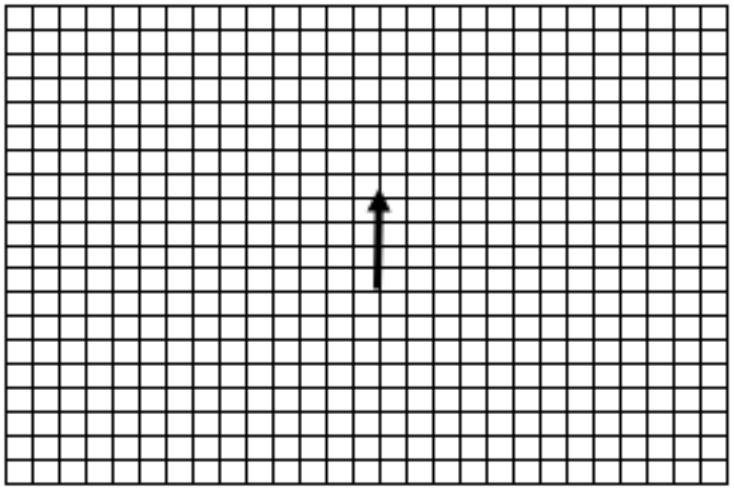
What's Your Angle

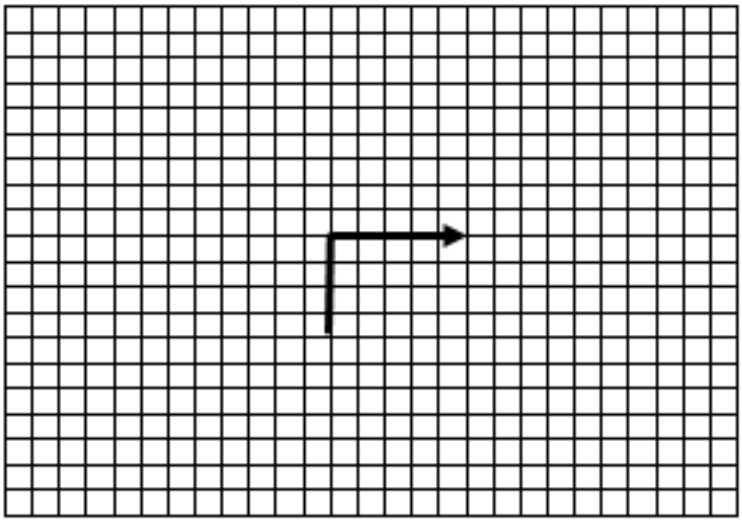
Level C

A spirograph is a geometric representation of a sequence of numbers. A spirograph with the numbers 4, 5, 6 is called an order-three spirograph because it has 3 numbers in its sequence. You create a spirograph using graph paper. Pick a point near the middle of the graph paper and call it home. Follow the steps to create a spirograph.

1. Take the first number in the sequence and draw a line "up" the paper with that distance.



2. Turn right 90˚ and draw a line the distance of the second number in the sequence.



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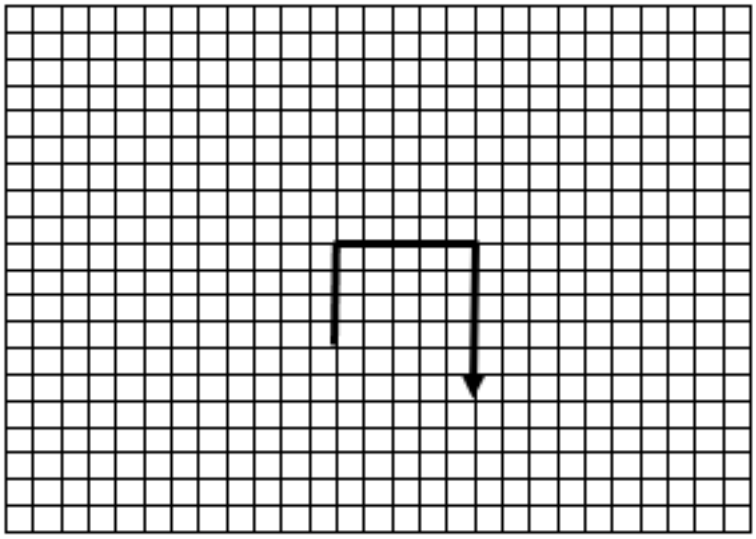
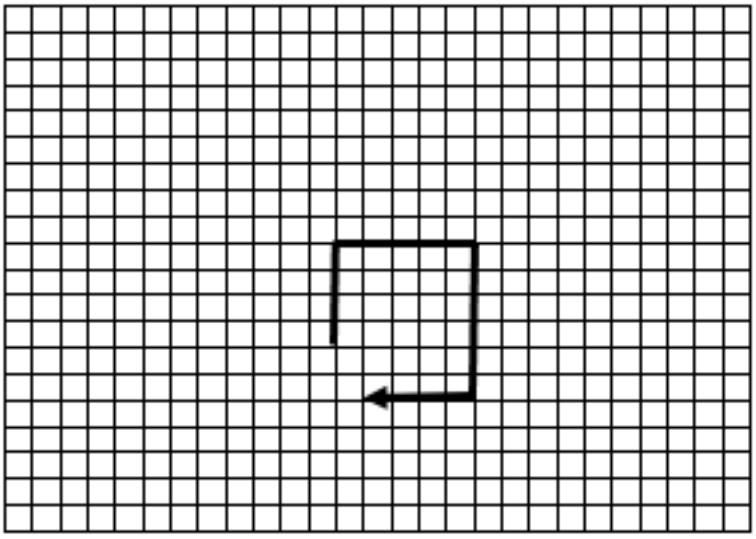
3. Turn right again 90˚ (now you are pointed down) and draw a line the distance of the third number in the sequence.



4. Again turn right 90˚ (now you are pointed left) and draw a line the distance of the next number in the sequence. If—as in an order-three sequence—you have run out of numbers, start again with the first number in the sequence.



5. Continue with the process, turning right and drawing a line segment the distance of the next number in the sequence, until you get back to home. Home is the place you started, and after turning right, you will just continue to repeat over the same path.

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Now that you know how to draw spirographs, experiment with their designs and, after some exploration, answer the following questions.

What patterns did you find in spirographs?

How are the designs impacted by the:

- Size of the numbers in the sequence?
- The number of numbers in the sequence (order size)?
- The arrangement of the numbers in the sequence?

Describe the relationship between the order number and the number of loops in the design.

Do all spirographs eventually return to home? Explain.

What is the relationship between the order of a spirograph and the number of cycles of sequence numbers used to return home?

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