COSC 123
Computer Creativity

Methods

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Key Points

1) Create our own methods for objects.

2) Declare and manipulate variables.

3) Generate and use random numbers.

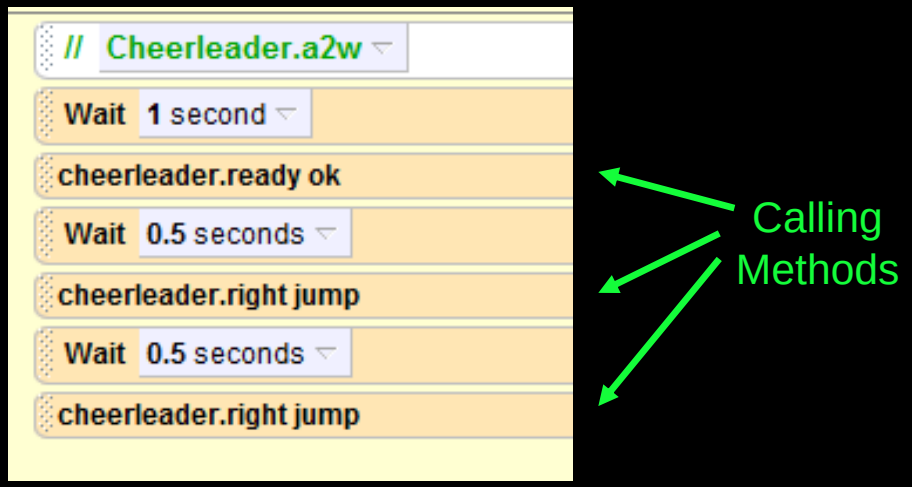
4) Create methods with parameters and understand how parameters work.

Methods

A ***method*** is a sequence of statements that performs an action for an object.

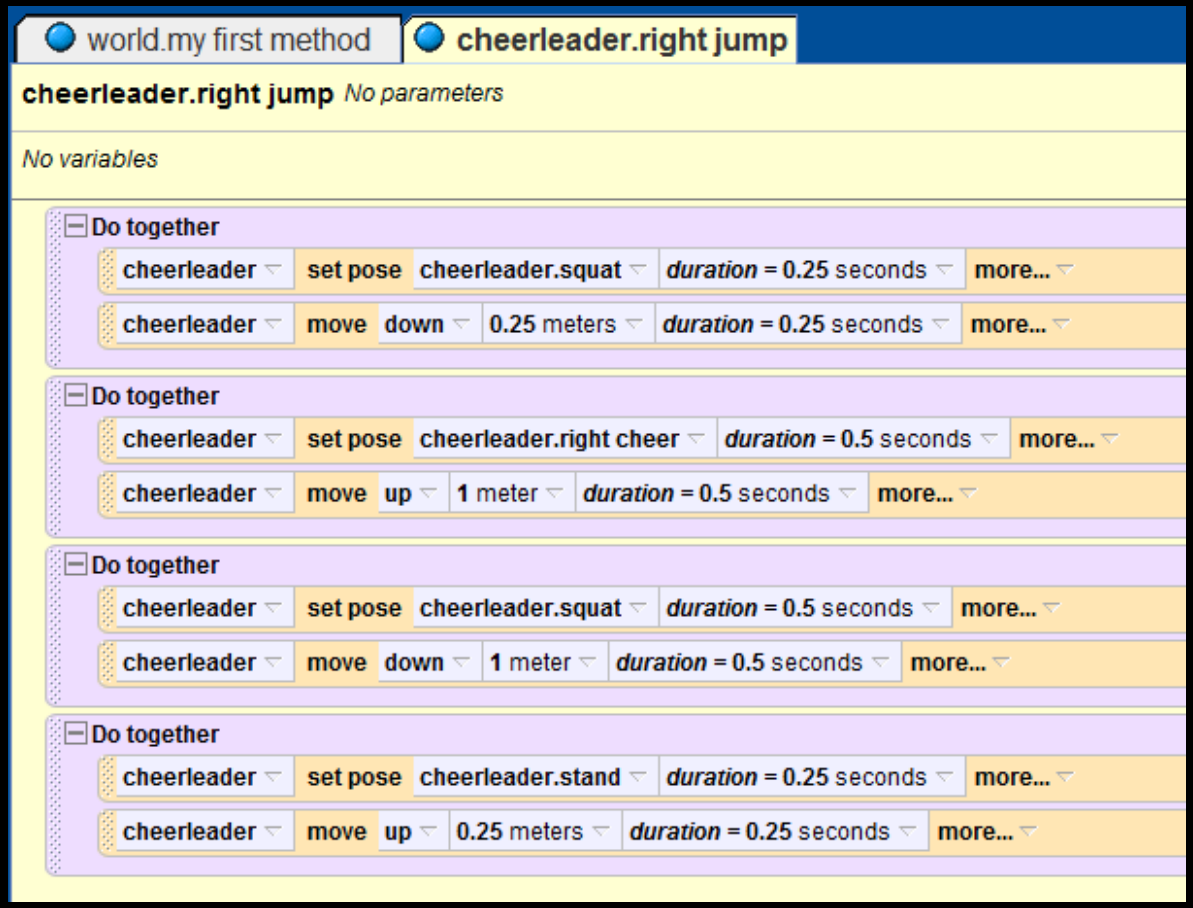
Creating a method avoids repeating statements and allows for better code organization.

Methods allow you to add new actions for an object.



Cheerleader Method Example

The **`right jump`** method is a sequence of statements that makes the cheerleader jump. Many of these statements are calls to other (built-in) methods such as `set pose` and `move`.



Creating Methods

To create a method:

- 1) Click on the object in the object tree to select it.
- 2) Click on the `create new method` button.
- 3) Give the method a name.
- 4) Add statements to the method to make it perform the actions desired.

Note: Usually methods are associated with a class but in Alice methods are associated with objects.

Why do we Create Methods?

Two main reasons to create methods:

- 1) To organize code into blocks that have specific purpose
- 2) To avoid duplication by reusing code

A method is a block of statements that does something useful.

- The block of code is separated from other statements which makes it easier to read and modify.
- The block of code can be called many times if the method needs to be done multiple times.

What is the alternative? Copy and paste and duplicate code. You will realize over time that this is actually the harder way to do things.

Variables

A ***variable*** is a name that represents a spot in memory that can store a value. The variable must be ***declared***, which defines the variable's name and the type of data it will hold.

An object's properties are managed using variables (called ***instance variables***).

Object properties can be used by every method of the object.

Variables in methods:

- Variables declared (created) in a method are ***local*** – available only in that method.
- Parameters are variables that are passed into a method. The method can use the variables while it is executing.

Data Types in Alice

A variable can hold one of the following data types:

- a number (integer or floating point)
- a Boolean (true or false)
- a character string
- a reference to any other type of object

The ***data type*** of a variable defines how much memory is needed to store that variable value.

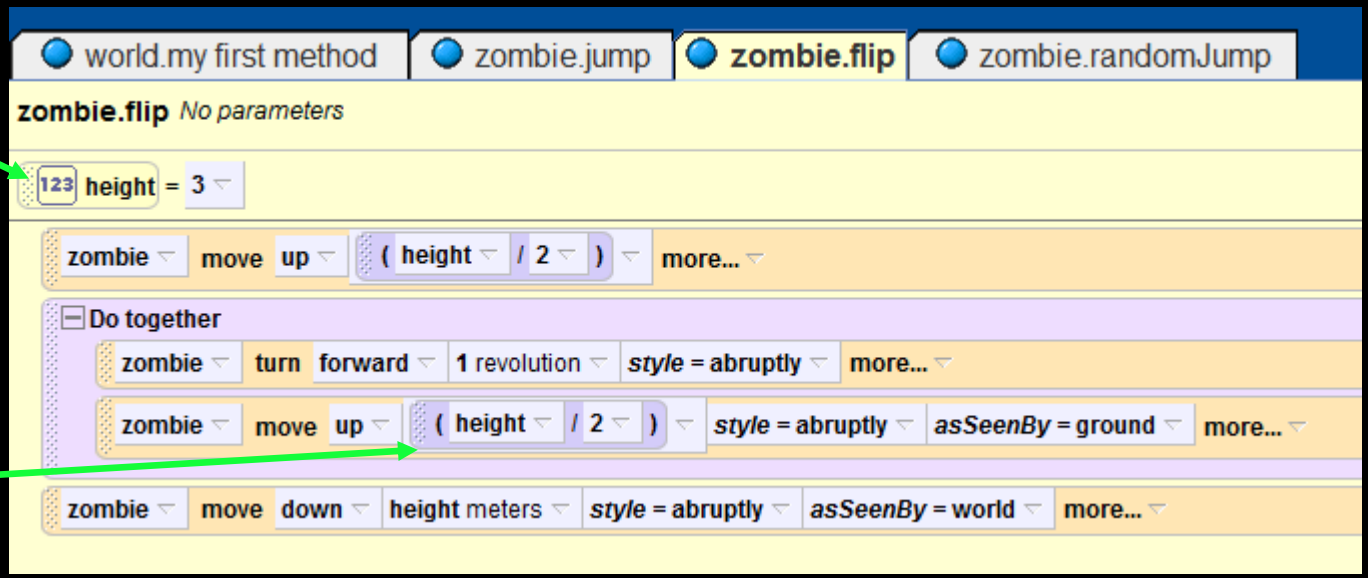
A variable has only one data type (can only store one type of data at any time).

Expressions

An ***expression*** consists of operands (variables, numbers) manipulated with operators (such as +,-,/,*).

Create variable `height` with value = 3.

Use `height` in methods and calculations.



Methods

Question: True or false: It is possible to create a method with no statements.

A) True

B) False

Methods in Alice

Question: True or false: In Alice, two objects of the same class always have the same methods.

A) True

B) False

Variables

Question: True or false: A variable declared inside one method can be accessed in another method.

A) True

B) False

Instance Variables

Question: True or false: An instance variable (object property) can be accessed by any method of that object.

A) True

B) False

Variables and Data Types

Question: True or false: In Alice, a single variable can store numbers and strings.

A) True

B) False

Parameters

A ***parameter*** is data passed into a method for it to use.

Methods may have zero parameters or as many as they want.

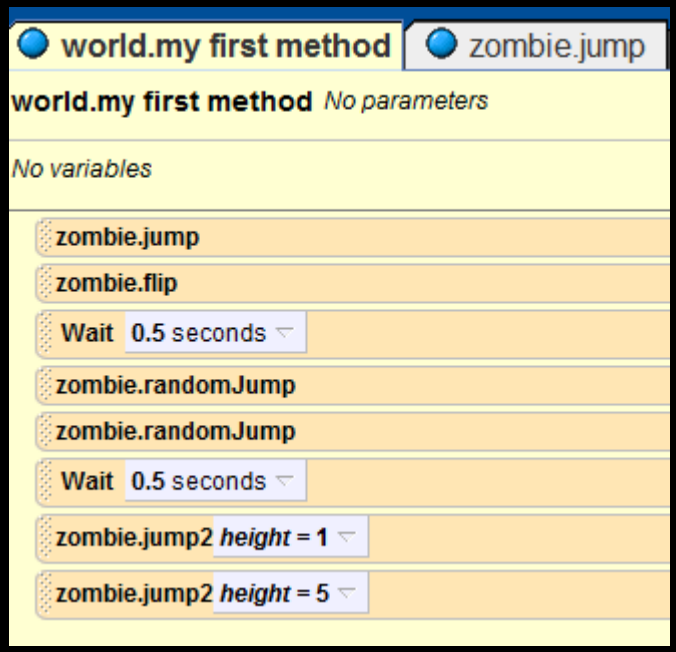
Each parameter has a data type.

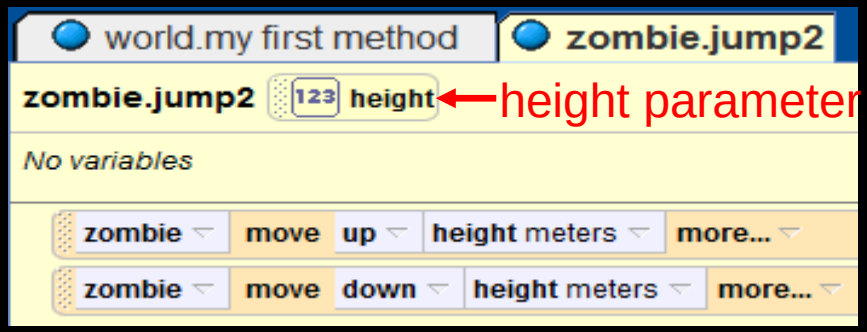
To call a method with parameters you must pass in the necessary values (called arguments) for the method to use.

Using parameters makes a method more powerful and useful.

Example Method with Parameters

Calling the `jump2` method with different inputs.





Random Numbers

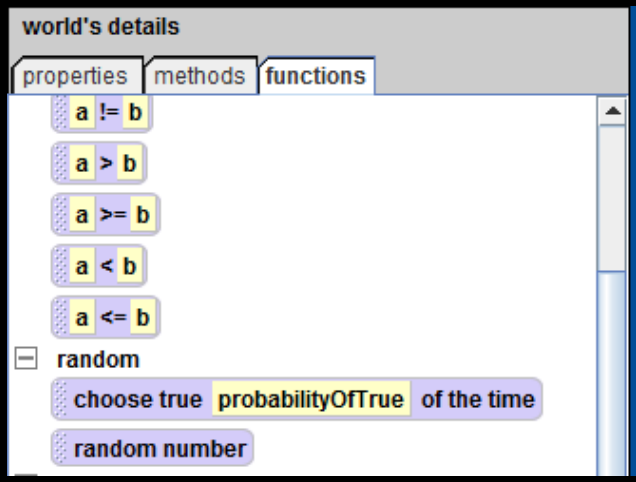
A random number is a number generated in a particular range.

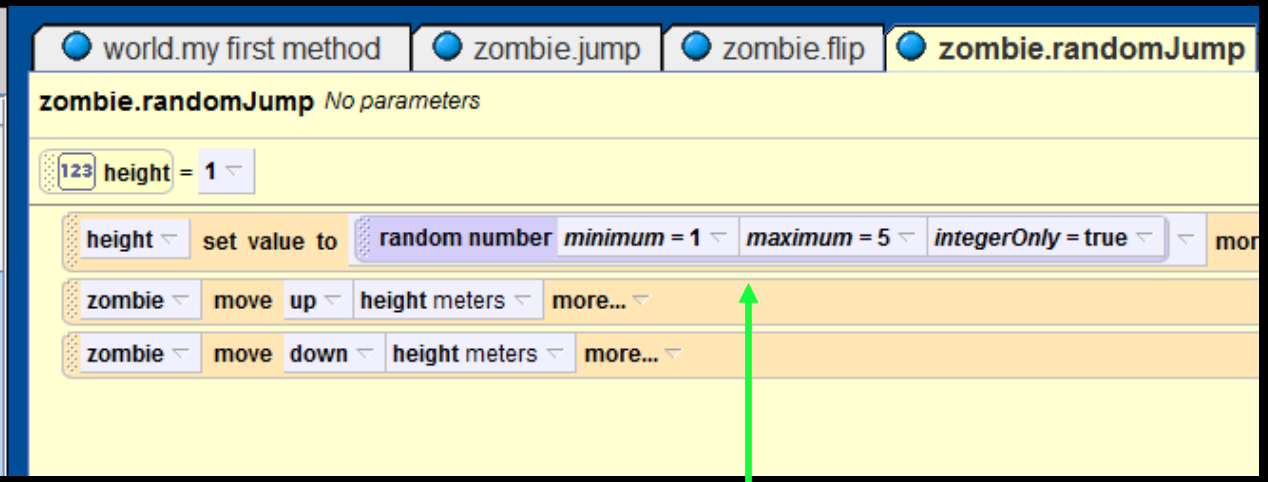
Function **`random number`** is a world function. You provide the minimum and maximum number, and the function returns a number in that range.

- Note: Make sure to specify if you want an integer or float.

Using random numbers allows your story and object behavior to change each time.

Applying Random Numbers





`random number` function is under world functions.

Calling the `random number` function asking for a number between 1 and 5 that must be an integer.

Demonstration Exercise Methods

Use **`Cheerleader.a2w`**. Tasks:

- Add a **`left jump`** method to the cheerleader that causes her to jump with her left arm and leg raised (use **`left cheer`** pose).
- Modify both **`left jump`** and **`right jump`** methods to use a new variable called **`height`** that controls the jump distance. Set **`height`** to a random number between 1 and 3 meters.
- Create a second cheerleader object by copying the first one.

Story:

- At the same time both cheerleaders should:
  - readyOk
  - rightJump
  - leftJump
- Note that the cheerleaders will jump different heights, but they should be synchronized in their movements.

Demonstration Exercise Parameters and Expressions

Use **`Jet.a2w`**. Tasks:

- Modify the **`circle`** method to accept a **`time`** parameter that is used to determine the duration (time to complete a circle).
- Create new **`circle2`** method that calculates time (not a parameter) to make sure that the jet travels the same distance regardless of speed.
- Create a second jet by copying the first one.

Story:

- Have **`jet1`** call **`circle`** three times. Each time the speed should be random between 10 and 100. The time parameter should be: first call 1 second, next 2 seconds, last 3 seconds.
- Have **`jet1`** call **`circle2`** twice. Once with speed 50 then 200.
- Make **`jet1`** and **`jet2 circle`** at the same time with speed 50 and time 1 second.

Conclusion

Methods can be added to objects to define additional behaviors.

- Creating methods organizes code and allows us to use the same code multiple times.

Variables defined in a method are local variables (only used in that method). Parameters are always local variables.

Object properties are instance variables that can be used by any method of the object.

Expressions use variables to calculate new values.

Objectives

Key terms: method, parameter, expressions, variable, value

Alice skills:

- Call a method.
- Create a method.
- Create and use variables.
- Generate random numbers.
- Create method parameters.
- Rename objects.
- Copying objects.