

Linear Patterns with the Linear Transformer

How does changing the slope of a line affect the equation of that line? How might changing a part of an equation cause the related line to move?

In these challenges, you'll use an interactive tool called the Linear Transformer available at http://seeingmath.concord.org/resources_files/Transformer.html to manipulate the functions that make up a Starburst pattern. These problems are designed to help you make clearer connections between graphs of lines and their symbolic expressions (their equations).

Before You Start

Take a few minutes to become acquainted with the Linear Transformer.

Open the Linear Transformer and use it to:

- Create a line
- Grab the line, move it, and watch how the equation describing the line changes
- Create another line
- Change some values in the symbolic expression of the new line and observe the effects of your changes on the graph
- Explore the Reflect feature
- Explore the Pushpin feature

When you are satisfied with your understanding of the Linear Transformer, please try the challenges below.

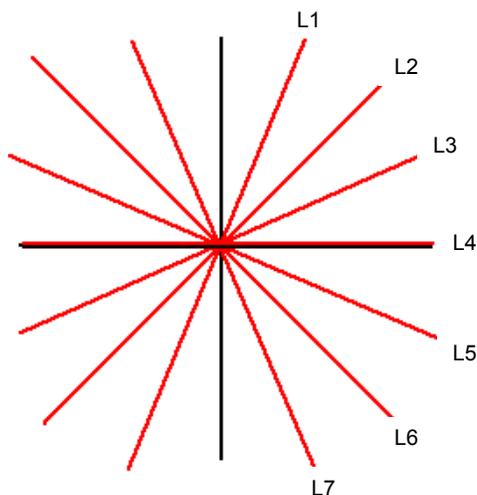
THE CHALLENGES

Keep these questions in mind as you work through the challenges:

- What form (point-slope or slope-intercept) of the equation do you find most useful in these challenges?
- Within each challenge, what elements do the equations have in common? What elements are different?
- As you move from one challenge to the next, what changes in the equations? What stays the same?

Challenge 1: The Starburst

Use the Linear Transformer to create the starburst figure below. All lines intersect at the origin $(0,0)$ and all angles are approximately equal.



Challenge 2: Move the Starburst Up

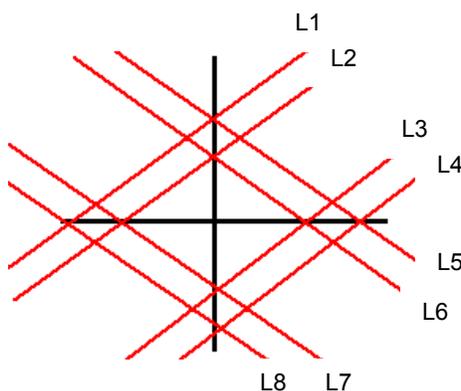
Use the Linear Transformer to make a similar starburst pattern with lines intersecting at the point $(0,4)$.

Challenge 3: Move the Starburst To the Right and Down

Use the Linear Transformer to make a similar starburst pattern with lines intersecting at the point $(4,2)$.

Challenge 4: Make a Diamond

Use the Linear Transformer to make a diamond pattern like the one below.



Reflecting on the Challenges

The Linear Transformer is powerful largely because it gives you the ability to manipulate symbolic and graphical representations and see the change reflected dynamically in the other representation.

You may find it helpful to consider the following questions, based on your experiences:

- Did the questions given to you at the outset help you focus your attention on certain features or behaviors of functions?
- When you were working through these activities, when did you choose to manipulate the symbolic or graphical representations?
- Did any of your actions during these challenges cause you to view the symbolic or graphical representations lines as objects?