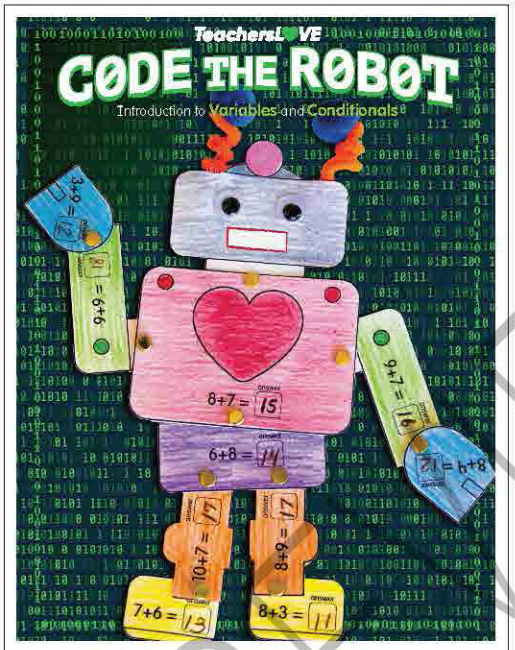


INTRODUCTION

Computer literacy is a must for preparing 21st century learners. Students need to learn to interact with, and experience a computer, not just be a consumer of it.

Computer programming, or coding, is a good place to start on this path to computer literacy. One could assume that coding is too difficult for young students, but the fact is that young children can easily learn the basics of computer coding.

- Young children can learn how to recognize patterns and follow a sequence in order to accomplish a task, with coding requires.
- It encourages analytical thinking.
- It requires discipline and concentration to the task at hand.
- Coding bolsters creativity in young children. Children must build a questioning mindset. They must experiment, explore, ask questions and make mistakes.
- Children learn a new language (coding) much easier when they are younger.
- Coding strengthens whole brain thinking.

The bottom line is this. Any form of computer programming is appropriate for younger students if it is kept engaging and fun!

These activities are hands on and screen free!

CODE THE ROBOT

This activity starts with a demonstration lesson so that students can be introduced to the vocabulary, and to teach them how to run the programing sheet needed to create the robot.

You will need the Vocabulary Cards, the large robot pieces, and a poster board or bulletin board paper. Preset the pieces of the robot to save time. Introduce the words, Program, Coding and Engineer to students, using the vocabulary cards and definitions. Tell students they will be acting as engineers to Build-a-Robot using the included program code. Show a piece of the robot to students and have them solve the math problem. Once they have solved the problem, they will then use the Build-a-Robot sheet to determine its color and what piece of the robot it is.

Introduce the remaining vocabulary words as you work through this process.

Variables and Conditionals are two of the basic building blocks of computer programming. They are two of the first concepts taught when learning to code, and every engineer uses them often when writing code.

Variables are used to store information, so that it can be referred back to from different parts of the code. In this case, we are using variables to determine what color each body part is. Some body parts, like hands, feet, legs, and arms, have multiple pieces, so we can re-use the variables to determine what color each piece is. We could take an entirely different set of robot parts and feed it through the program, and it would still produce a robot with the same colored body parts, even if those parts looked very different. Or we could change around the colors of the variables. If we did this, our robot "output" would change as well. In our program, we only refer to each variable one time, but in more complicated programs, variables can be referenced dozens or hundreds of times. Using a variable makes it easy for the engineer to change the variable once in a single place, rather than looking for every time it appears throughout hundreds or thousands of lines of code.

Conditionals are just a fancy name for simple "If/Then" statements. When the "If" part of the statement is true, THEN you follow the instructions inside of it. For example, IF today is a weekday, THEN we will go to school. If it is raining, THEN I will put on boots, wear a rain jacket, and use an umbrella.

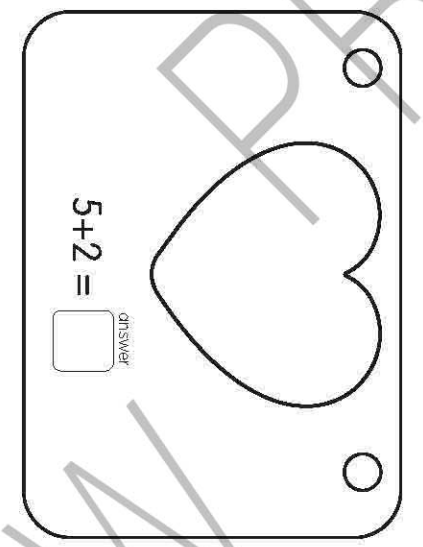
To use the Build-a-Robot sheet, you start at the top and work your way down through each line of instructions. The indented instructions are only executed if the stated math problem or "condition" is true. For example, if the body part has an answer of 2, then you would skip the entire first block of instructions underneath the statement "If answer – odd", because that statement is false. The next statement, "If answer – even" is true, so you would continue within the next line within that section. Continue with this process until you have finished all the pieces. The robot can can be assembled by gluing the pieces on the large paper. Students can add the face and other details to the robot using crayons, googly eyes, pipe cleaners for antenna, etc.

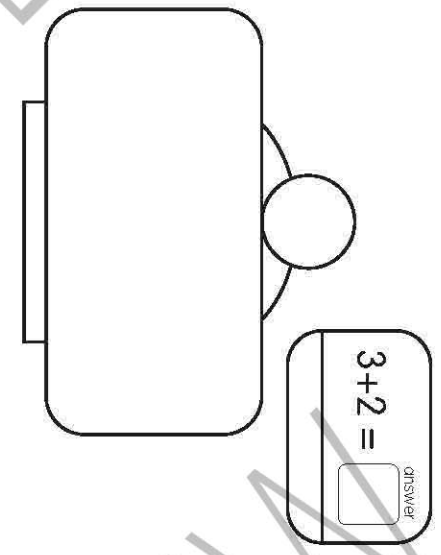
After this initial lesson, students can then try one on their own. Several different sets of math problems are included to allow for differentiation; easy/hard addition and easy/hard subtraction. One robot is assembled on a template and the other is assembled with brads or glue. How you choose to have your students assemble their robot will depend upon their dexterity. If you don't want to use brads, then just dot glue where the brads should be punched.

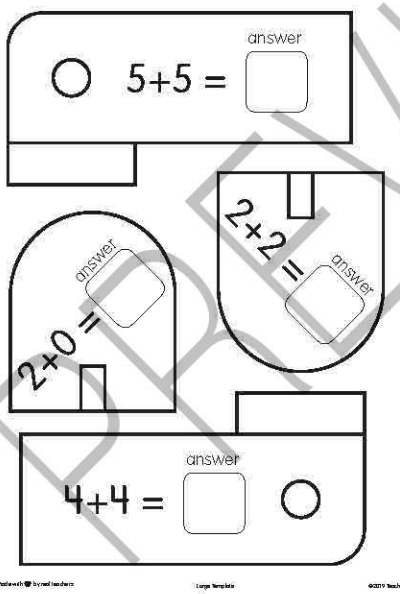
Whether you teach the lesson or just guide your students through the process of making the robot only, your students are experiencing what actual coding looks like. Screen free activities such as this, allow your students to get a truer experience into the role of coding.

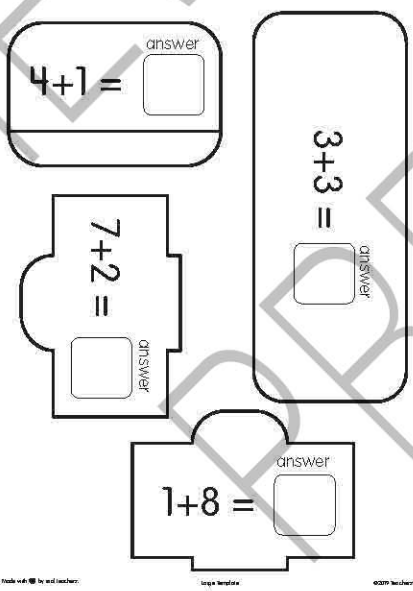
Materials:

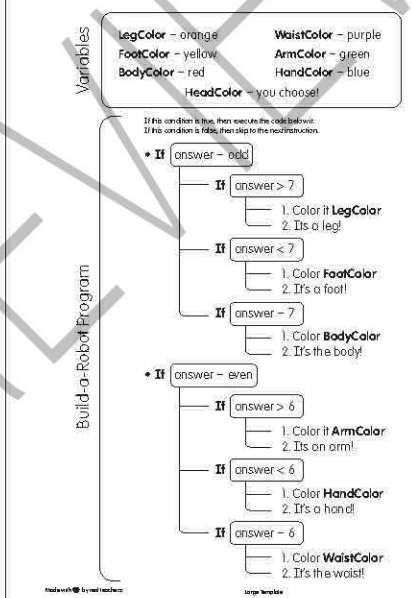
- Paper punch
- Brads
- Colored pencils or Crayons
- Scissors
- Glue
- Card stock
- Poster board or Bulletin Board Paper
- Code-a-Robot Worksheets
- Optional: googly eyes, pipe cleaners, fussy balls, tool, etc.



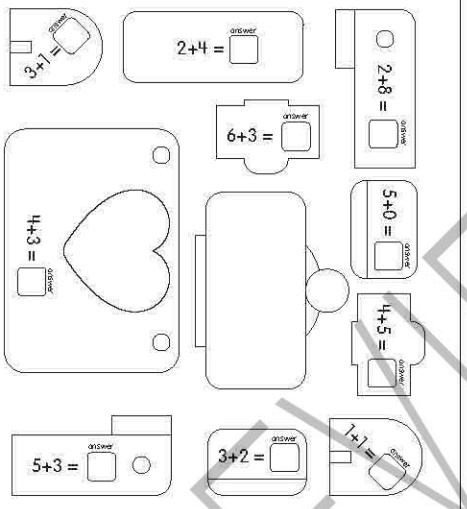








Directions:
Solve all the math problems on the body parts. Then use the program on this sheet to determine the color of each part. Glue the colored body parts on the template and then put a face on your robot! Last, put your name on your creation.



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Variables

LegColor – orange
FootColor – yellow
BodyColor – red
WaistColor – purple
ArmColor – green
HandColor – blue
HeadColor – you choose!

Build-a-Robot Program

If this condition is true, then execute the code below it.
If this condition is false, then skip to the next instruction.

- **If** answer – odd
  - **If** answer > 7
    1. Color it **LegColar**
    2. It's a leg!
  - **If** answer < 7
    1. Color **FootColar**
    2. It's a foot!
  - **If** answer = 7
    1. Color **BodyColar**
    2. It's the body!
- **If** answer – even
  - **If** answer > 6
    1. Color it **ArmColar**
    2. It's an arm!
  - **If** answer < 6
    1. Color **HandColar**
    2. It's a hand!
  - **If** answer = 6
    1. Color **WaistColar**
    2. It's the waist!

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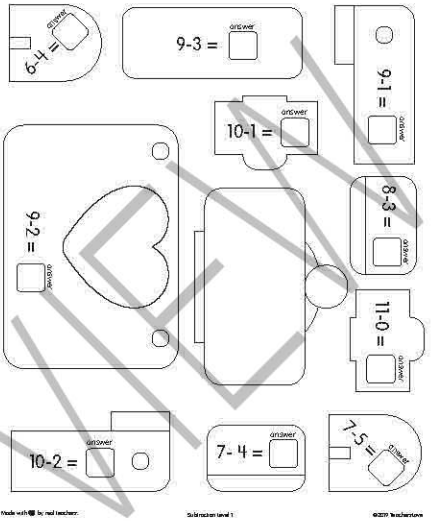
Directions:
Solve all the math problems on the body parts. Then use the program on this sheet to determine the color of each part. Glue the colored body parts on the template and then put a face on your robot! Last, put your name on your creation.



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  - **If** answer > 6
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    2. It's an arm!
  - **If** answer < 6
    1. Color **HandColar**
    2. It's a hand!
  - **If** answer = 6
    1. Color **WaistColar**
    2. It's the waist!

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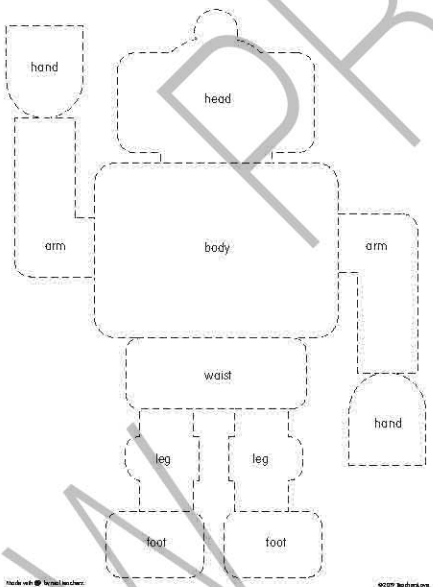

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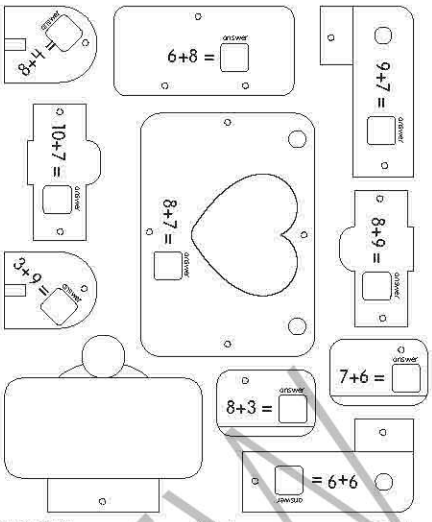
Directions:
Solve all the math problems on the body parts. Then use the program on this sheet to determine the color of each part. Fasten the pieces together with brads and then put a face on your robot! Put your name on your creation.



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WaistColor – purple
ArmColor – green
HandColor – blue
HeadColor – you choose!

Build-a-Robot Program

If this condition is true, then execute the code below it.
If this condition is false, then skip to the next instruction.

- **If** answer – odd
  - **If** answer > 15
    1. Color it **LegColar**
    2. It's a leg!
  - **If** answer < 15
    1. Color **FootColar**
    2. It's a foot!
  - **If** answer = 15
    1. Color **BodyColar**
    2. It's the body!
- **If** answer – even
  - **If** answer > 14
    1. Color it **ArmColar**
    2. It's an arm!
  - **If** answer < 14
    1. Color **HandColar**
    2. It's a hand!
  - **If** answer = 14
    1. Color **WaistColar**
    2. It's the waist!

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Directions:
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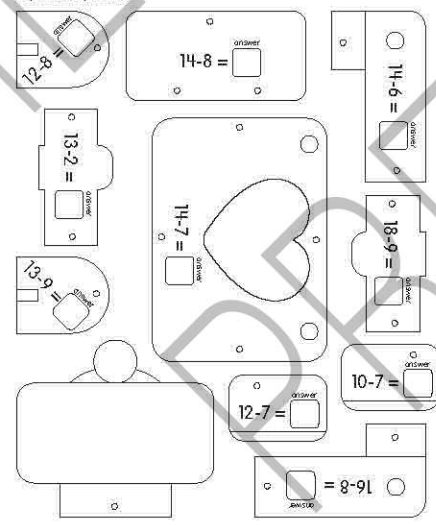

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Coding

The language used to give instructions to a computer.

Program

An entire collection of instructions used to operate a computer.

Examples:
Minecraft, Snapchat

Engineer

The person who writes code instructions into the computer.

Algorithm

Mini sets of instructions followed by a computer to accomplish a specific task.

Variable

The place in a computer program where information is stored to be used again later.

Conditional

Instructions that only run when the math problem is correct.

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Name _____

Directions: Read each definition and write the matching word from the Word Bank in the box below it.

Word Bank

algorithm
program
variable
software
conditional
engineer

The place in a computer program where information is stored to be used again later.	The language used to give instructions to a computer.
Instructions that only run when the math problem is correct.	An entire collection of instructions used to operate a computer.
The person who writes code instructions into the computer.	Mini sets of instructions followed by a computer to accomplish a specific task.

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