

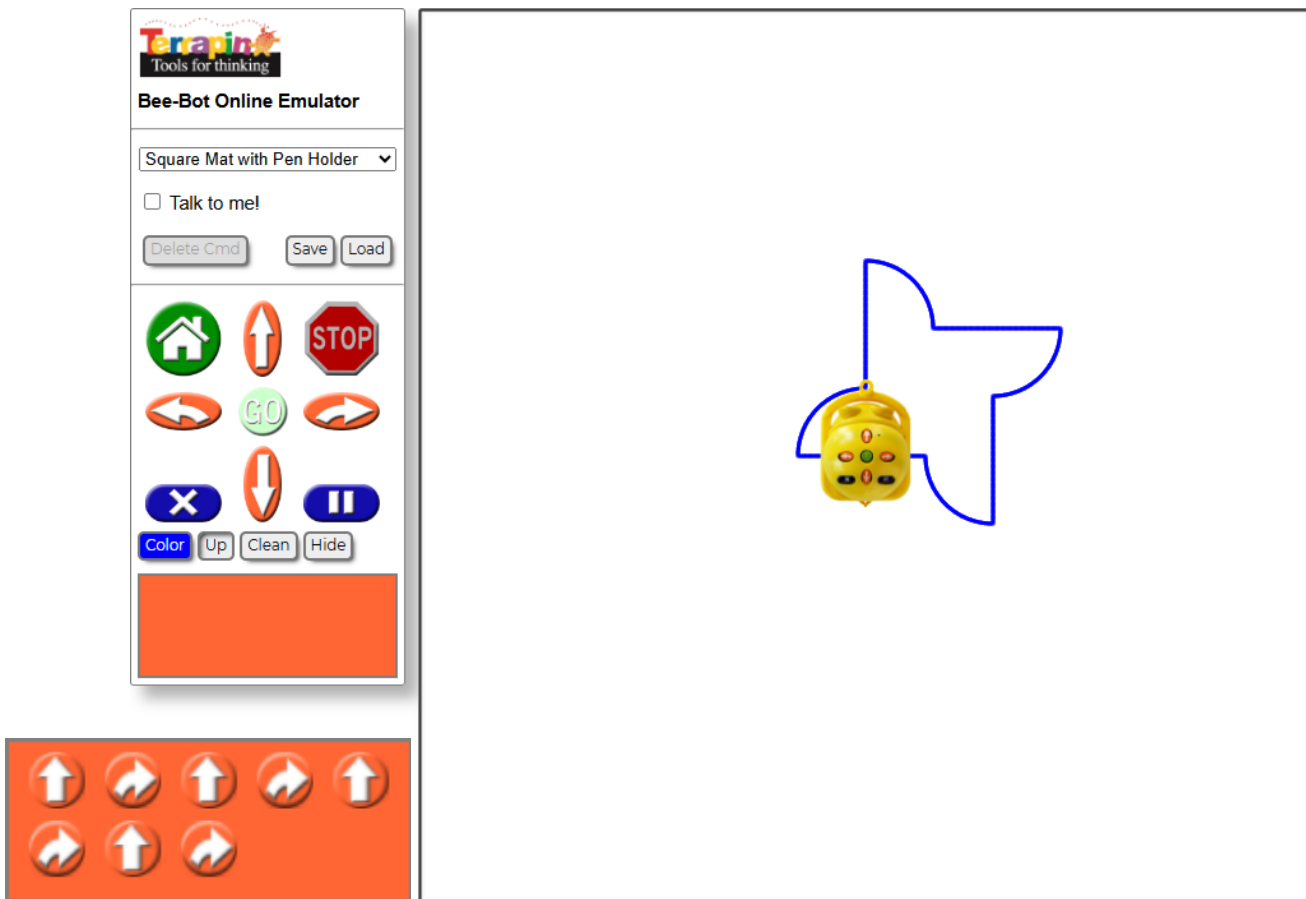
Problem-Solving with Online Emulators

The [Bee-Bot](#) and [Blue-Bot](#) Online Emulators can provide powerful problem-solving challenges for your students. Watch your students as they think through the problems to find solutions.

Bee-Bot Challenges using the Square Mat with Pen Holder

In these challenges, Bee-Bot can draw using a virtual Pen Holder Jacket. How did it draw this design? Bee-Bot's pen is at the front, but turns from its center, which makes for interesting designs.

[Load this mat](#) and see if you and your students can figure out how to make this drawing.

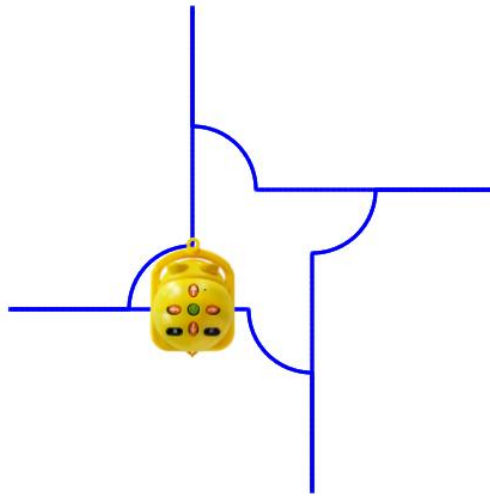


The solution is actually surprisingly simple. You just enter commands shown above to draw a square!



Put a real [Pen Holder Jacket](#) on your Bee-Bots and Blue-Bots, and they can draw on paper in your classroom!

Let's add to this design. See if your students can figure out the pattern to draw it. Looking for patterns is key to computational thinking. If you can find a pattern, you can repeat it.



This challenge is similar to the first one, but requires using a Back command in addition to Forward.

Once you figure out the pattern and enter the basic commands for it, you can press **GO** several times to repeat the code and complete the design, like this;



Blue-Bot Challenges

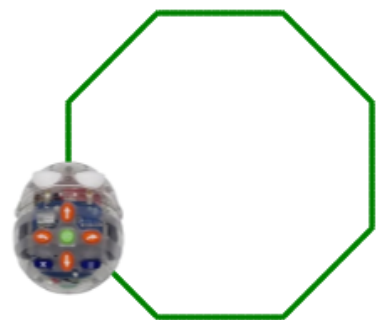
Blue-Bot won't be wearing a Pen Holder Jacket in these challenges, so it will be easier to predict how it will respond to your commands. There are still tricky bits to decode here, though!

These challenges use the [Blue-Bot Explorer Mat](#), which offers 45° and 90° turn, loops, and the ability to draw. A new feature of this mat is that choosing a pen color puts that selection into your list of commands so when you save the code, it reflects exactly how it was coded.

Blue-Bot Challenge #1 – A Simple Shape

Let's start with a simple shape. What shape is this? What is its name? Do you see a pattern that you can repeat?

In this mat, you can create a repeat loop. Here's how.



Did you figure out that this is an octagon? It has 8 sides and 8 angles. Each angle is 45 degrees.

You can try it out first using these buttons and pressing GO 8 times.



Now try using a repeat loop.

Press the **RPT 2** button 7 times (because it starts at 2): 

The command will appear in the white area at the bottom with the correct number of repeats.

Then add the Forward command and a 45° turn. End the loop with the **JRPT** command.

Your command area will look like this:



If you want to draw in color, use the color selection button.



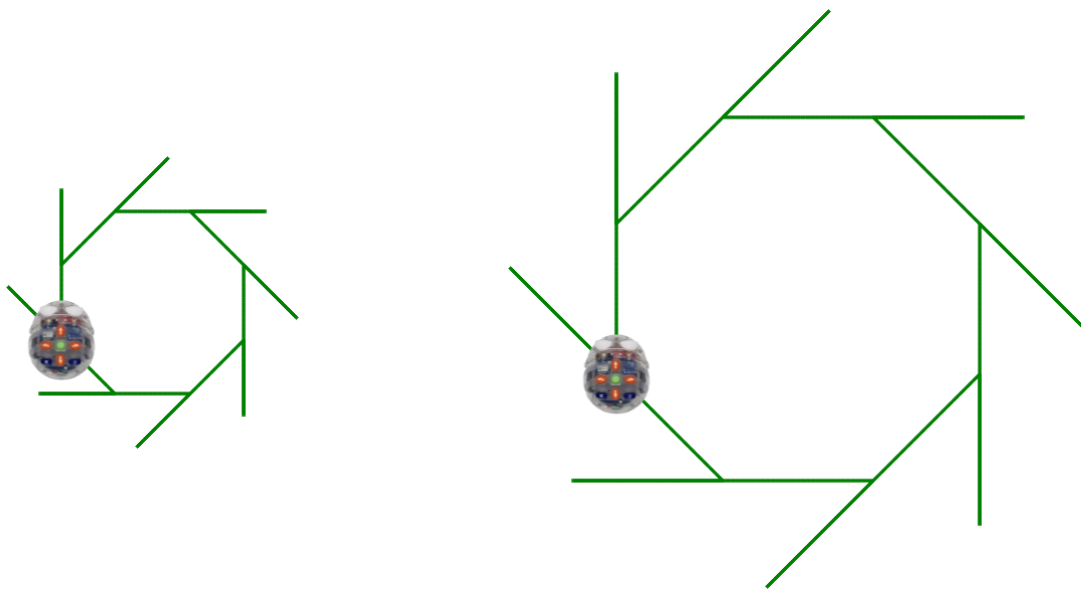
The color is added as a command at the end of the list. Drag it to the beginning, before **RPT 8**.



Let's try a more complicated octagon design next.

Blue-Bot Challenge #2 – A More Complicated Octagon Design

Take a look at these two designs. First of all, you will notice that one is smaller than the other. But how is it different from the first octagon you drew? How might you code this more complex design?



The basic shape is the same, but you need to use more commands. Can you figure out its pattern? To help students figure out what to do, have them become the Blue-Bot and walk through the design in the classroom. What do they need to do? This will help them identify the pattern to recreate.

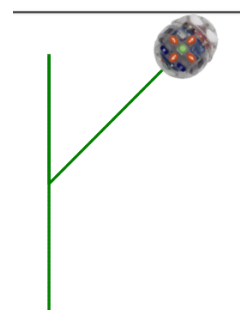
These are the commands we used for the smaller design.
Be sure to use the **] RPT** command to end the Repeat loop.



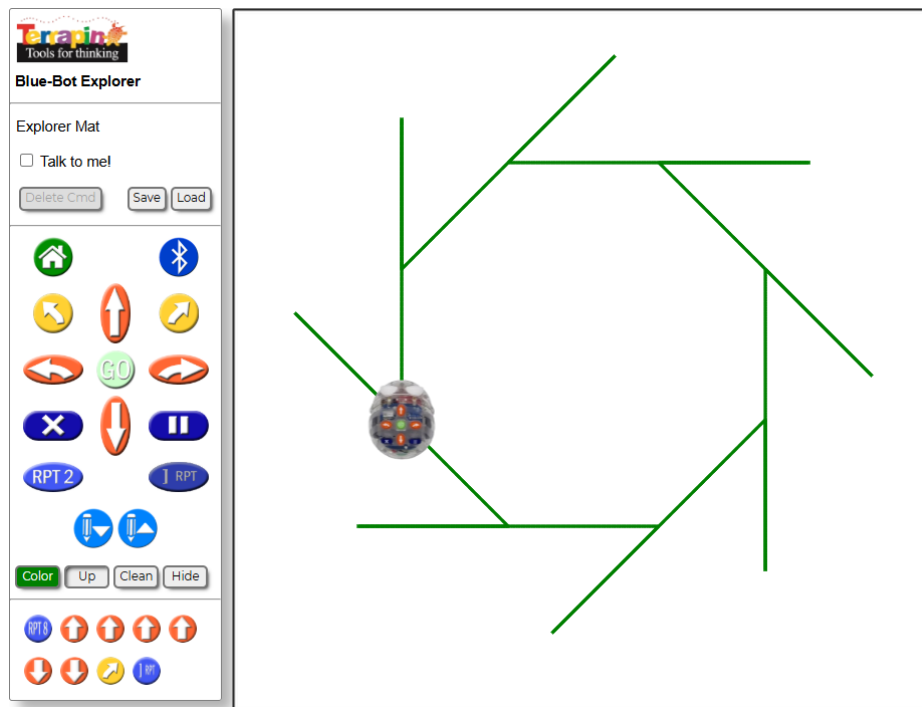
You can also make the design twice as big. Use 4 Forwards and 2 Backs, like this:



However, if Blue-Bot starts at its regular Home position, it will stop moving when it reaches the edge of the mat and not complete the correct shape. There is a solution, at least for this particular shape! To prevent Blue-Bot from touching the edge of mat, you can drag Blue-Bot to a different starting location before you press **GO**. Note that if you do this, pressing **Home** will return Blue-Bot to the center of the screen, not to where it started.

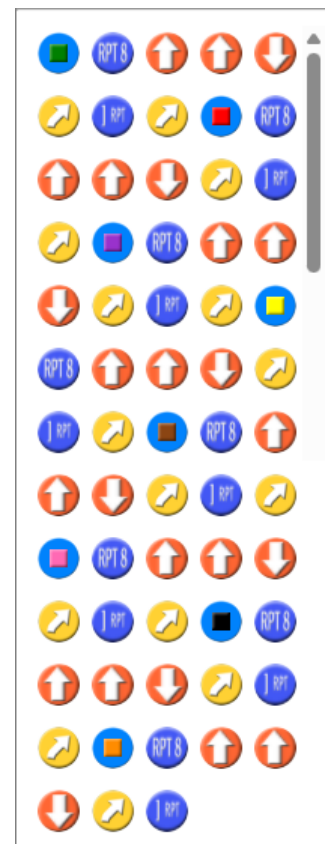
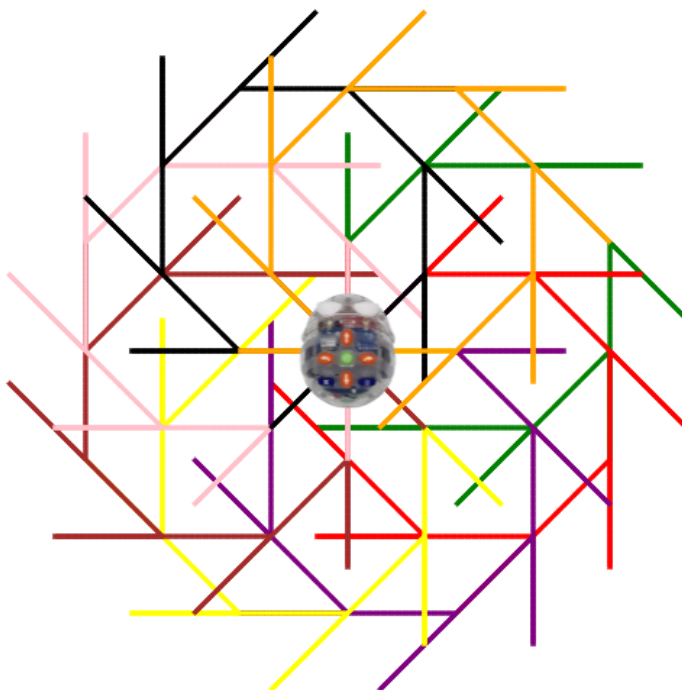


See how Blue-Bot can complete the shape if it starts and ends in the position shown below.



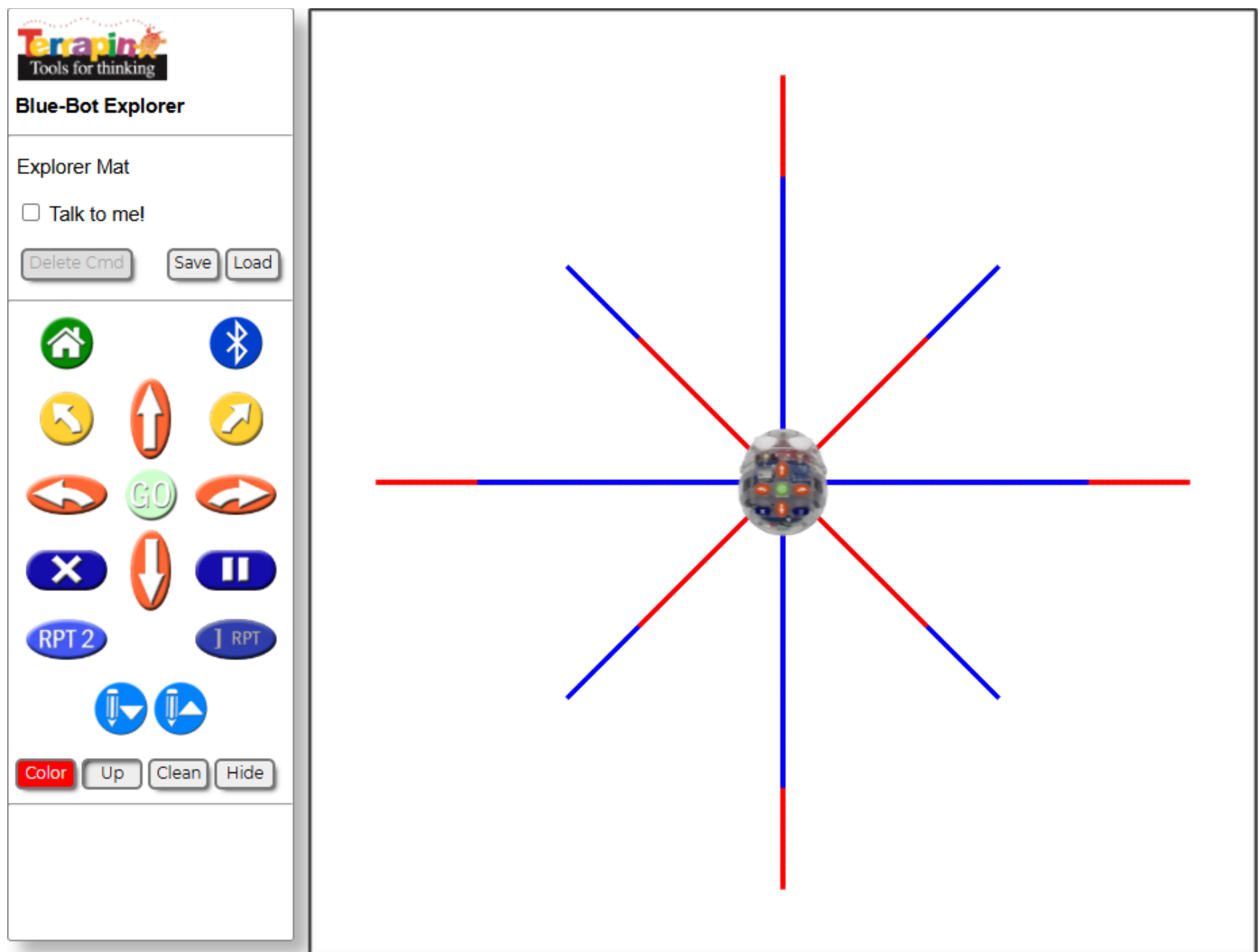
What interesting octagon shapes can you create?

The design below uses the same code as the small octagon, but turns 45° , sets a new pen color, and draws the pattern again. Eight octagons, each with a different pen color, with a 45° turn in between created this result! The code became quite long! What a great challenge for your advanced Blue-Bot students to try!



Blue-Bot Challenge #3 – Fireworks!

When we posted this design on social media around Independence Day, one educator asked how we did it? The teacher wasn't sure which colored lines to do first.



Consider the first line that points straight up from Blue-Bot. What color should you use first?

The red line extends farther than the blue one. If you draw the blue line first, then the longer red line will cover up the blue line. That won't work.

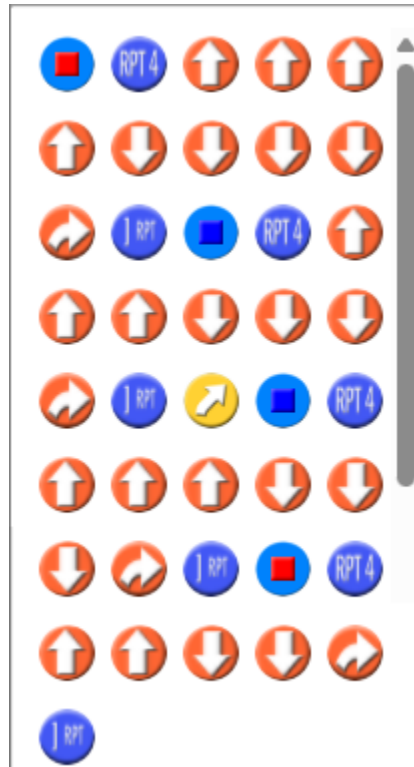
You may notice that the lines going off at an angle are not as long.

You'll need several repeats, using two different colors, to create this design. Think about how to do it and then read on for more clues and the solution!

Fireworks design algorithm:

1. Set the pen color to red.
2. Repeat 4 times: draw a long line (4 steps forward, 4 steps back) and turn right 90°.
3. Set the pen color to blue.
4. Repeat 4 times: draw a slightly shorter line (3 steps forward, 3 steps back) and turn right 90°.
5. Turn right 45°.
6. Set the pen color to blue.
7. Repeat 4 times: draw a longer line (3 steps forward, 3 steps back) and turn right 90°.
8. Set the pen color to red.
9. Repeat 4 times: draw a shorter line (2 steps forward, 2 steps back) and turn right 90°.
10. Press Hide so you can see the entire drawing.

Here is the code in the Command area.



Give it a try!

Create other challenges for your students that are adapted to their capabilities.

Have them create challenges for each other!

The possibilities are unlimited!