

## Lesson 3.5: Drawing Dots - Part 2

### Objectives

In this lesson, students will:

- ❖ Explore computational problem solving
- ❖ Recognize repeated sequences of code
- ❖ Learn the concept of a *procedure*
- ❖ Use abstraction and modularization by creating their own blocks of code (procedure)
- ❖ Learn about random numbers
- ❖ Practice and explore creating a drawing using smaller building blocks

### Agenda

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|---|---------|
| 1. Multiple Dots Exploration - My Block               | 10 mins |
| 2. Student Activity: Creating New Blocks              | 10 mins |
| 3. Exploring Randomness                               | 10 mins |
| 4. Student Activity: A Sky Full of Stars and Balloons | 20 mins |

### Preparation

- Computers connected to the internet.

### Resources & Links

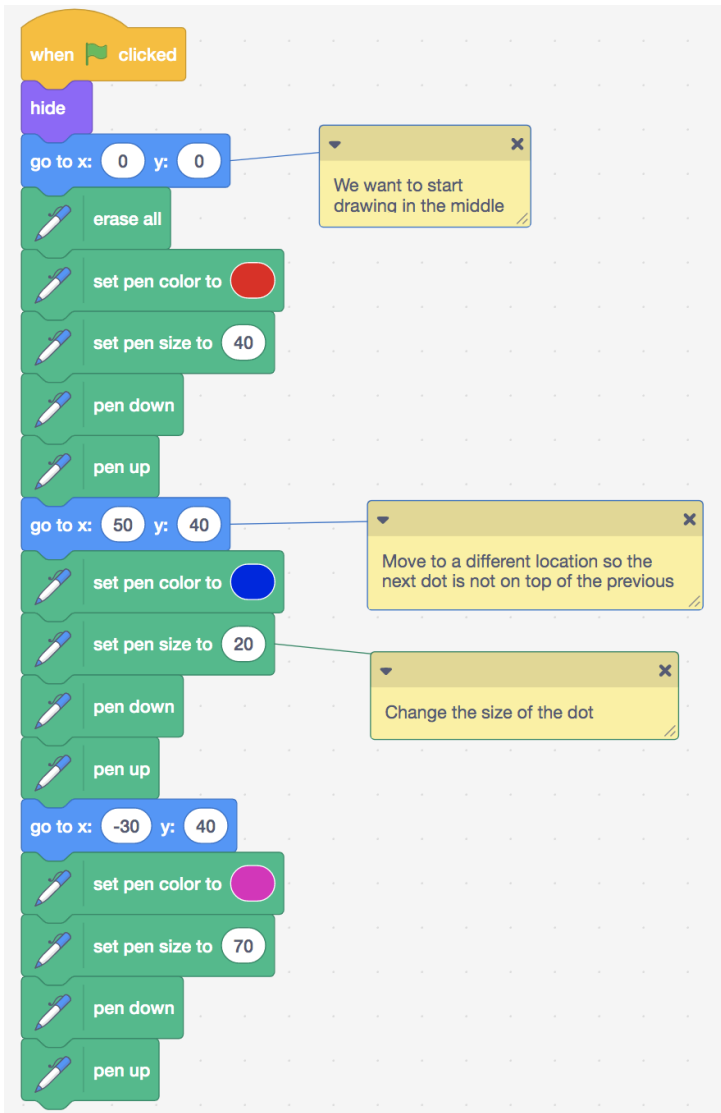
- Draw Many Dots Demo Project:  
<https://scratch.mit.edu/projects/324877825>
- Sky Full of Stars and Balloons starter project:  
<https://scratch.mit.edu/projects/325214673>
- Sky Full of Stars and Balloons solution project:  
<https://scratch.mit.edu/projects/325218262>

## 1. Multiple Dots Exploration - My Block



Engage students in an interactive demonstration and instructions:

Open the *Draw Many Dots Demo Project*.



The code shows one way to draw multiple dots of different colors and sizes.

Which is the block that determines the size of the dot? (set pen size to ...)

Which is the code that actually draws the dot and keeps repeating? (*pen down*, *pen up* - to keep from drawing after the dot is done)

Scratch has blocks to do all sorts of things. We used the *move*, *repeat*, *turn* and many more. What if we had a block that could draw a dot?

With a dot block, we could simply use it in the code every time we wanted to draw a dot instead of writing the code again and again.

In programming, if a piece of code is repeated many times in a program, the code can be grouped into a

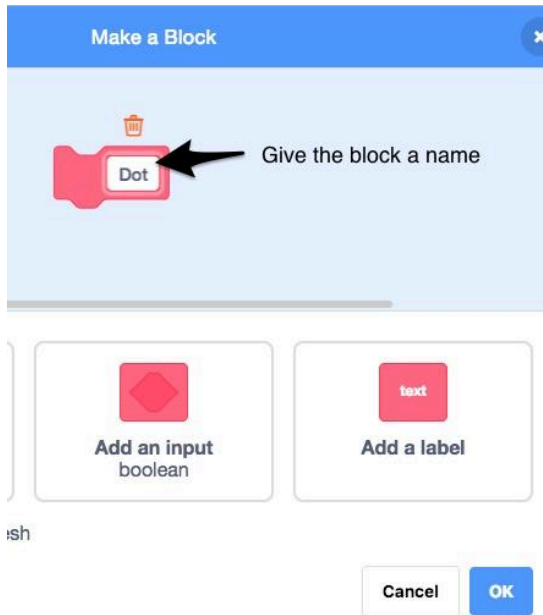
*procedure*.

**Procedures** are small sections of code that are used to perform a particular task. They are used to avoid repetition and to break down the program into smaller parts which makes it easier to understand.

To create a procedure in Scratch, we use **Make a Block** under **My Blocks**.



1) In the **My Blocks** category, click on **Make a Block**.



2) Give the new block a name, **Dot**.

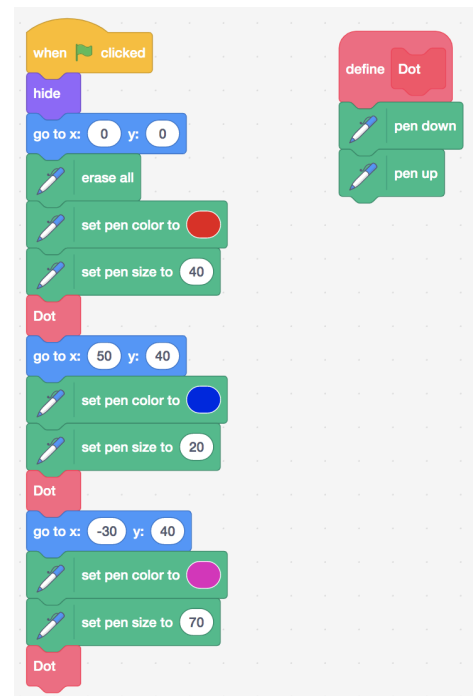
3) Click ok.

We created a new block, but it does not do anything as it has no code in it. For the **Dot** block to draw a dot, move the code from the program that draws the dot into the **Dot** block. Now every time we want to draw a dot, the **Dot** block instruction is added to the program.

Display the code using the Dot block (**Dot Block Octopus** sprite) and explain it to students.

What if we wanted the Dot block to draw dots of size 40 only?

Which block do we need to move inside the dot block? (**set pen size to 40** before **pen down**)



## 2. Student Activity: Creating New Blocks



Instructions to give to students:

1. Open your Dot project in Scratch
2. Create 2 new blocks, **small dot** and **big dot** to create dots of 2 different sizes.
3. In the main script, add calls to the new blocks to draw dots of different sizes.
4. Remember to change positions before calling a Dot block so the dots are not drawn in the exact same place.

### Solution:

There is no single solution. The **Activity 2 Blocks** sprite of the **Draw Many Dots Demo Project** at <https://scratch.mit.edu/projects/324877825> is an example of how it could be coded.

## 3. Exploring Randomness



**Engage** students in an interactive discussion and demonstration:

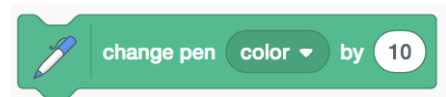
What if we want to fill the stage with dots of different color and size and at random locations.

At random locations.... What does that mean?

**Explain** what a random number is. It could be helpful to use the role of a dice to illustrate the generation of a random number. Scratch has multiple instructions to generate randomness. Explain what each does.



Each color is assigned a number, so you can also pick random colors by using this block:



Demonstrate the script for the **Random sprite** of the **Draw Many Dots Demo Project** by simply clicking on the script or by clicking on the green flag and then the space bar. Show the code and explain the first 3 instructions inside the loop.

For the **go to** block, explain that the x value of the stage goes from -200 to +200 and the y value of the stage goes approximately from -170 to +170. By using these limits, we pick a position somewhere inside our stage



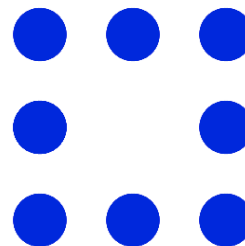
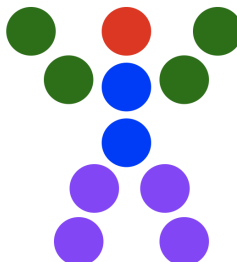
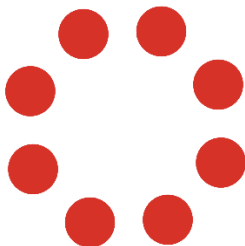
#### 4. Student Activity: A Sky Full of Stars and Balloon



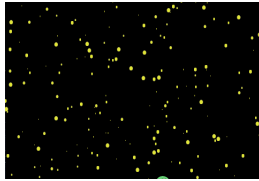

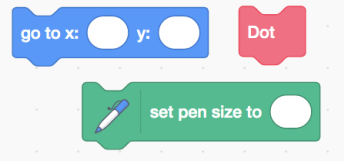
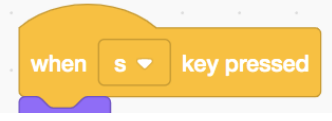
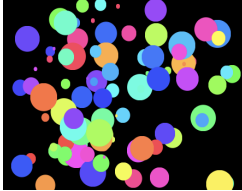

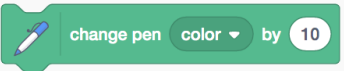
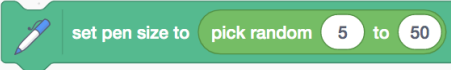
Distribute the activity worksheet and explain the activity to students.

#### 5. Extension: Free Coding Time: Practice What You Learned

If time permits, students practice what they learned. Prompt them to explore drawing multiple dots in different configurations such as circles or lines or stick figures or create other projects using dots.



### Student Activity: A Sky Full of Stars and Balloons

What to do:	Using/Details:
 <p><b>Create a sky full of stars:</b></p> <p><b>Remix and save</b></p>	<p><a href="https://325214673">325214673</a></p>
<p>Inside the <b>Stars</b> sprite, place the <b>pick random</b> operators inside the correct blocks</p>	
<p><b>Explore</b></p> <p>Snap the blocks together and place them inside the loop to create a sky full of stars</p>	
<p>Run your script by clicking on the <b>s</b> key.</p> <p><b>Experiment</b> with your code until you are happy with your sky full of stars..</p>	
 <p><b>Create a sky full of balloons:</b></p> <p>Copy the main script from the <b>Stars</b> sprite to the <b>Balloons</b> sprite by dragging it.</p>	
<p>Add the <b>change pen color</b> block inside the loop</p>	
<p>Change the <b>random</b> limits of you pen size until you are happy with your balloon sizes</p>	
<p>Run your script by clicking on the <b>b</b> key</p> <p><b>Experiment</b> with your code until you are happy with your sky full of balloons</p>	