

## Activity

### CHAPTER 3 Programming Concepts, Variables

Name:  
Date:

**Purpose:** Group activity teaching how to declare and assign the variable types Boolean, Integer and Character. Text in italics denotes actual Arduino code.

**Materials:** None

#### Vocabulary to be explained prior to activity:

**Variable:** A way to store a piece of information that may change.

**Value:** Piece of information assigned to a variable.

**Declaration:** Creating a variable, when you declare a variable it has no value.

**Assignment:** Sets or resets the value of a variable.

#### Types of variables:

**Boolean:** This variable type has only two values. True or false, which can also be represented as one and zero or HIGH and LOW. Arduino syntax: *boolean*

**Integer:** This variable type is used to store whole numbers. Because RedBoard uses two bytes to store integers it can only store numbers from -32768 to 32767. Arduino syntax: *int*

**Character:** This variable is used to store any character you can type on a keyboard (and some you can't). It is basically an integer, but it is used for letters and characters. It is mainly used to print messages or send messages when human interaction is needed. Arduino syntax: *char*

#### Declaring variables:

**Boolean:** *boolean variableName;*

variableName can be anything as long as it makes sense and has no spaces in it.

Example: *boolean pamHappy;* This variable could be used to indicate if Pam is happy or not. Remember the semicolon, it's important!

**Integer:** *int variableName;*

variableName can be anything as long as it makes sense and has no spaces in it.

Example: *int pamAge;* This variable could be used to indicate how old Pam is. Remember the semicolon, it's important!

**Character:** *char variableName;*

variableName can be anything as long as it makes sense and has no spaces in it.

Example: *char pamShirtColor;* This variable could be used to indicate the color of Pam's shirt. Remember the semicolon, it's important!

#### Assigning variables:

Assigning variables is really easy! No matter what type of variable you simply type the variable name followed by a single equals sign and then the value you are assigning to your variable followed by a semicolon. Example: *pamShirtColor = 'p';* Values have certain requirements depending on their types. A boolean needs to be true or false (or one or zero), an integer should be a number between -32768 and 32767 and a character should be a single character with single quotation marks around it. **Finally, remember the semicolon, it's important!**

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Students should have completed the introduction to variables worksheet that comes with this activity. Examples of variable types, declarations and assignments can be posted somewhere visible in the classroom to help students who are not completely comfortable with the concepts yet.

Students go around in a circle declaring variables that apply to themselves and other students. For example, if they wish to declare a variable about their age they would need to declare an integer variable with a name that makes sense. It is up to the students how specific they want to get, they can declare an integer variable named age, or they could go so far as to declare a variable named pamAge. The difference is that the variable age can apply to anyone, the variable pamAge is specific to a person named Pam. A boolean variable can be used for any quality that is either yes or no. For example, a student might declare pamHappy as a boolean variable to indicate whether Pam is happy or not. Character variables can be used to keep track of anything that does not fit nicely into either integer or boolean. For example, a student may create a variable called pamShirtColor. Declaration of variables should be in the syntax used in Arduino, for examples see previous page.

Once each student has declared a variable go around the circle and have each student assign a value to their variable. Assignment of variables should be in the syntax used in Arduino, for examples see previous page.

#### Additional activities:

Students can declare their variables on pieces of construction paper. Each variable type should have a distinct color or shape (or some other way to identify the variable type other than the declaration). Students can write their variable declaration and assignment for display and personalize the construction paper so it makes sense with their variable name. Throughout the unit students should be encouraged to reassign the value assigned to their variable if it changes. Obviously you will probably want to have a designated time for variable reassignment to avoid classroom disruption. For example, Pam may declare char pamShirtColor; on a shirt shaped piece of yellow construction paper (yellow to designate it a character variable). Pam can then tape a piece of paper with the letter 'B' (don't forget the single quotation marks) to indicate she is wearing a blue shirt. The next day Pam may then replace the letter 'B' with a 'P' to indicate that today she is wearing a purple shirt. You may want to limit reassignment to once a week if your class has a tendency to be overzealous about activities like this.

If your students are having difficulty with the concept of variable types try this activity: Create three different shaped holes in a board, designate one hole for each of the three variable types. Label each hole with the corresponding variable type and definition. Create or buy a bunch of objects that can only fit through one of the holes and label the objects with values that correspond to the variable type. Give the objects out to students and explain that each object can only be one of the three different type of variables and the students need to match up the objects with the variable types by putting them in the corresponding holes.

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