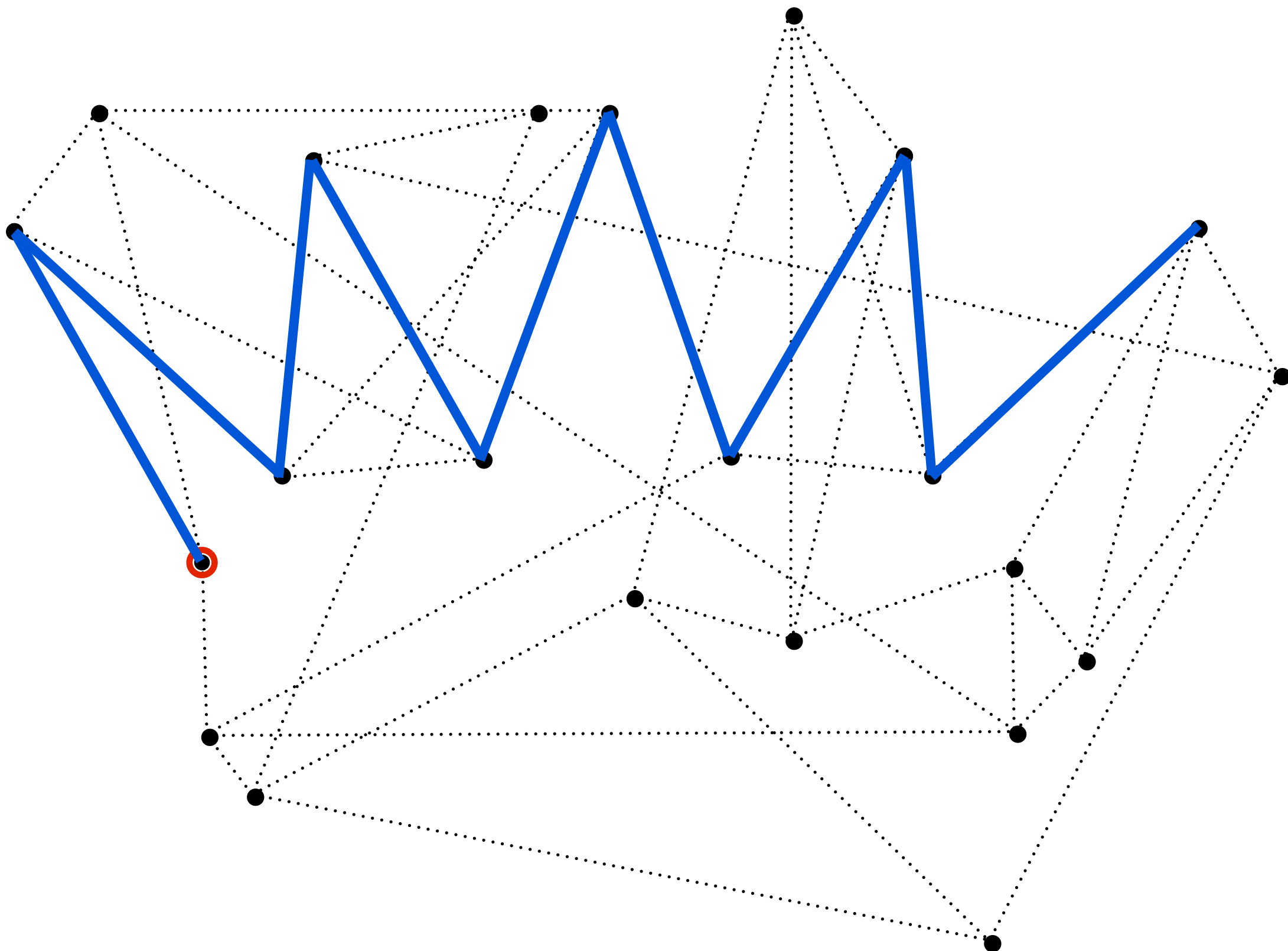


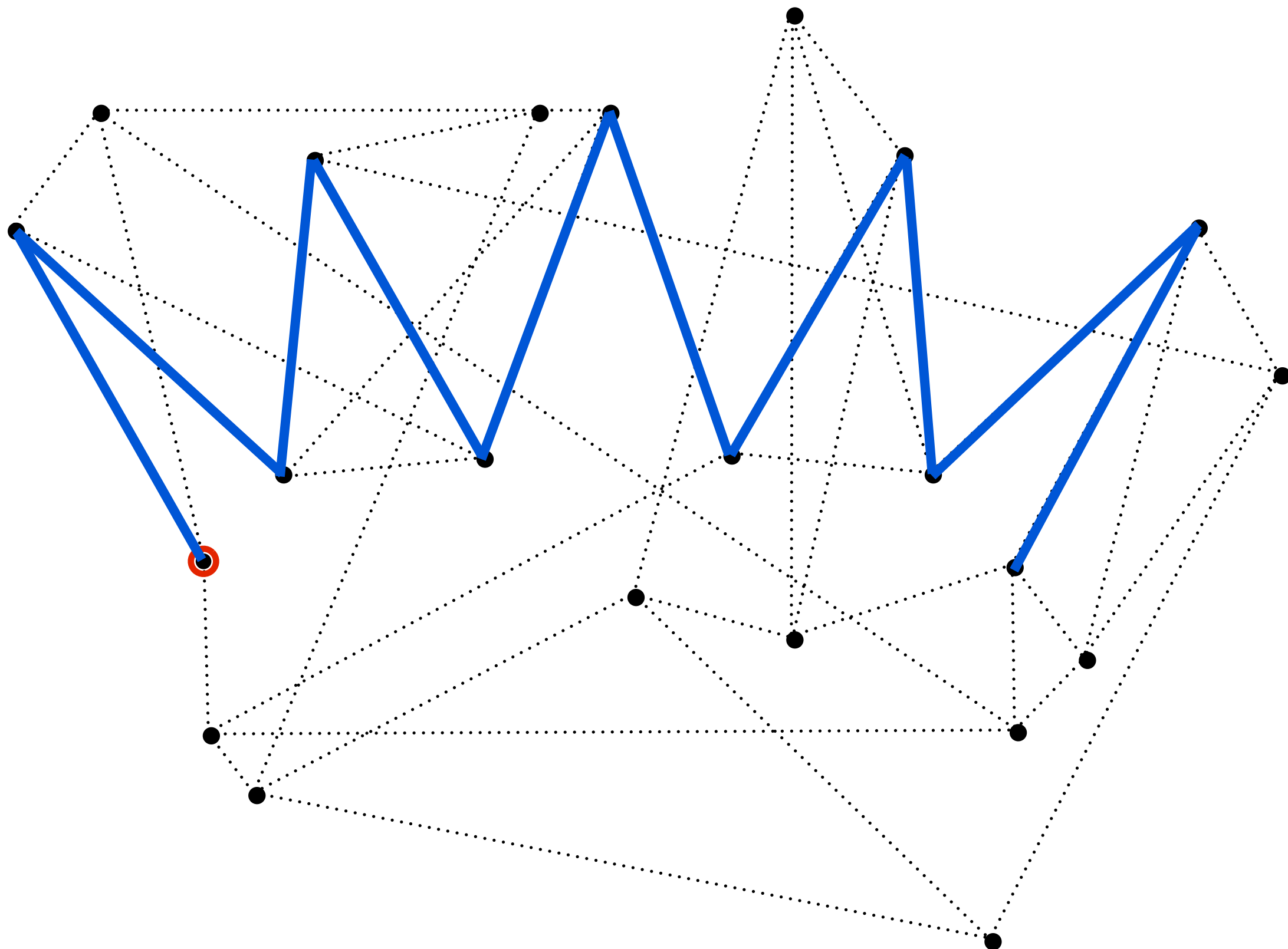


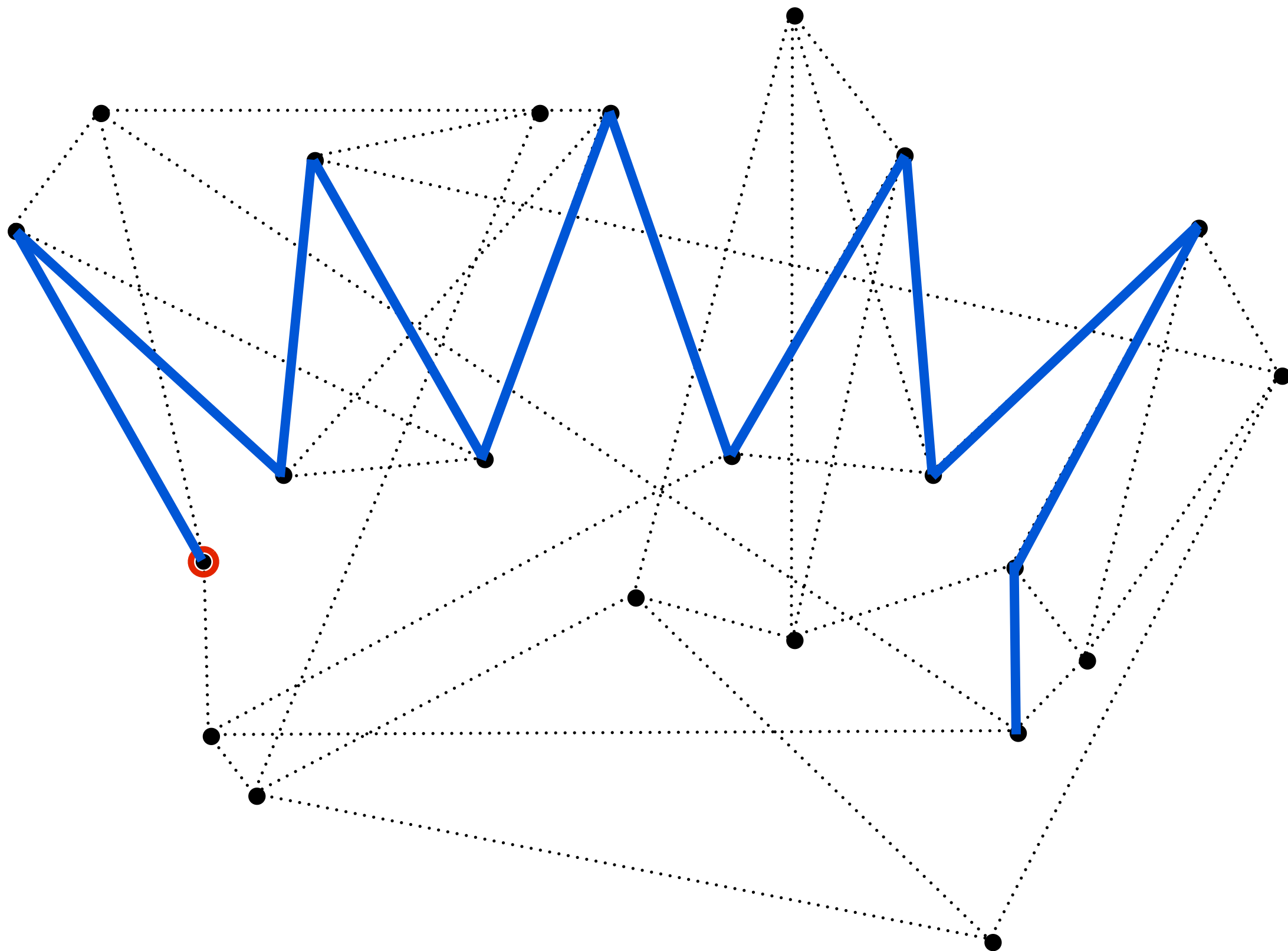


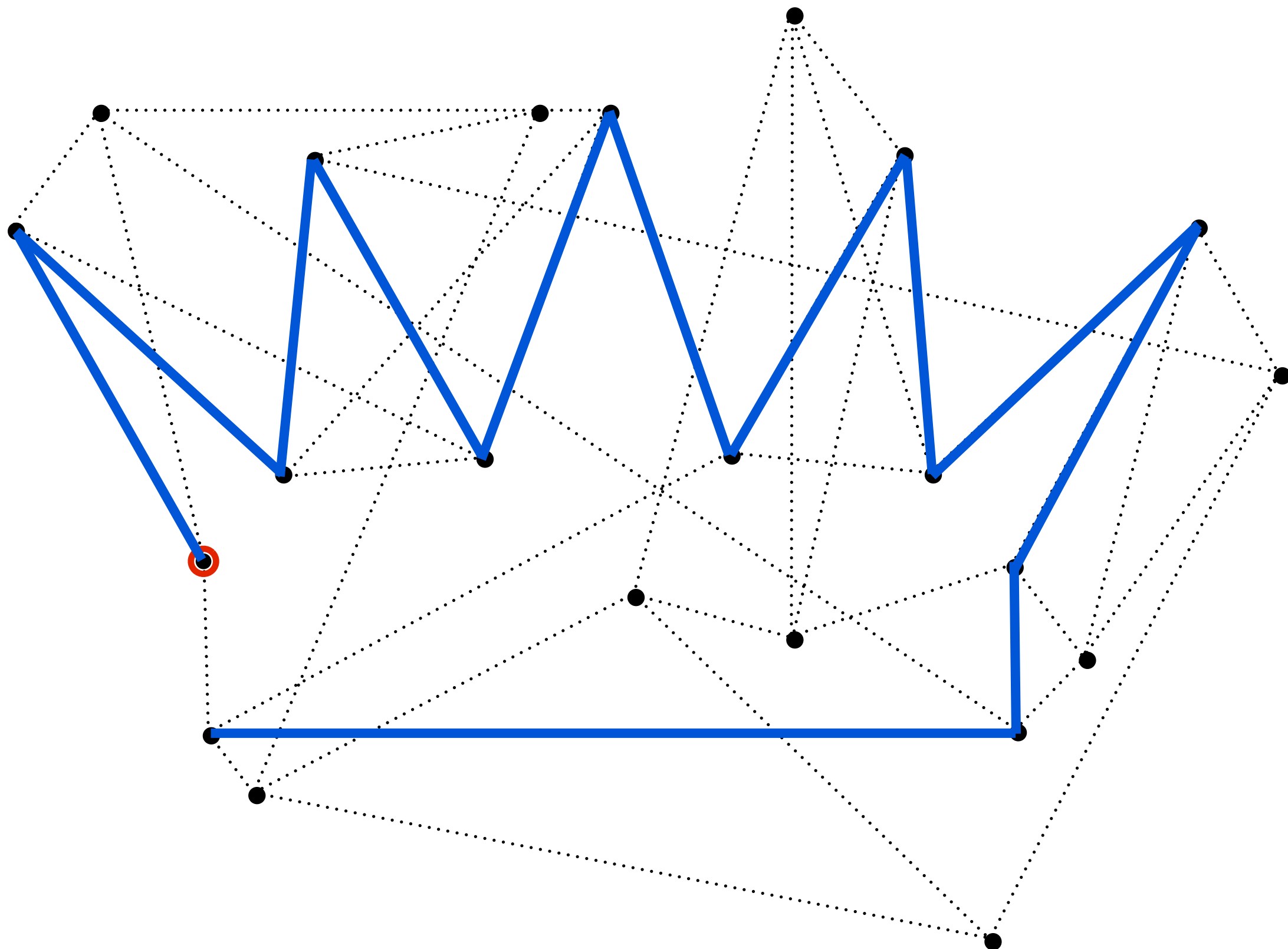


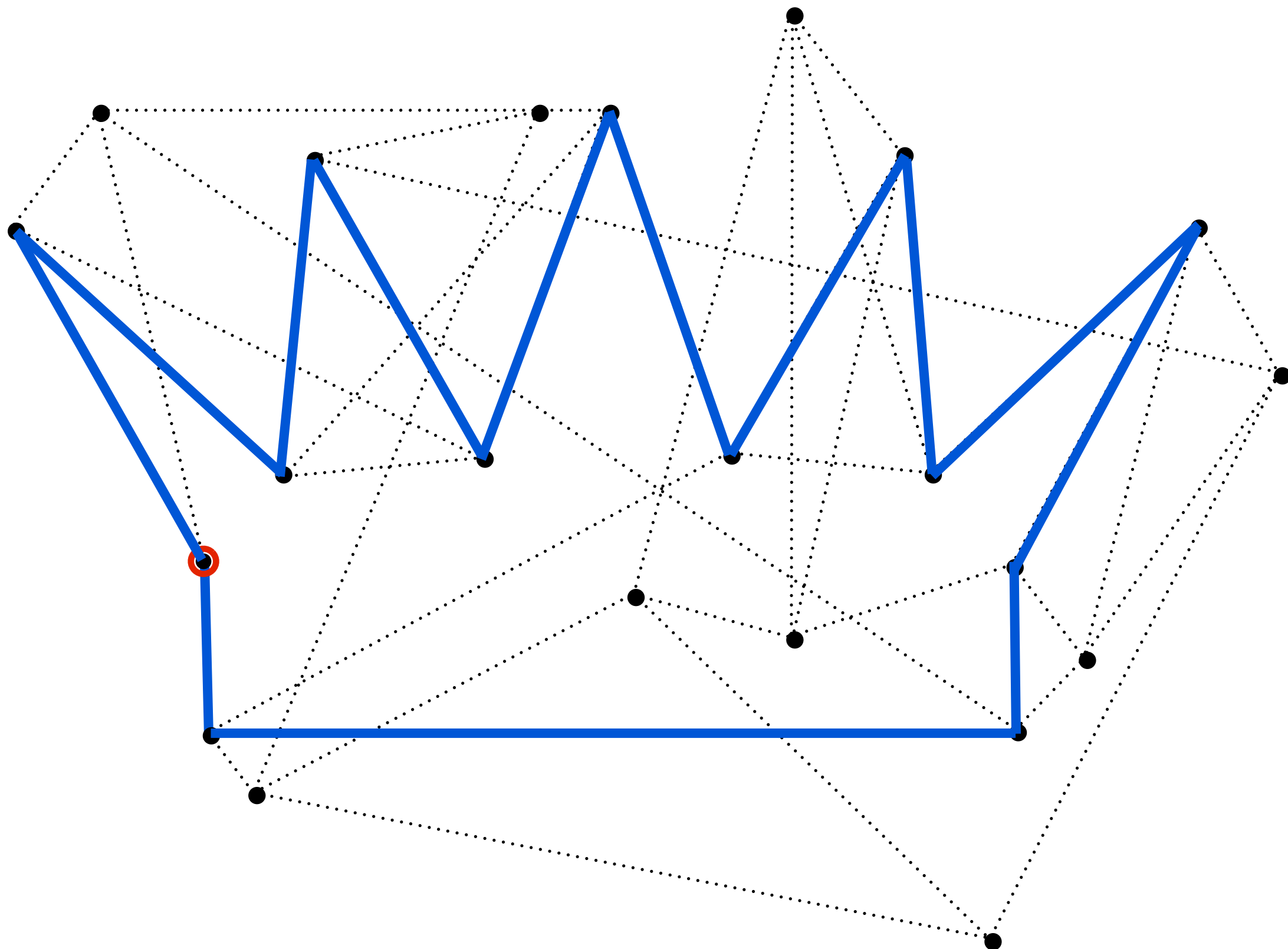


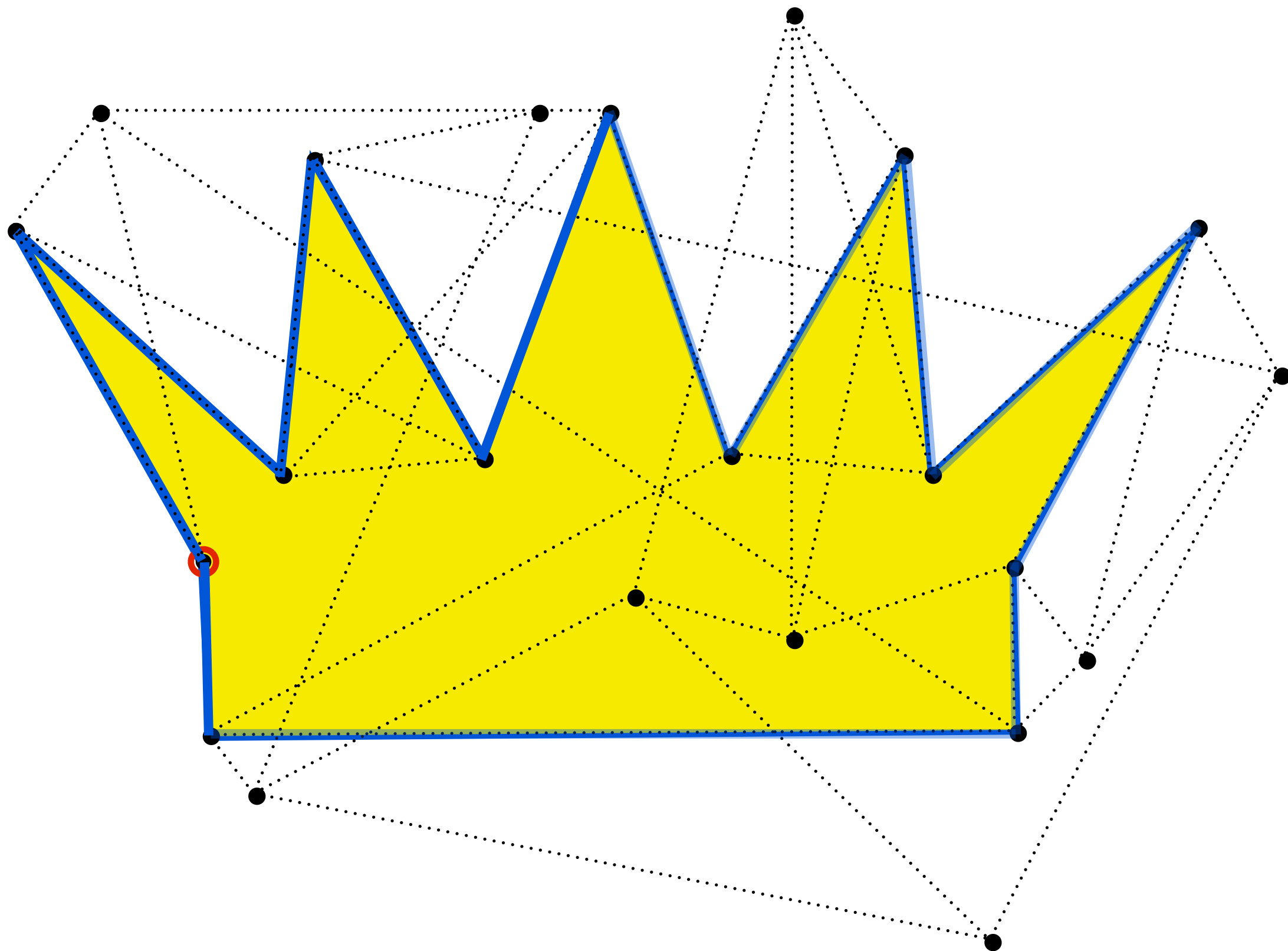




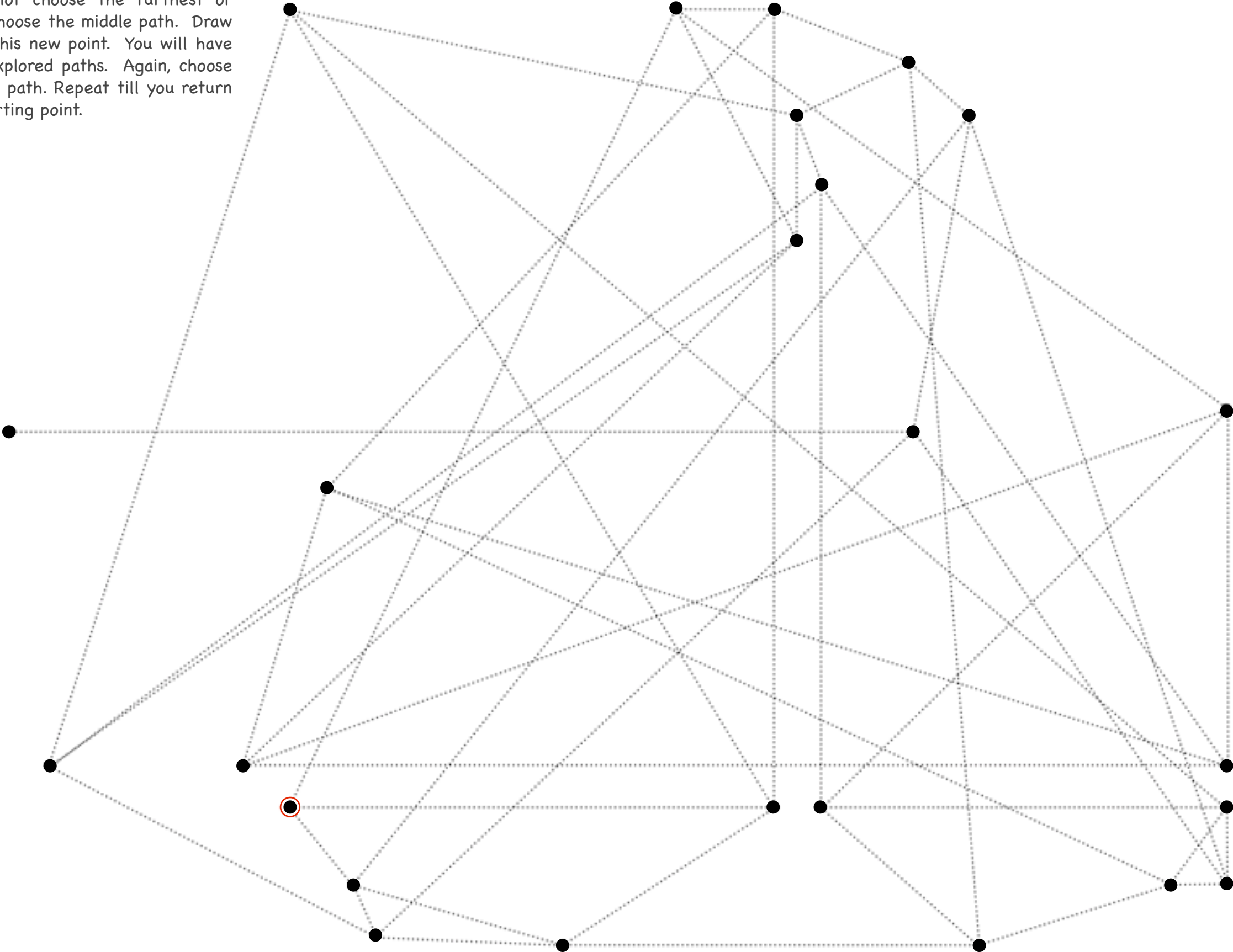




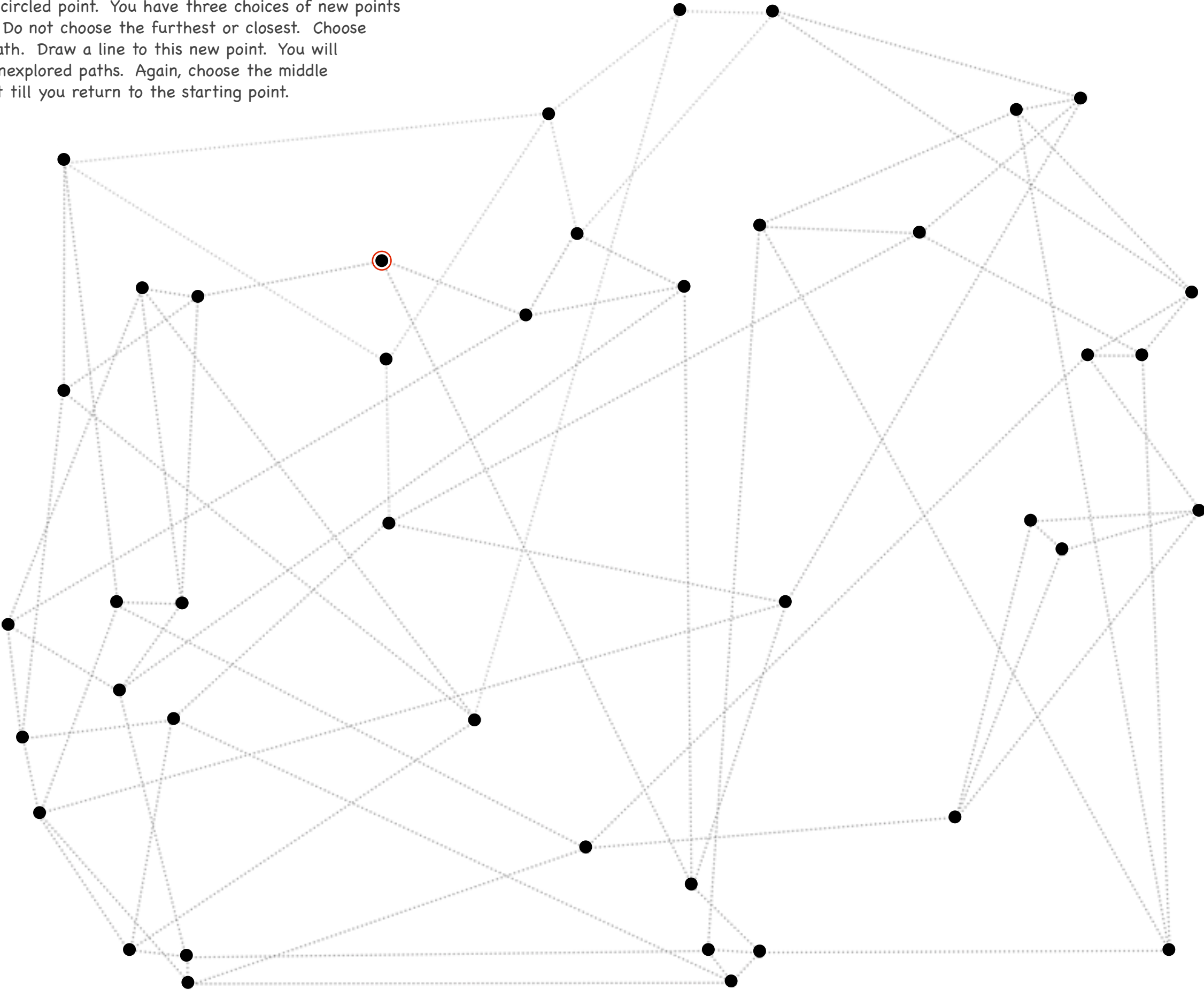




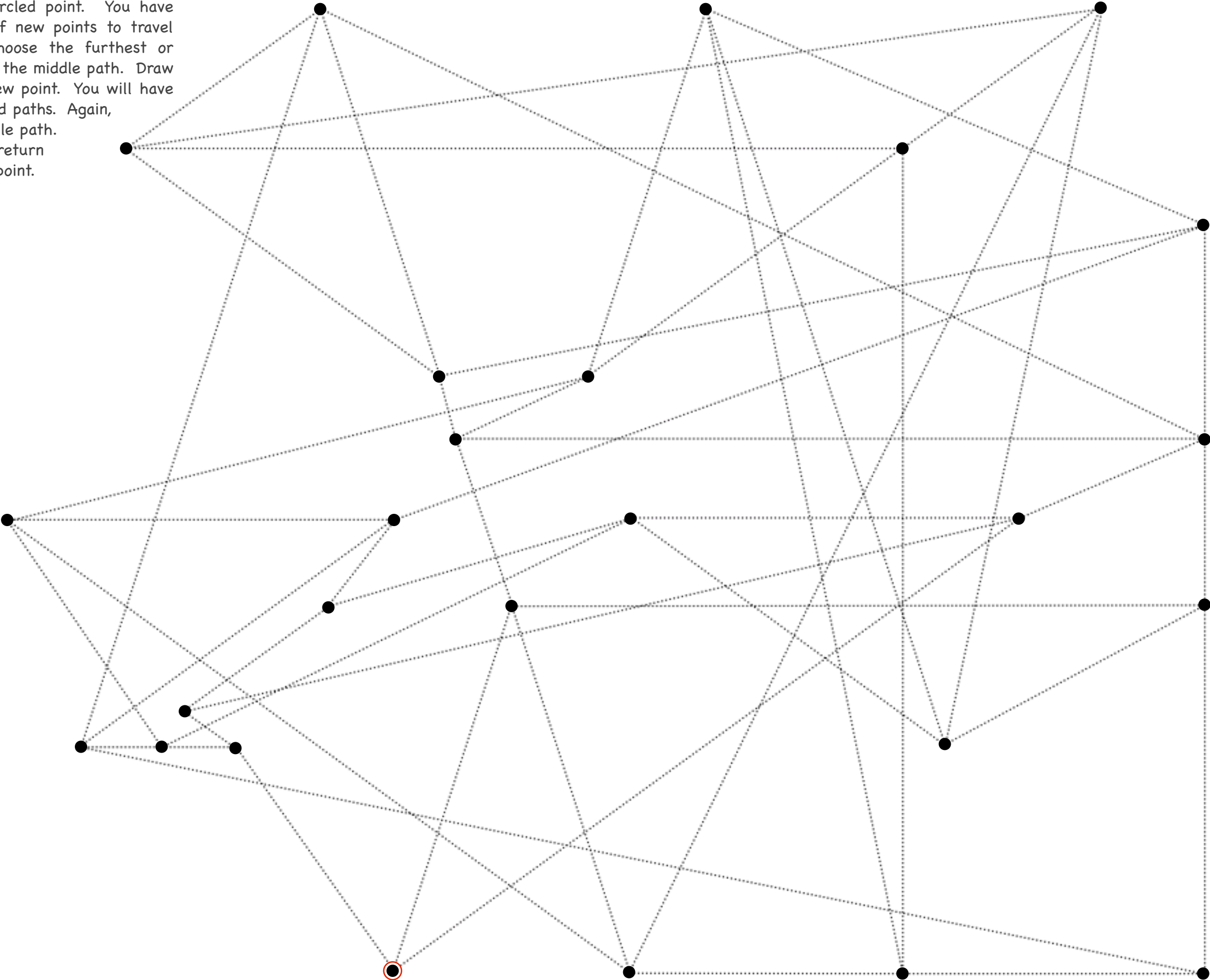
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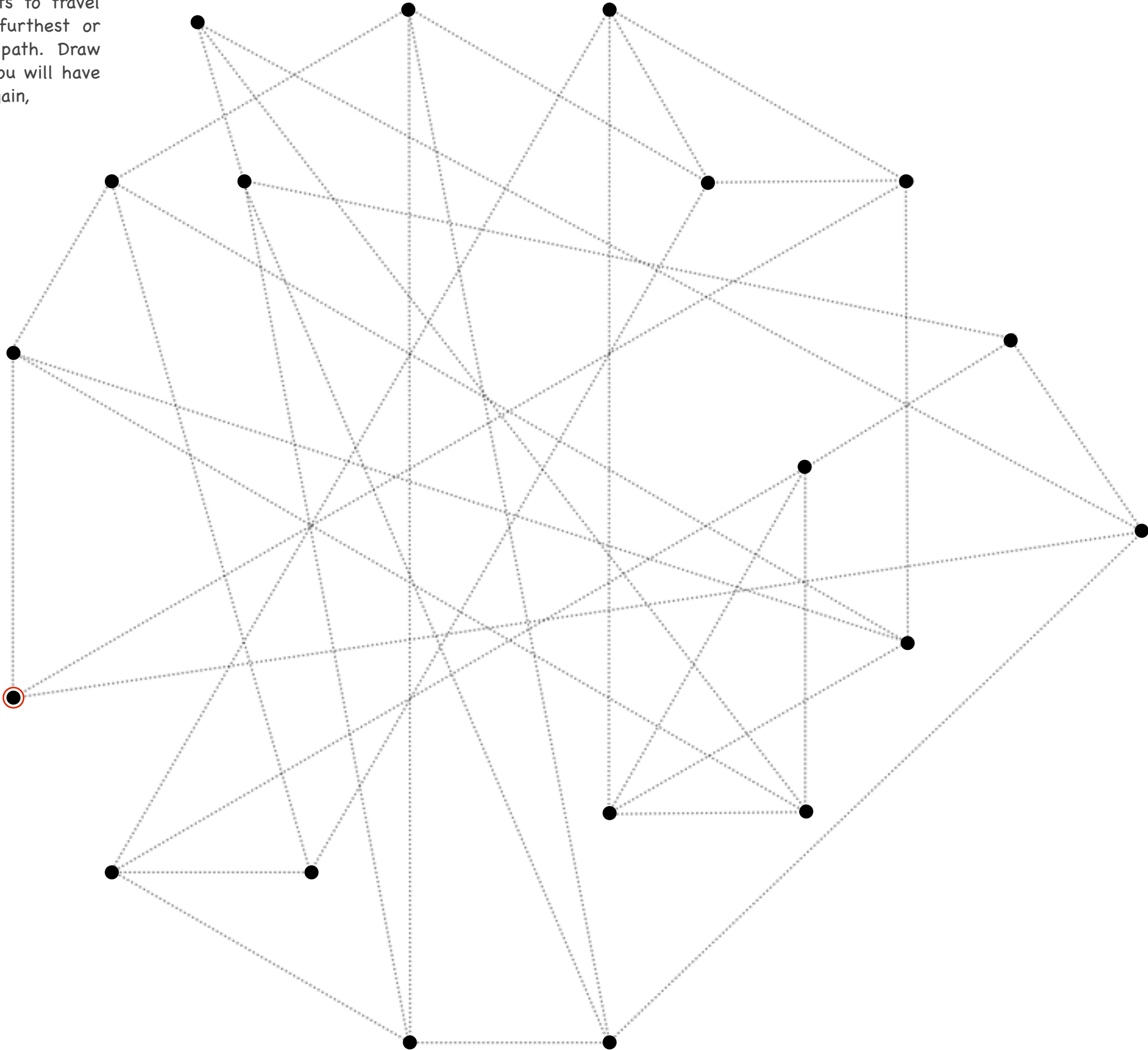
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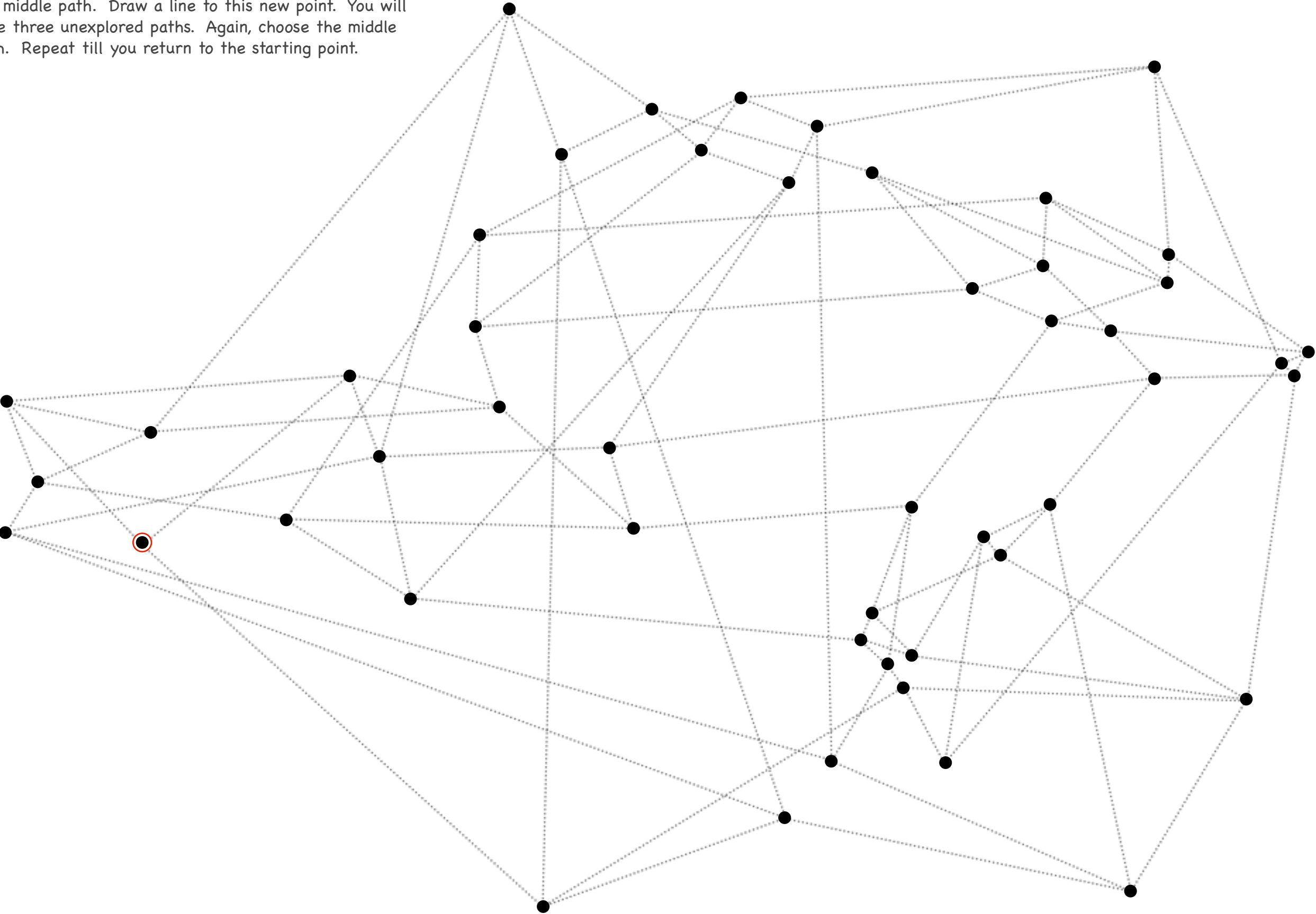
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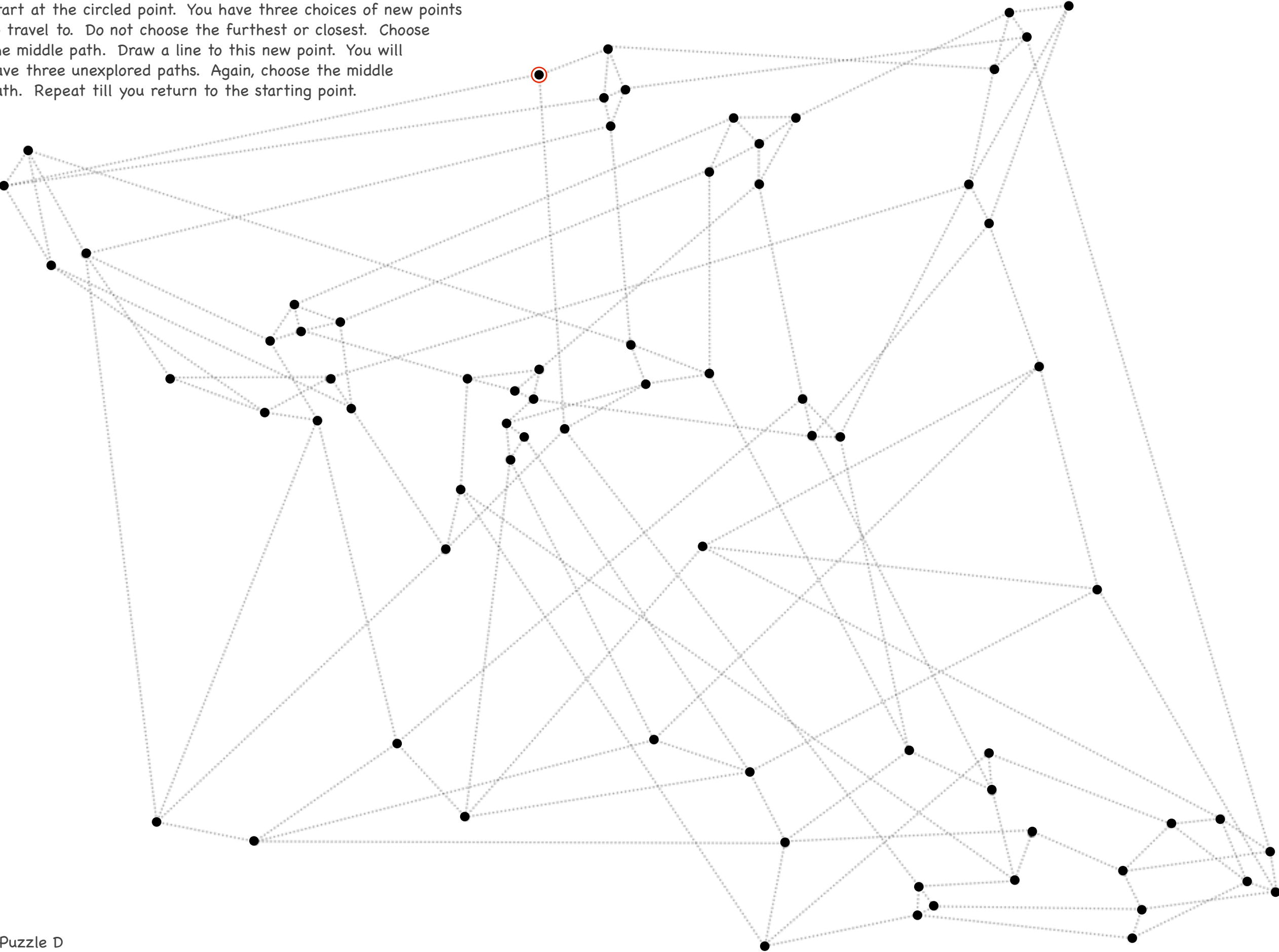
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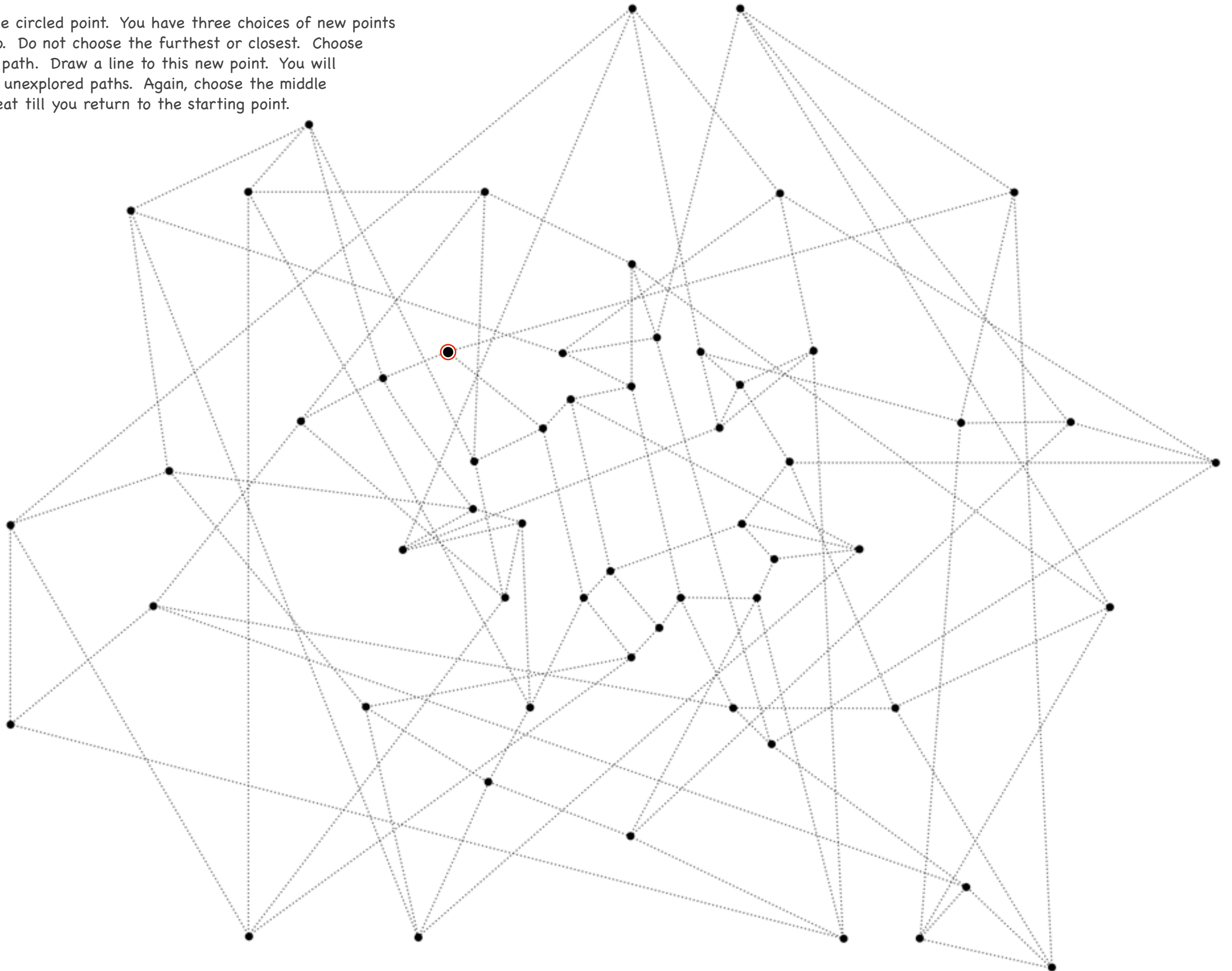
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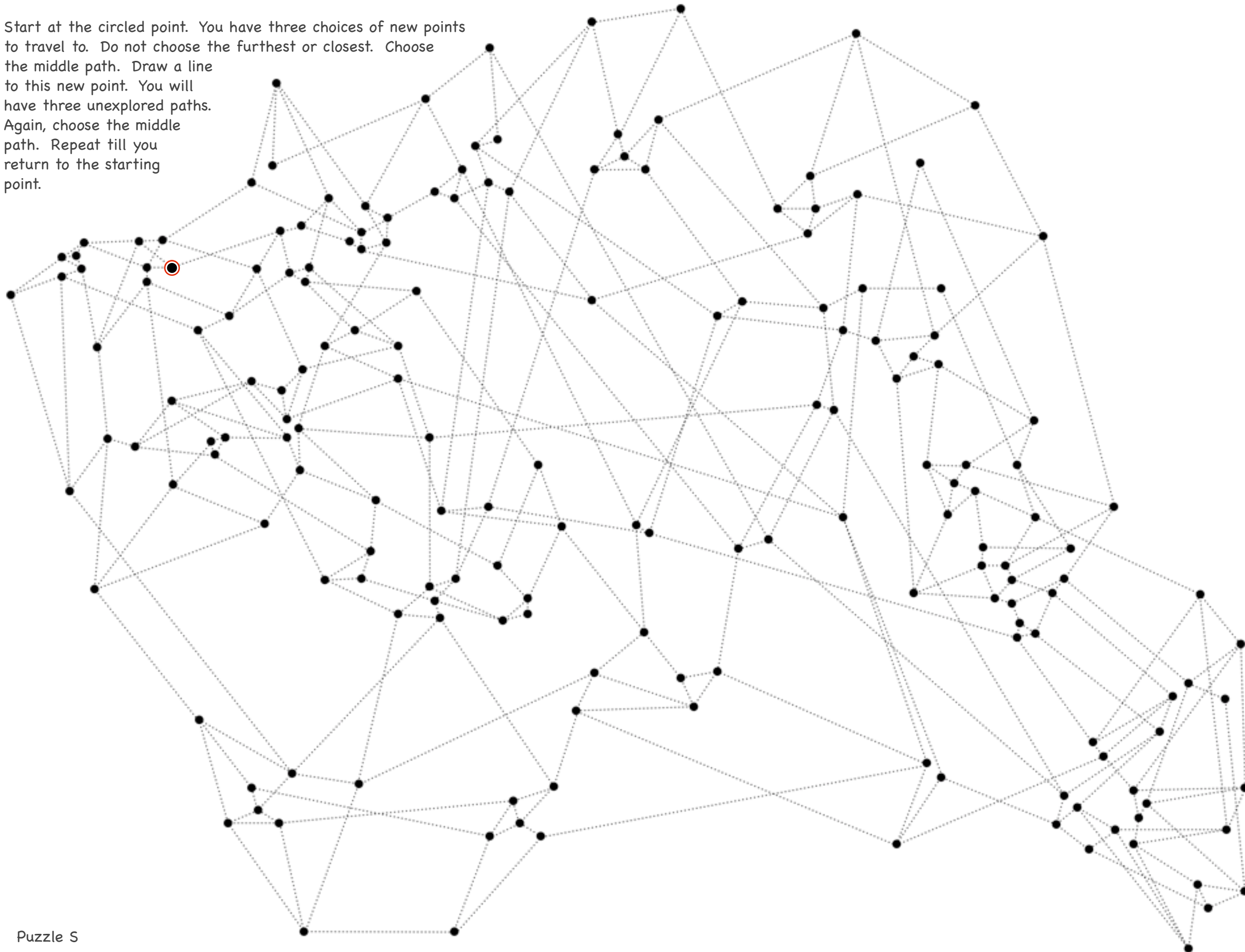
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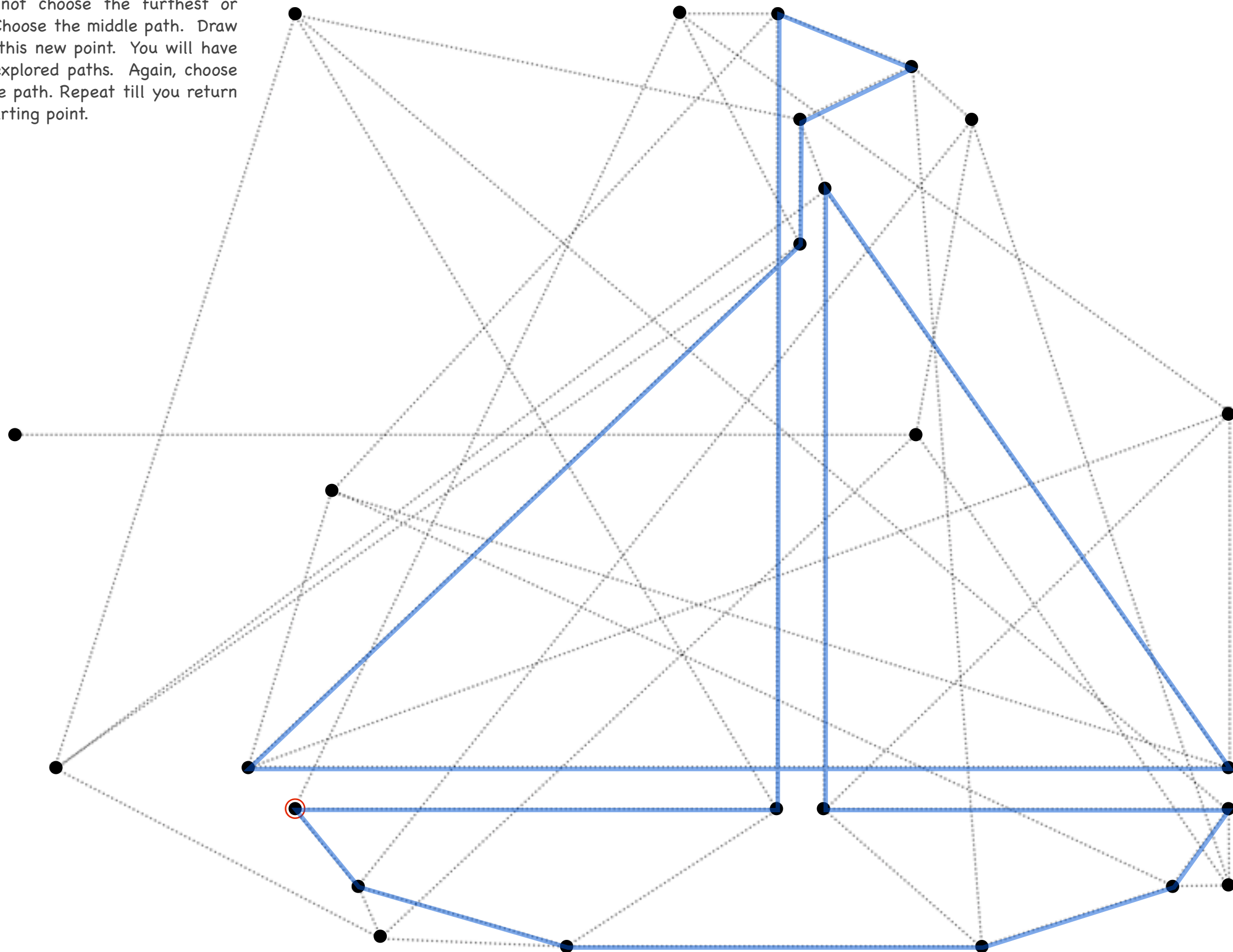
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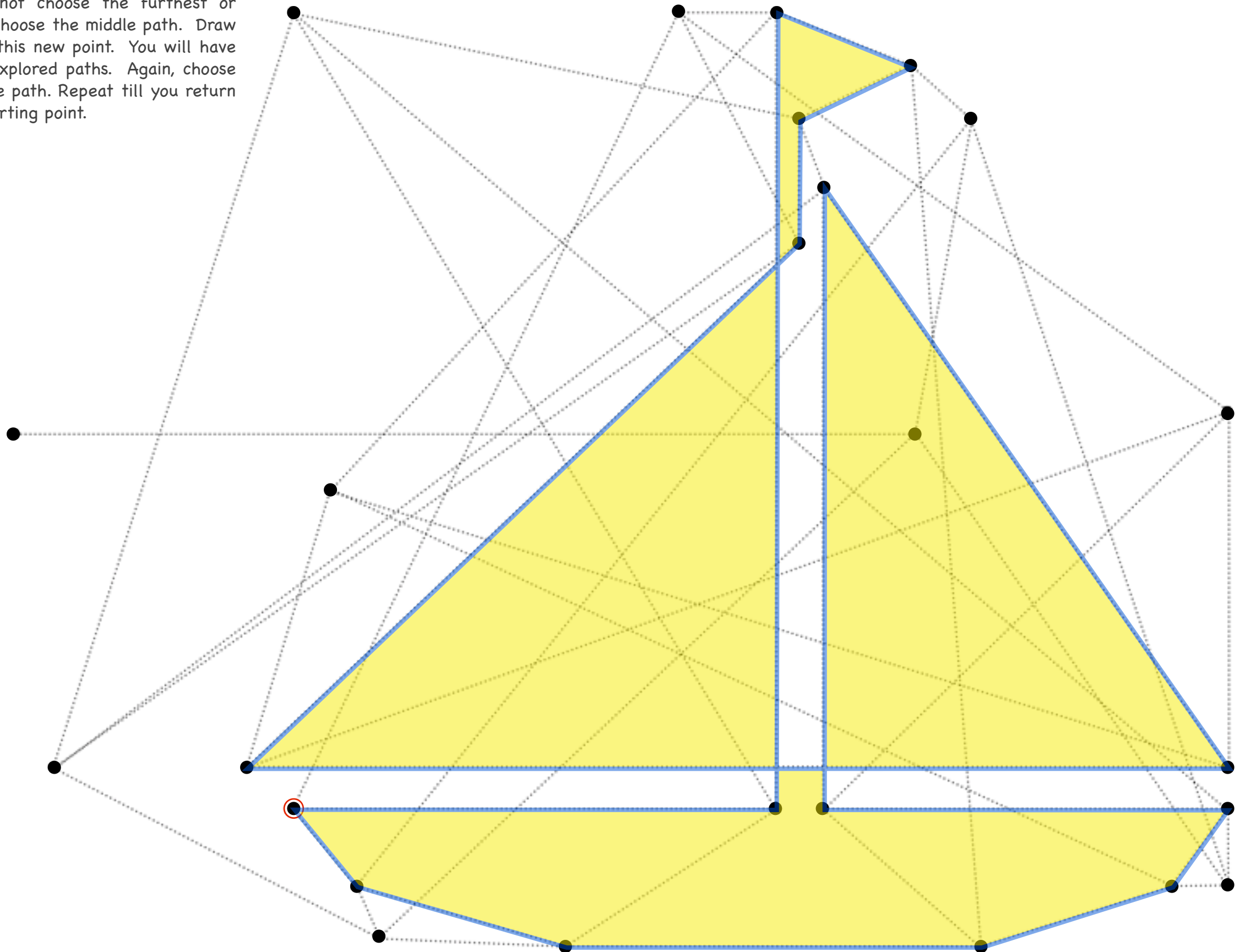
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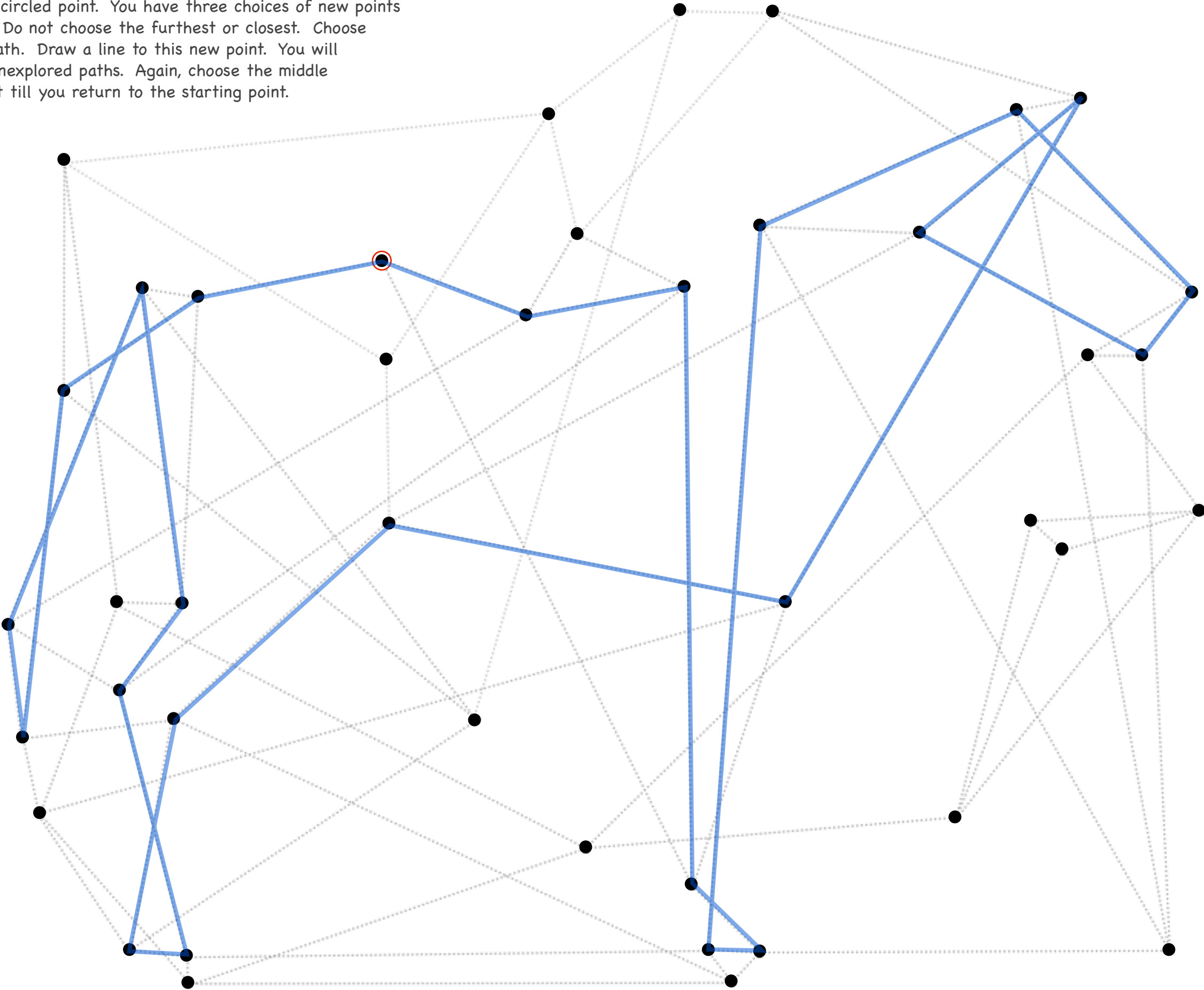
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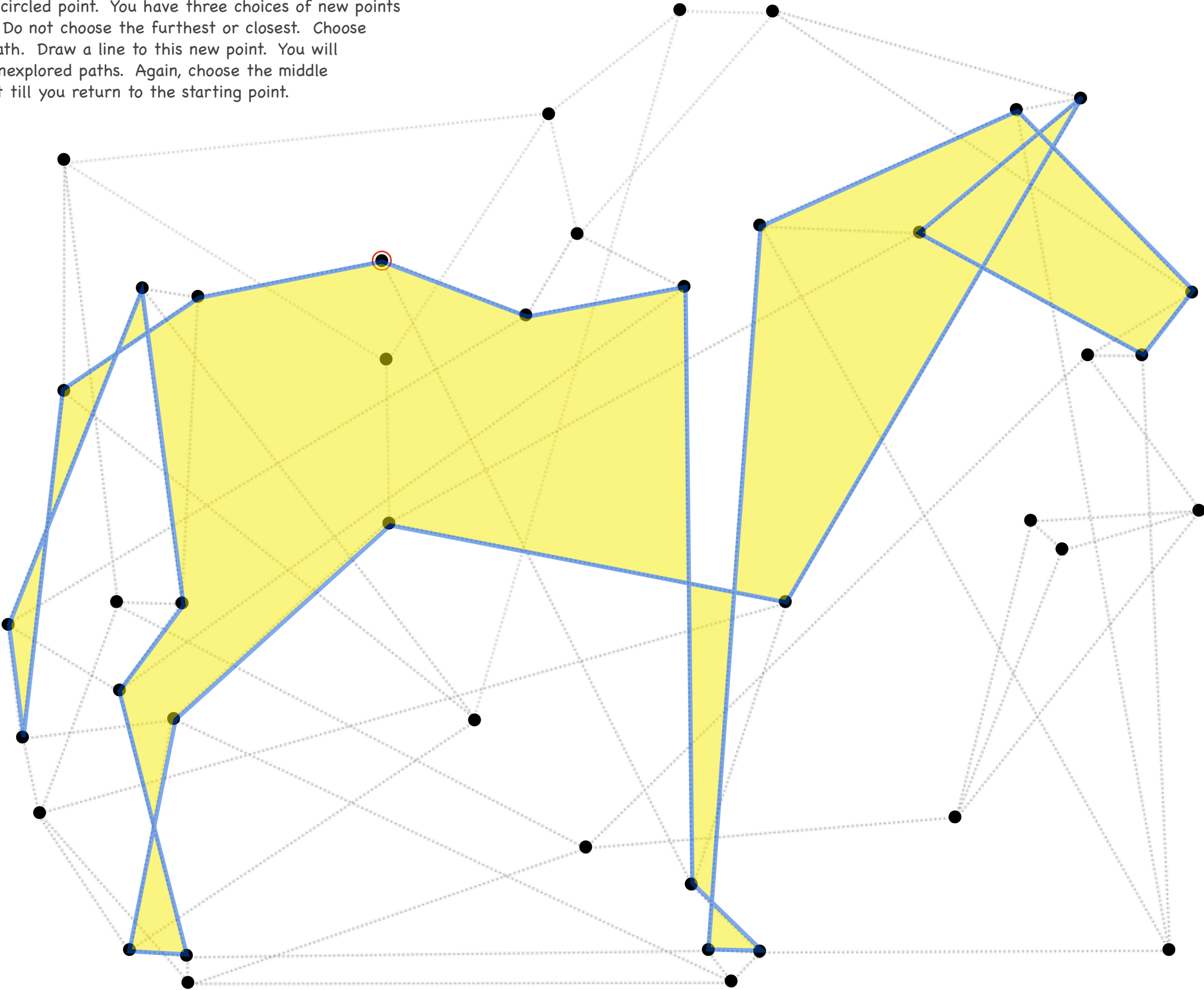
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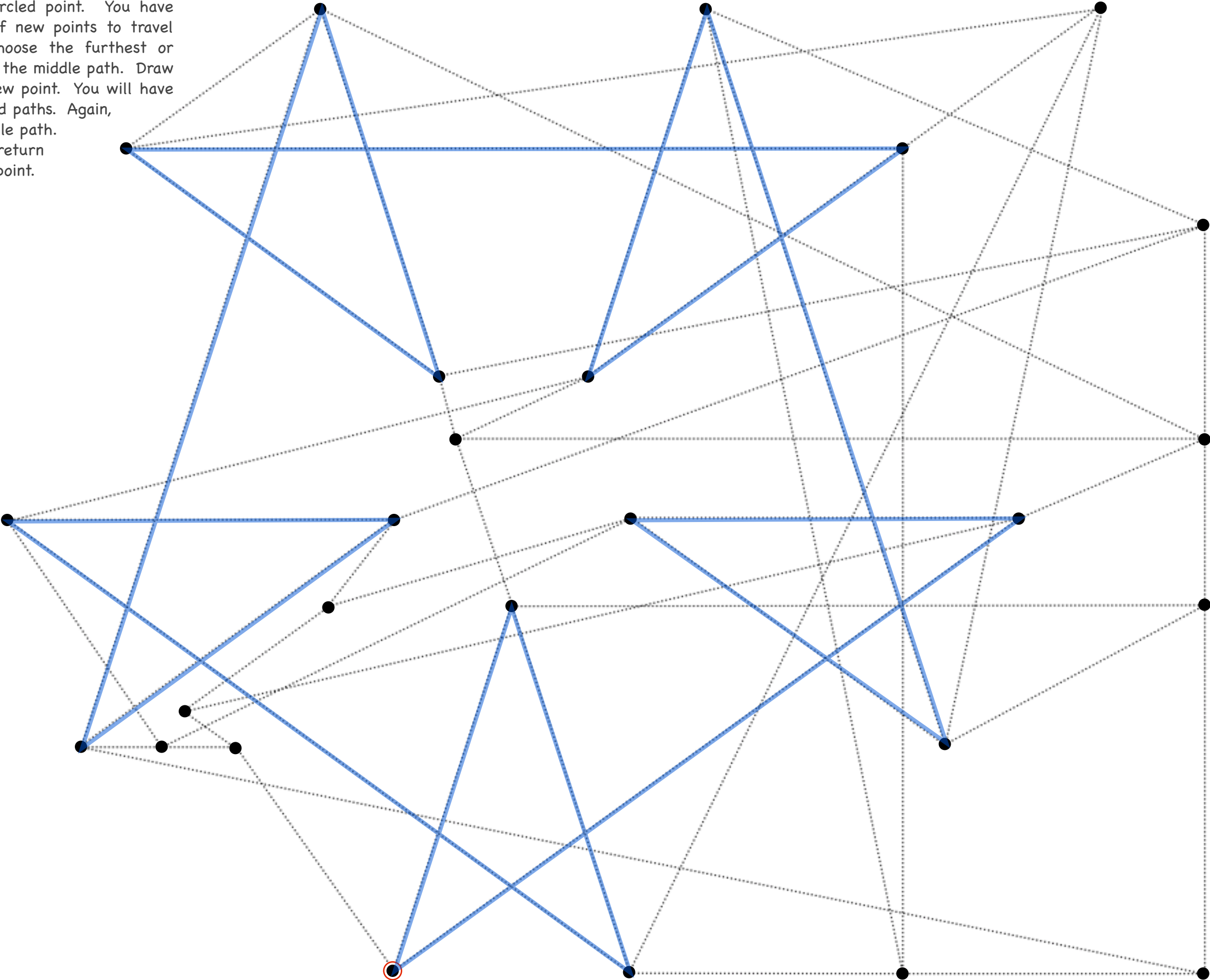
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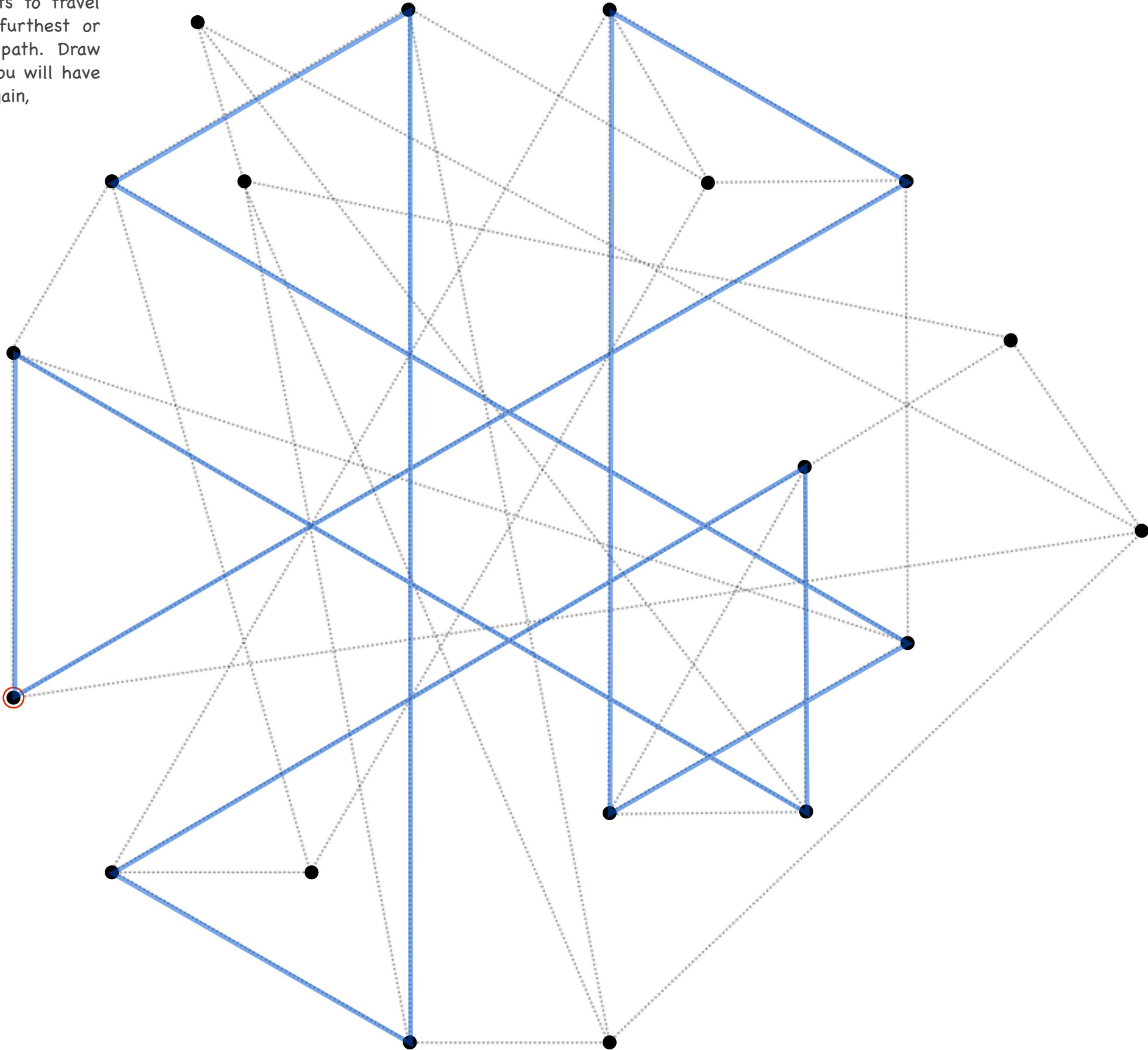
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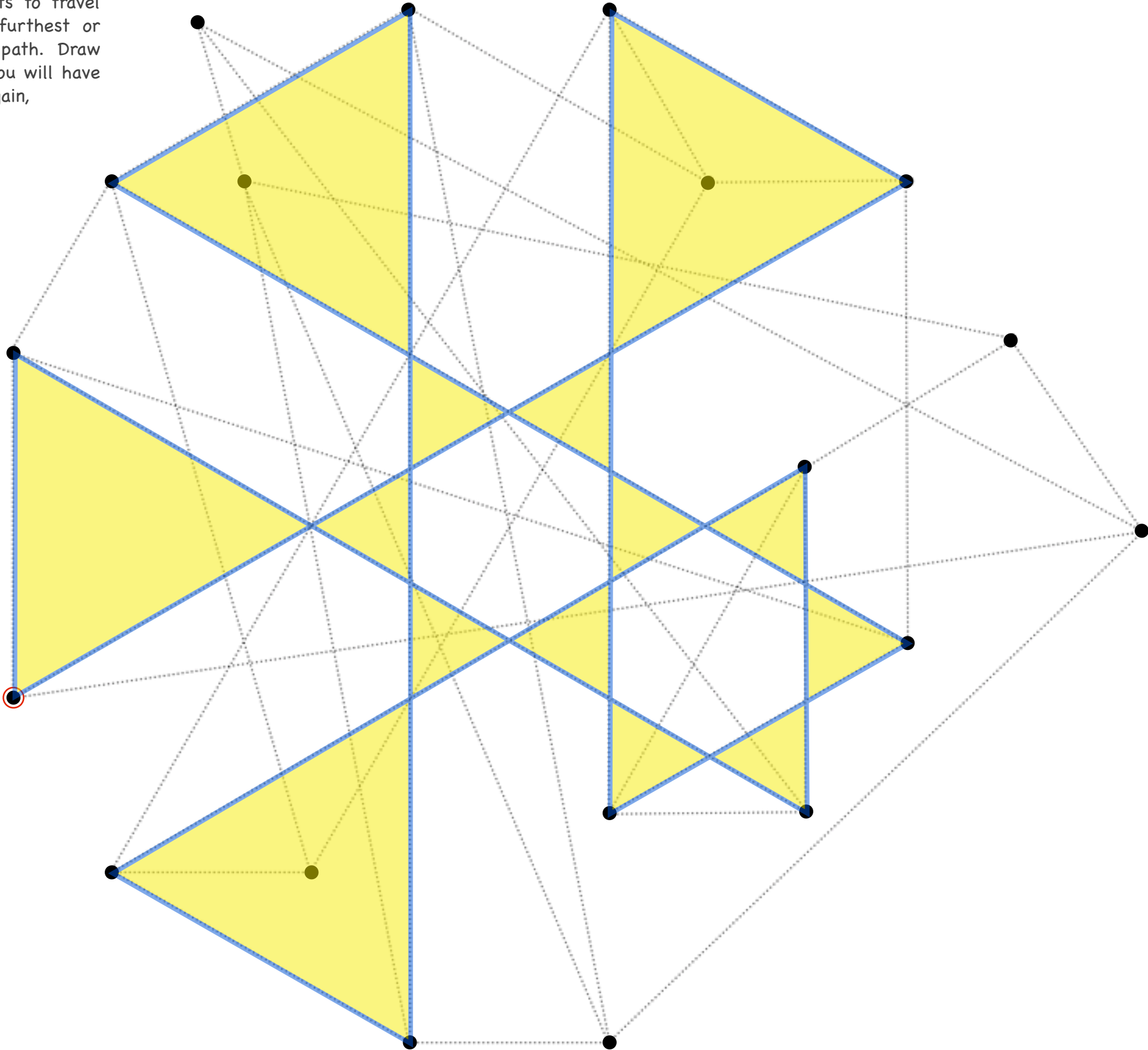
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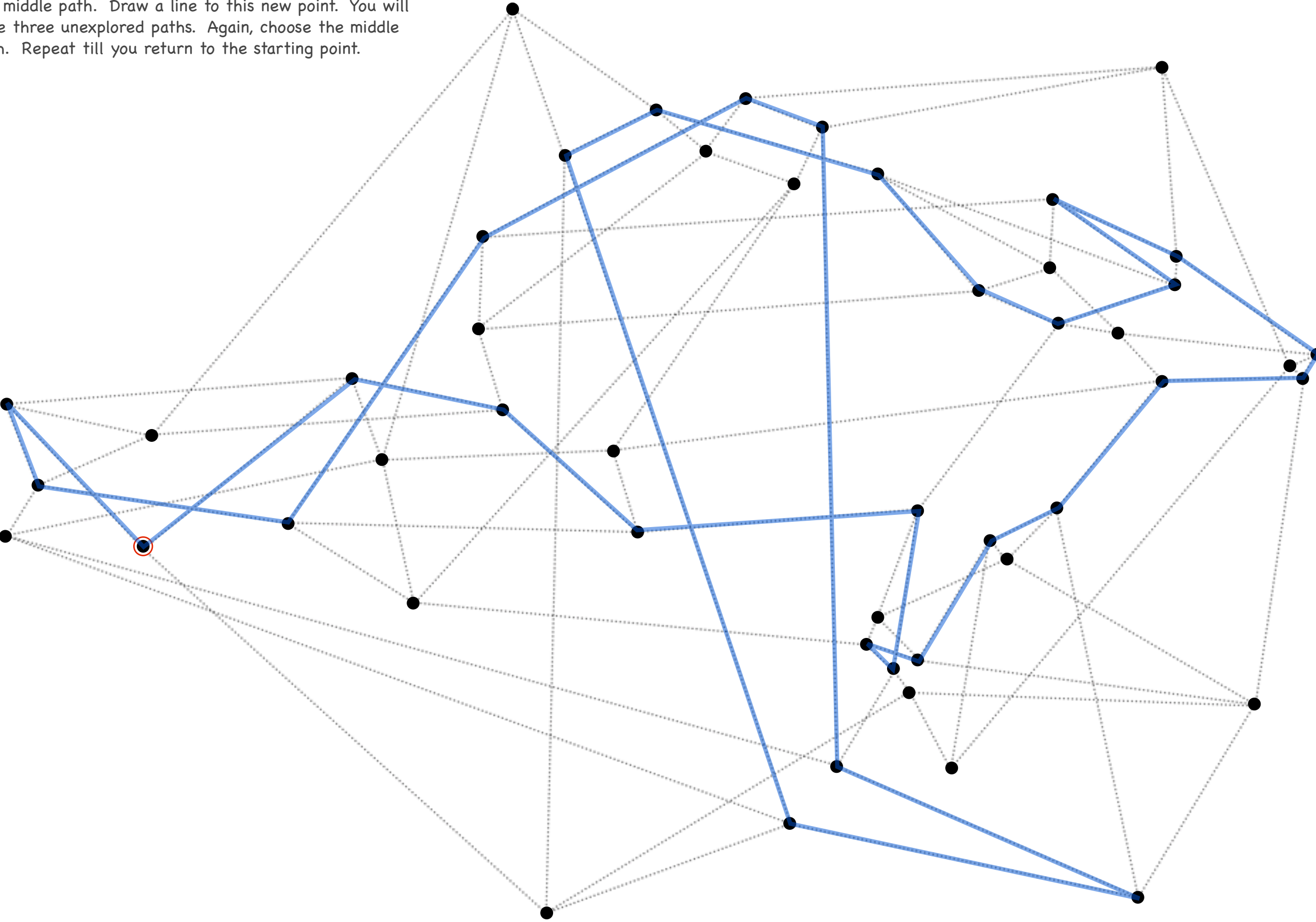
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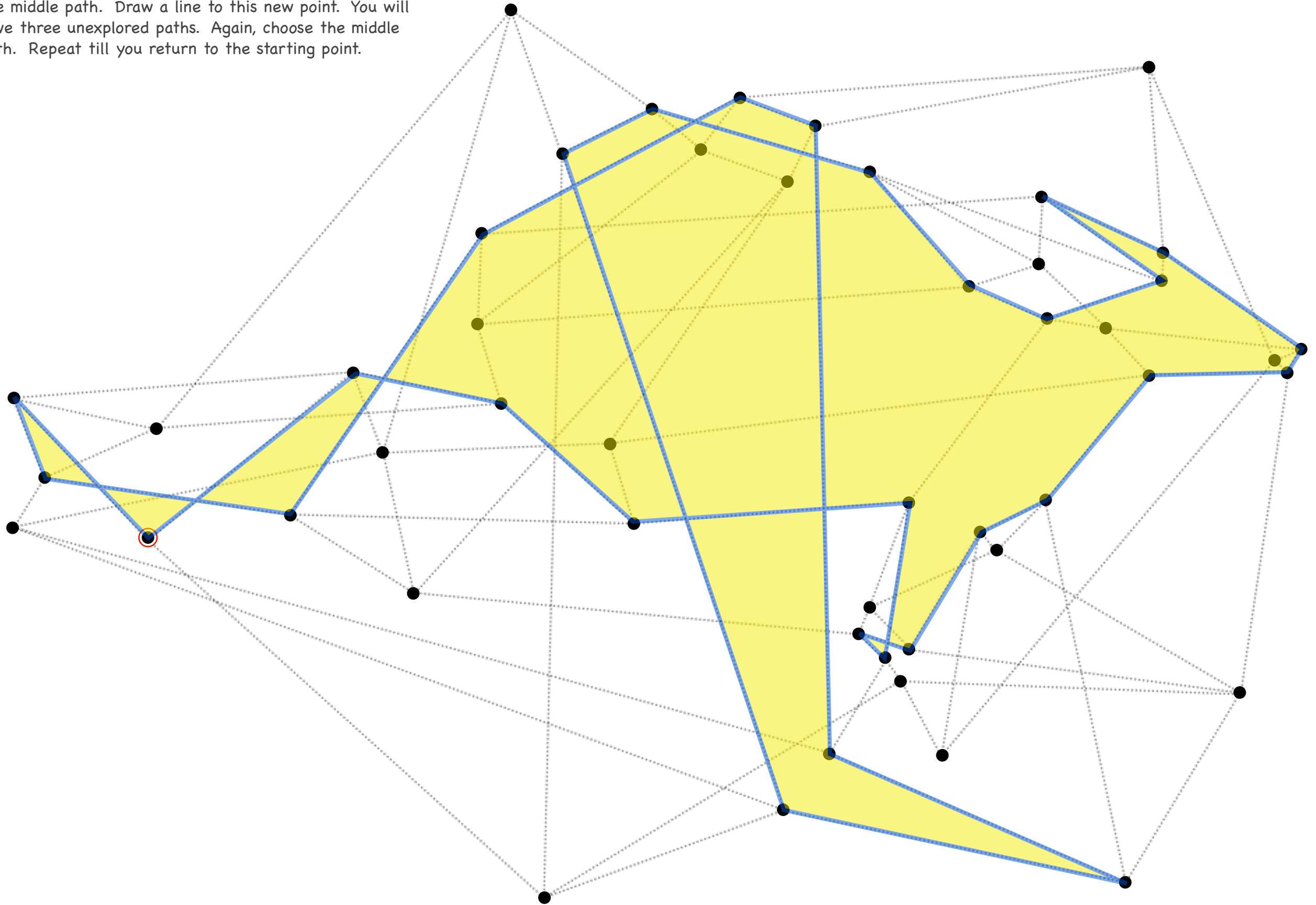
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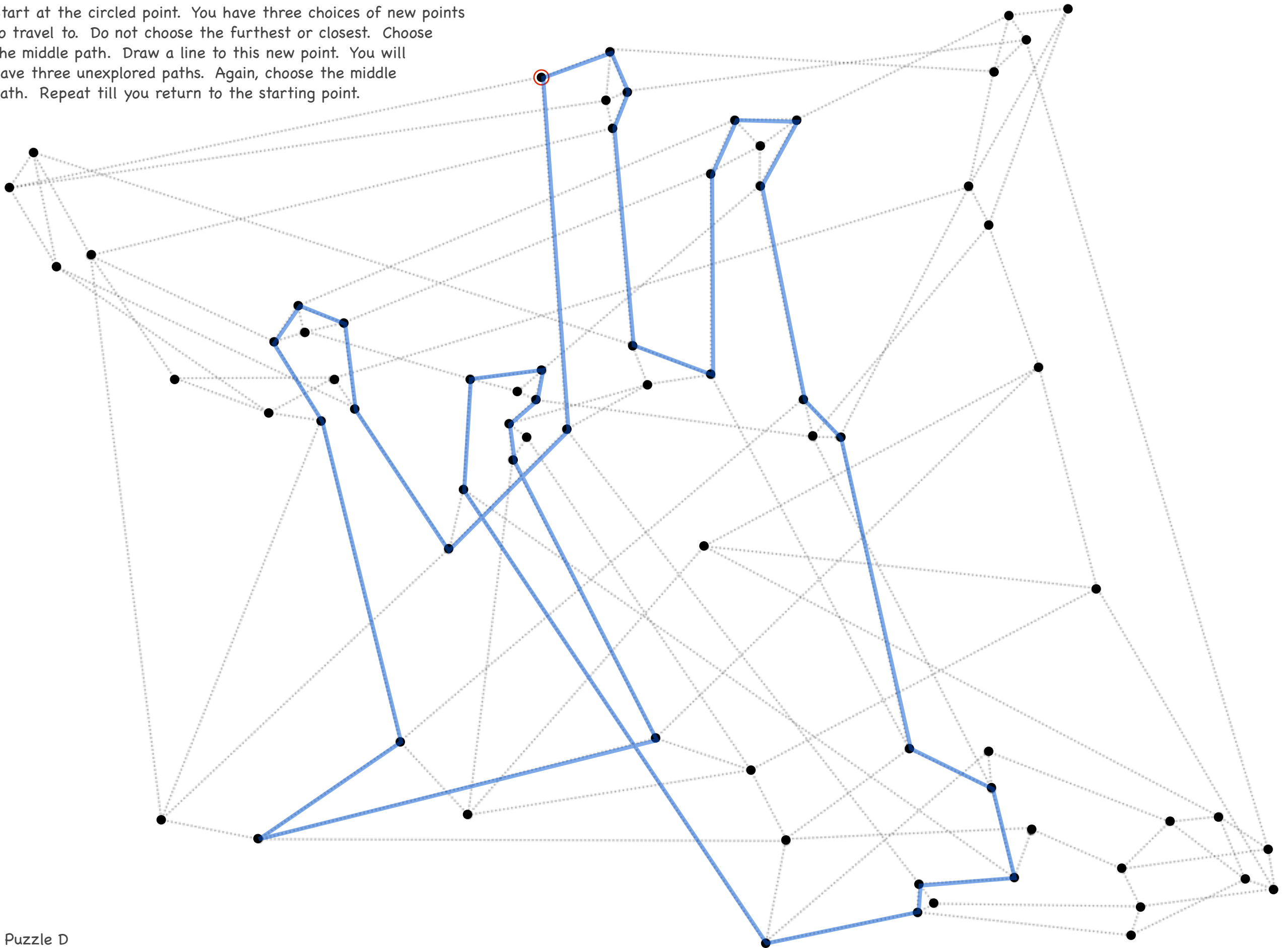
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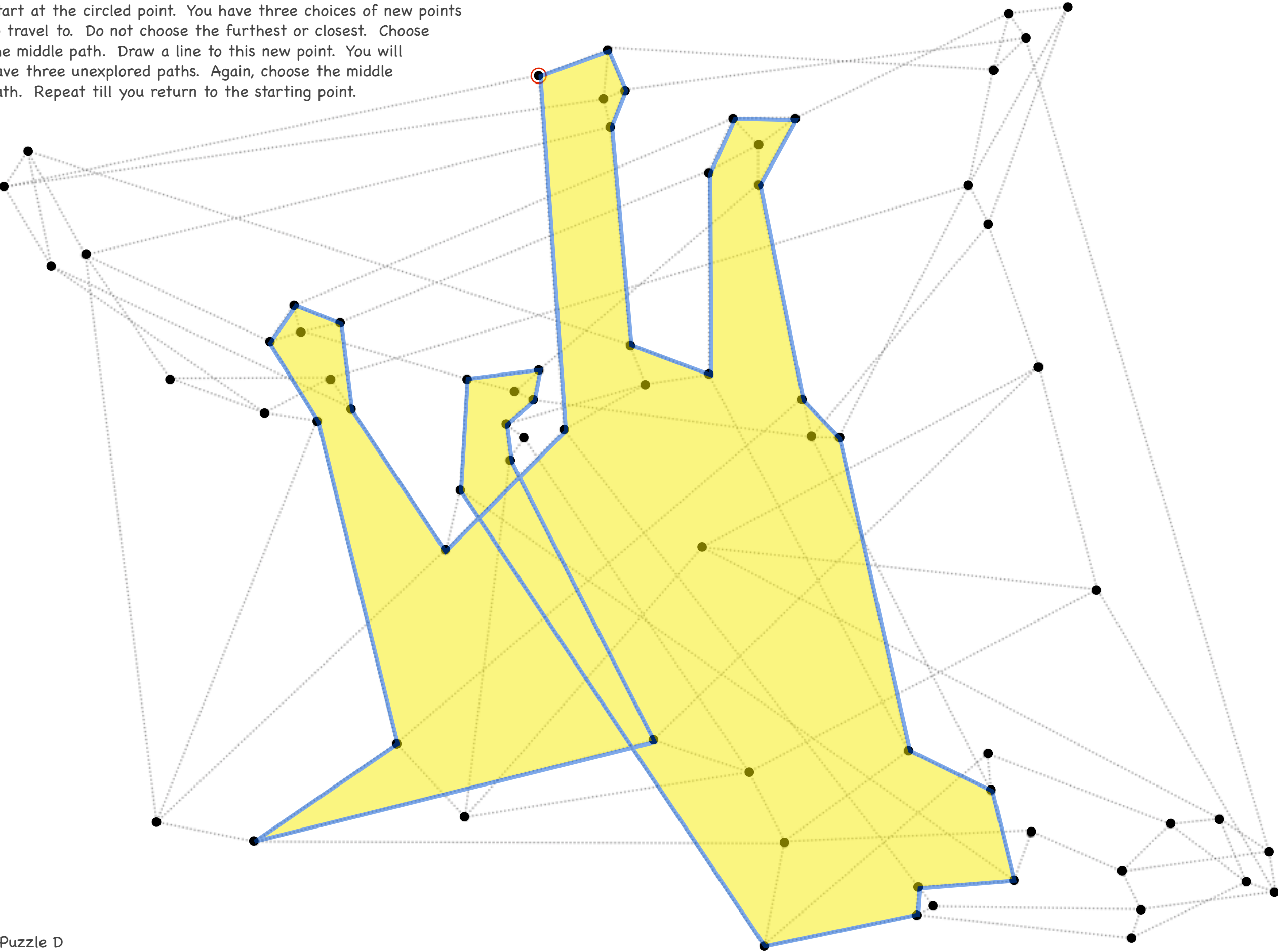
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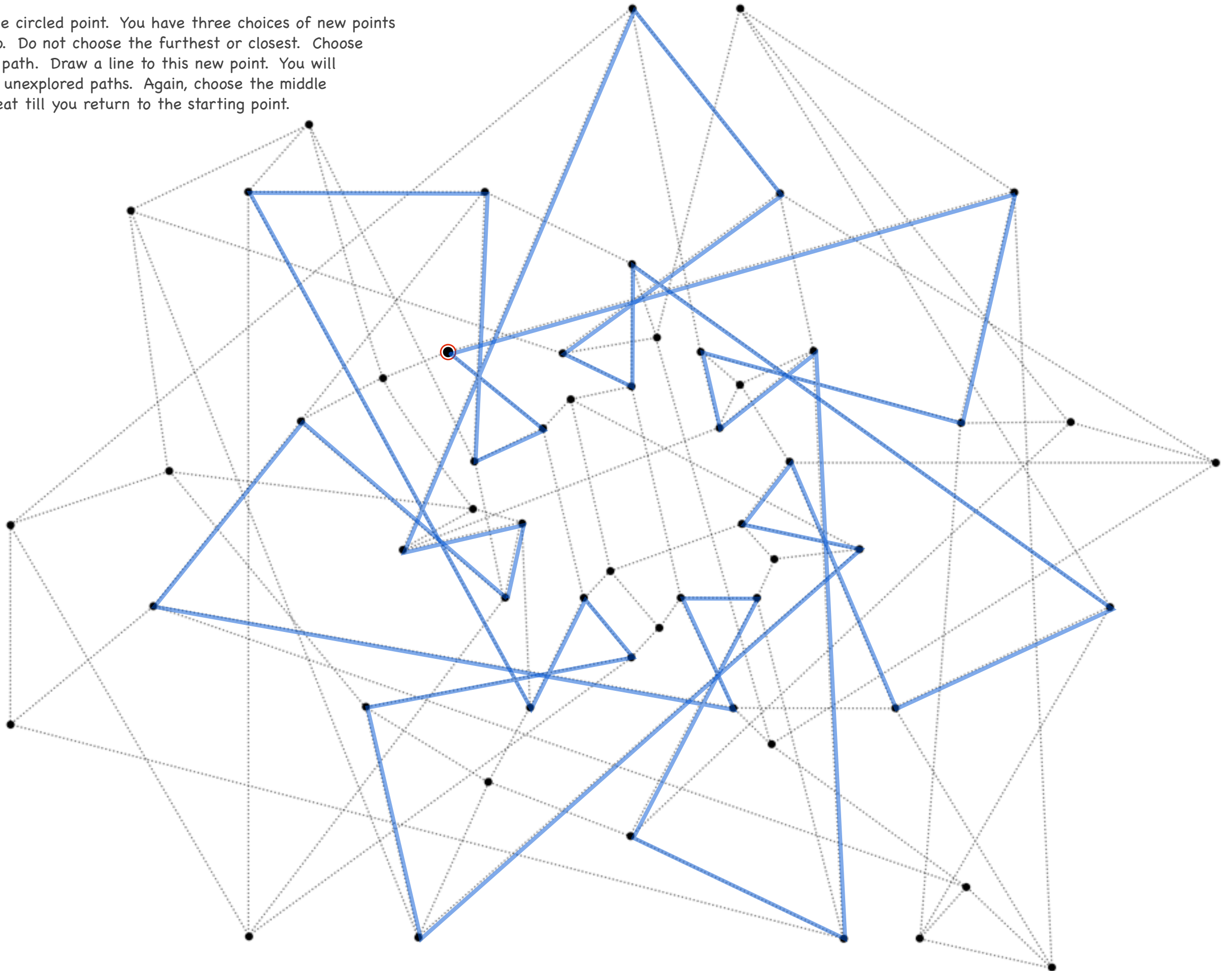
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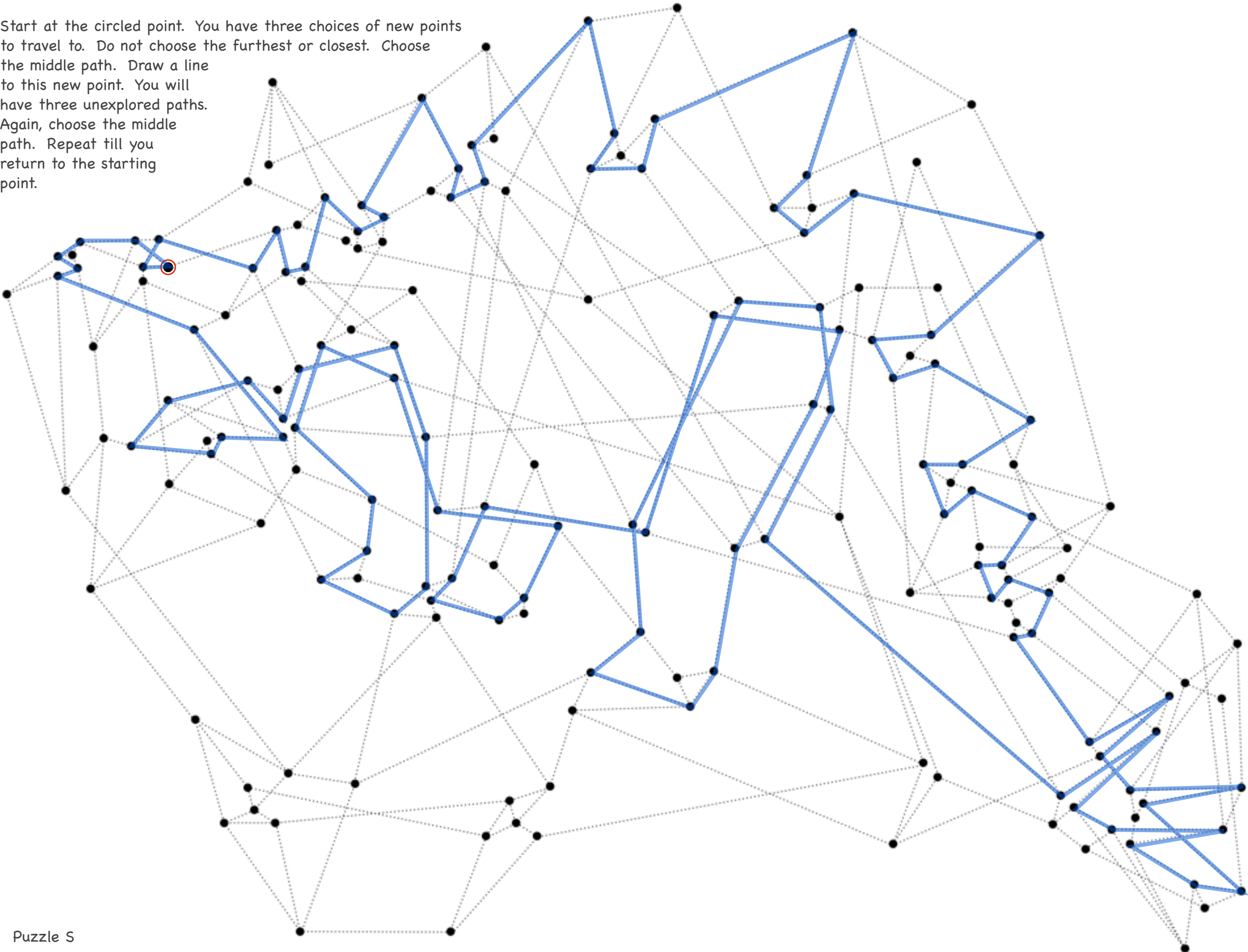
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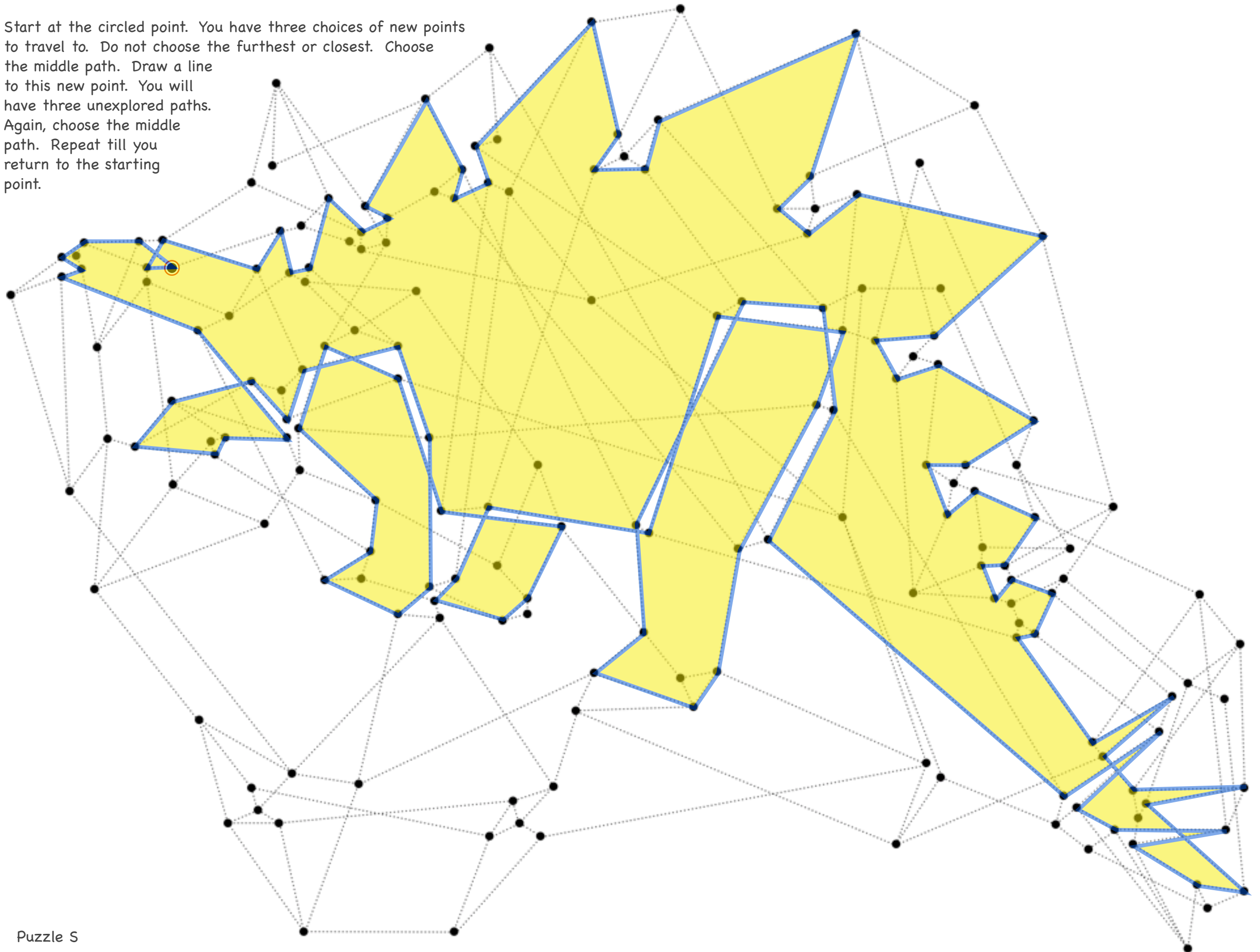
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I'm a father of two elementary school children, a mathematician, and designer of puzzles and board games. Students call me Dr. Pickle. There is nothing I enjoy more than stumping students and having them stump me.

I founded MathPickle.com in 2010 to inject new ideas into the classroom. MathPickle's primary objective is to get thirteen curricular unsolved problems into classrooms worldwide - one for each grade K-12. A conference in November 2013 established the thirteen unsolved problems. To aid with the dissemination of these awesome problems, MathPickle is looking at setting up a \$1,000,000 reward for each - the prize money to be split between the person who solves the problem and their most inspirational K-12 educator.

MathPickle is also developing a range of curricular puzzles like the ones you'll find at TpT. These help teachers them with their number one challenge:

“How to engage the spectrum of student ability?”

Whenever an elementary school teacher wants to teach addition, she will invariably face 20% of students who already know how to add and another 20% who are struggling with last year's curriculum. How can she engage the top students without losing the bottom students? How can she engage the bottom students without boring the top students?

One solution: Parents of top students often ask that their child be allowed to accelerate through the curriculum. This exacerbates the problem for future teachers, and sets up a failure-impooverished education experience for the bright student.

A wiser approach is to use curricular puzzles, games and mini-competitions to simultaneously teach curriculum to the students who need it, and to deflect top students into tough problem solving activities. This is never time wasted, because problem solving is the primary reason we teach mathematics.

Last thing I want to say - The experience of mathematics should be profound and beautiful. Too much of the regular K-12 mathematics experience is trite and true. Children deserve tough, beautiful puzzles.

Gordon Hamilton
MMath, PhD

