



License to Code: Pro-bots

Target Grade: 3-5th grade Technology

Time Required: 60 minutes

Standards:

ISTE Student Standards:

- 5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
 - 5a: Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
 - 5d: Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Lesson Objectives:

Students will:

- Understand the idea that writing code is a list of linear instructions.
- Be able to code simple commands to a Pro-bot.

Central Focus:

In this lesson, students will learn simple coding by using Pro-bot car robots. Students will do a variety of activities such as code the car through a maze, write their initials with code, and draw a snowman using code. This lesson offers a fun alternative to programming on a computer, and it gets kids out of their seats and active!

Background Information:

Coding is a language that can be as basic or complex as needed, depending on the age and ability level of the user. Code is simply step-by-step instructions given to a computer to execute. In the context of this lesson, students will be coding a Pro-bot, a simple car shaped robot targeted to grades K-8. The Pro-bot can be used for basic coding using the directional buttons, or can become more advanced using directional buttons and numerical values. If students really excel at coding, students can also code the Pro-bot from a computer with more complex code, use loops, and even code built in sensors. This lesson will cover the initial basics of coding to help students understand the concept that code is written and executed in a linear way.



Materials

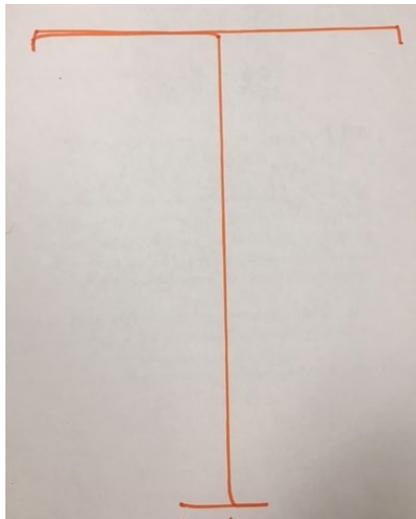
- Pro-bots
- Pro-bot Markers
- Roll of large butcher paper
- Scratch paper
- Rulers
- [Numbers coding handout](#)
- Letter Cheat Sheet
- Pro-bot Maze

Instruction

Hook:

Teacher will invite students to stand around a large piece of paper in the floor. Teacher will place the Pro-bot with the pre-entered code to make the recognizable T for Tennessee. Teacher will run the Pro-bot for students to watch. Code is as follows:

```
Fd4  
Bk2  
Lt  
Fd20  
Lt  
Fd8  
Lt  
Fd1  
Bk1  
Lt  
Fd16  
Rt  
Fd
```



Introduction to Coding:

Teacher should explain to students that coding is creating step-by-step instructions to tell a computer what to do. You can use this simple [video](#) to show some examples of everyday items that are coded. Tell them that a Pro-bot has a computer in it, and they are going to code the Pro-bot to move and write their initials, draw a picture, and go through a maze.

Introduction to Pro-bot

Put down a Pro-bot (in off position) in front of each student. Make sure students know to not touch the Pro-bot until they are instructed to do so. This is an introductory lesson to coding and Pro-bots, so the teacher will not be showing all of the functions or inputs in this lesson. Remind students that the Pro-bot that ran at the beginning of class was just following a simple set of



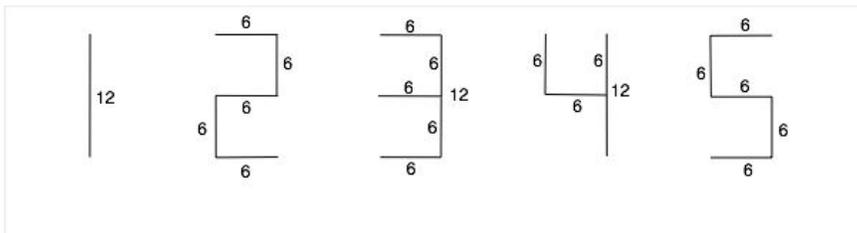
step-by-step instructions that the teacher told it to do. Ask students if they know what those steps were to cause it to make the Tennessee T? Let the students guess. What if they were going to ask a student to walk in a square, how would they give step-by-step instructions? Have one student try to give the directions and the teacher can “walk” the student’s instructions. Run a square program on the Pro-bot so the students can watch. Explain that you put in the following code to make the Pro-bot complete a square:

```
Fd
Rt
Fd
Rt
Fd
Rt
Fd
Rt
```

Now allow the students to put in some code. Explain that pushing the forward button moves the Pro-bot forward 25cm. Have students look at rulers to understand how far 25 cm is. Have students push the forward button twice and push the go button to see how the Pro-bot moves. Ask students to guess how far the Pro-bot moved after pushing the forward button twice (50cm). Explain that the distance can be changed by putting the number of centimeters the Pro-bot should move after pushing the forward button. Explain how to clear the former code with the clear button. Talk the students through the button strokes to move forward 10 cm (forward, 10), have them set it on the floor, and push go. Lastly, have the students experiment with having their Pro-bot move and make a turn. Give students 2 minutes to experiment with the code. Teacher should circulate to ensure that all students understand how to erase old code and how to enter new code (press clear once on an existing command, or erase all commands by holding down clear then maneuvering down to clear main).

Numbers:

Ask students how they would code the Pro-bot to move in the shape of the number one to make it 12 cm in height (just a straight line using Fd12). How about the number 2, like on a digital clock? Draw a digital 2 on the board so students can think the commands through. Allow the students to predict the code needed to create a 2 and write the commands in order on the board. Hand out the numbers coding sheet and let students code the number of their choice (3-5) using the distances given. If students are able to do this very quickly, let them try a number 6-9 on their own.





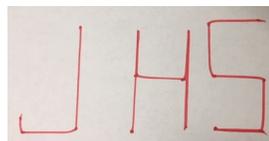
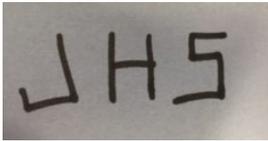
Once students have a number coded in their Pro-bot, give them a marker and piece of paper to “draw” their number using the Pro-bot.

Stations:

Teacher will explain the 2 different stations students will be working through during class. Once students successfully complete one station, they are welcome to move to the other. If both stations are finished with time remaining, students may move on to the Snowman Challenge.

Station 1: Write your Initials (or name if it’s short)

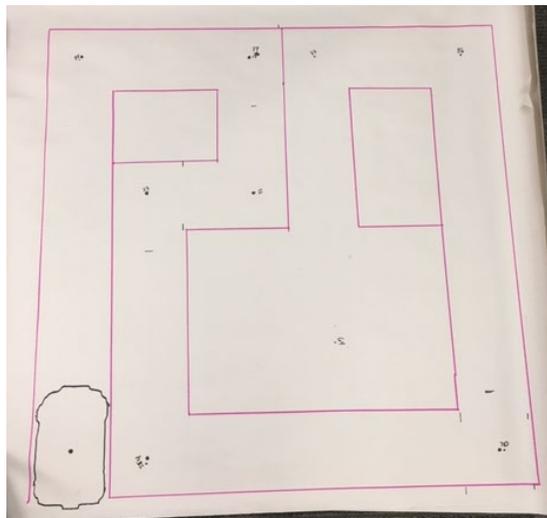
On a scratch piece of paper, students will write out their initials in block letters that can be coded by straight lines and right angles. The initials JHS are modeled below, first written as block, then as drawn by a Pro-bot.



If they have a letter that cannot be coded with a right angle (D, K, M, N, Q, R, V, W, X, Y, Z), they can ask for a letter cheat sheet. Students should work on coding each letter individually. When they believe a letter is coded correctly, they may ask the teacher for a marker and paper to draw their letter(s) with code.

Station 2: Maze

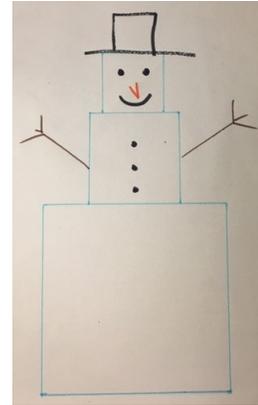
Students will code the Pro-bot to maneuver the entire maze in one line of code. They should place the front of the bot on the start line, and end up in the winner’s circle at the end. Students will not all have their Pro-bots on the maze at the same time. They should take the Pro-bot off to enter code, and place it back on the maze when they need to test the code to see if it is correct and complete. Once students have completed the code to successfully run the maze, they should ask for a pen to draw the path their bot takes through the maze. Students can then sign their names in the winner’s circle of the maze.





Snowman:

Students who finish the first two stations with time remaining should try the Snowman Challenge: Code your Pro-bot to draw all three body parts of a snowman, in one run. Students should work on solving the code before putting the marker in the Pro-bot. Once a student believes he/she has it solved, they may ask for paper and a marker to draw it.



Differentiation

Differentiation is built into the lesson in that students can achieve success at varying ability levels of coding. Students who are struggling can use the sheet that helps with the letter codes while students who are excelling can write something more complicated. The teacher can also make a yardstick available to help students measure the distances to travel on the maze, rather than guessing.

Assessment

Formative: Check students' basic understanding that code is linear instructions by their ability to problem solve the solutions to the letters and maze.

Difficult to Code Letters

Each of the following letters are about 25cm tall.

D	K	M	N	Q	R
Fd Rt 130 Fd 12 Rt 50 Fd 9 Rt 50 Fd 13	Fd 12 Rt 120 Fd 13 Rt 180 Fd 13 Rt Fd 13 Rt 180 Fd 13 Rt 150 Fd 13	Fd Rt 145 Fd 12 Lt 110 Fd 12 Rt 145 Fd	Fd Rt 160 Fd Lt 160 Fd	Fd Rt Fd 13 Rt Fd Rt Fd 13 Rt 180 Fd 13 Lt 145 Fd 5 Lt 180 Fd 5	Fd Rt Fd 12 Rt Fd 12 Rt Fd 12 Lt 135 Fd 17
V	W	X	Y	Z	
Rt 30 Fd Rt 180 Fd Rt 120 Fd	Lt 30 Fd Rt 180 Fd Fl 140 Fd 12 Rt 160 Fd 12 Lt 140 Fd	Rt 45 Fd Rt 180 Fd 12 Rt Fd 12 Rt 180 Fd	Fd 12 Lt 45 Fd 12 Rt 180 Fd 12 Lt Fd 12	Lt Fd 12 Rt 135 Fd Lt 135 Fd 12	

