Lesson 6: Random Numbers

45 minutes

Overview

This lesson introduces randomness, which is important both as a way to make programs more interesting and also to motivate the use of variables. Students are introduced to the `randomNumber()` block and how it can be used to create new behaviors in their programs. They then learn how to update variables during a program. Combining all of these skills, students draw randomized images.

Question of the Day: How can we make our programs behave differently each time they are run?

Standards

Full Course Alignment

CSTA K-12 Computer Science Standards (2017)

▶ **AP** - Algorithms & Programming

Agenda

Warm Up (5 minutes)

Activity (35 minutes)

Programming Images

Wrap Up (5 minutes)

Objectives

Students will be able to:

- Generate and use random numbers in a program
- Update a value stored in a variable

Preparation

- Review the level progression in Code Studio
- Check the **"Teacher's Lounge"** forum for verified teachers to find additional strategies or resources shared by fellow teachers
- If you are teaching virtually, consider checking our **Virtual Lesson Modifications**

Links

Heads Up! Please make a copy of any documents you plan to share with students.

For the teachers

- **Random Numbers** - Slides
  ▼ Make a Copy

For the students

- **Random Numbers** - Resource

Introduced Code

- `null`

Teaching Guide

Warm Up (5 minutes)

Prompt: So far, our programs have done the same thing every time that we run them. Are there any times that you'd want a program to do something differently each time it was run?

Discuss: Allow students time to write down some ideas, then discuss them as a group.

Discussion goal: The goal of this discussion is to set the context for the introduction of random numbers. Students may come up with various ideas related to user interaction or gathering input from other sources. Allow them to discuss the different ideas that they have, but eventually, turn the conversation to the idea of randomness.

Remarks

> So far, we've wanted our programs to do exactly as we've coded, and most of our surprises have been bugs. Today we're going to look at how we can code random behaviors into our programs so that we can get some good surprises.

Question of the Day: How can we make our programs behave differently each time they are run?

Activity (35 minutes)

Programming Images

Transition: Move students onto Code Studio

Teaching Tip

Guide to Programming Levels: Additional guidance for programming levels is provided in the **CSD Guide to Programming Levels**. This document includes strategies and best-practices for facilitating programming levels with students.

1 **Predict**

Discussion Goal: Students should predict that *something* will happen with the x-coordiante of the ellipse, even if they are unsure what will happen. Students may say that the value will be either 200 or 400, or they may say the value will be between 200 and 400. This creates the effect of drawing an ellipse somewhere on the right side of the screen.

When facilitating the class discussion, ensure that students look at their neighbors screen and compare - this helps them see that different behaviors are occuring for different people. Also encourage students to run the code multiple times to see the result.

2-5 **Skill Building**

2 3 4 5

6 Practice

7 Assessment

Assessment Opportunity

Formative Assessment: This level can be used as a formative assessment. A rubric is provided in the level, and written feedback can be given to students. **Click here to learn more about giving feedback to students**.

8 Challenges

Share: If some students have taken extra time to work on their projects, give them a chance to share their more complex rainbow snakes. Focus conversation on which parameters students are manipulating or randomizing to create their drawings.

Wrap Up (5 minutes)

Question of the Day: How can we make our programs behave differently each time they are run?

Prompt: So far, we've only looked at random numbers. Are there any other things that you might like to be random in your program?

Share: Allow students to share out what sorts of random things they might like in their programs.

Discussion Goal: The discussion is intended to have students think about the wider implications of randomness in games and other programs. Although there is no block to generate random data other than numbers, in later lessons students will learn techniques that will allow them to use random numbers to randomly choose from a variety of behaviors.