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Jt Scratch Lesson 7 • Summer 2012 • slide 1

Scratch Programming

Lesson 7 : Lists

Multiple Values

- It is possible to create as variable that holds multiple items
- This is called a “list”



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Multiple Values

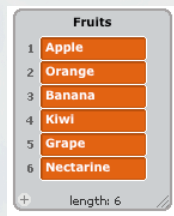
- It is possible to create as variable that holds multiple items
- This is called a “list”
- The values in the list can be numbers



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Multiple Values

- It is possible to create as variable that holds multiple items
- This is called a “list”
- The values in the list can be numbers
- Or text



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Filling Lists

- Lists start out empty



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Filling Lists

- Lists start out empty
- You can add to lists in various ways:



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Filling Lists

- Lists start out empty
- You can add to lists in various ways:
 1. Click + when visible on stage



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Filling Lists

- Lists start out empty
- You can add to lists in various ways:
 1. Click + when visible on stage
 2. Use the Add block to place new value at end of the list

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Filling Lists

- Lists start out empty
- You can add to lists in various ways:
 1. Click + when visible on stage
 2. Use the Add block to place new value at end of the list



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Filling Lists

- Lists start out empty
- You can add to lists in various ways:
 1. Click + when visible on stage
 2. Use the Add block to place new value at end of the list



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Filling Lists

- Lists start out empty
- You can add to lists in various ways:
 1. Click + when visible on stage
 2. Use the Add block to place new value at end of the list
 3. Import from a file by right-clicking on list while on stage

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Create file as Text-Only

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Filling Lists

- Lists start out empty
- You can add to lists in various ways:
 - Click + when visible on stage
 - Use the Add block to place new value at end of the list
 - Import from a file by right-clicking on list while on stage

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Filling Lists

- Lists start out empty
- You can add to lists in various ways:
 - Click + when visible on stage
 - Use the Add block to place new value at end of the list
 - Import from a file by right-clicking on list while on stage

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Demo: Create and Fill Lists

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List Blocks

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List Blocks

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List Blocks

Remove particular item from some spot in list - length of list gets smaller

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List Blocks

Place a new item at a particular spot in the list, moving others down - length of list grows

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List Blocks

Overwrite the value at a particular spot in the list with a new value - lists stays same length

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List Blocks

What value is currently at a particular spot in the List? - used as a value in many other blocks such as Say or a + operator

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List Blocks

How many items are currently in the list? - used as a value for other blocks such as Repeat

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List Blocks

Is a particular item currently in a specified list? True or False? - used as a condition, - for example in an IF

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Examples

A Scratch list titled "Fruits" containing six items: Apple (1), Orange (2), Banana (3), Kiwi (4), Grape (5), and Nectarine (6). The list length is 6.

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Examples

A Scratch list titled "Fruits" containing six items: Apple (1), Orange (2), Banana (3), Kiwi (4), Grape (5), and Nectarine (6). The list length is 6.

A Scratch "delete" block with the value "3" and the list "Fruits" selected.

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Examples

A Scratch list titled "Fruits" containing six items: Apple (1), Orange (2), Banana (3), Kiwi (4), Grape (5), and Nectarine (6). The list length is 6.

A Scratch "delete" block with the value "3" and the list "Fruits" selected.

A Scratch list titled "Fruits" containing five items: Apple (1), Orange (2), Kiwi (3), Grape (4), and Nectarine (5). The list length is 5. A red arrow points from the "Banana" item in the previous list to this one.

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Examples

A Scratch list titled "Fruits" containing five items: Apple (1), Orange (2), Kiwi (3), Grape (4), and Nectarine (5). The list length is 5.

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Examples

A Scratch list titled "Fruits" containing five items: Apple (1), Orange (2), Kiwi (3), Grape (4), and Nectarine (5). The list length is 5.

A Scratch "replace item" block with the value "4", the list "Fruits", and the text "Melon".

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Examples

A Scratch list titled "Fruits" containing five items: Apple (1), Orange (2), Kiwi (3), Grape (4), and Nectarine (5). The list length is 5.

A Scratch list titled "Fruits" containing five items: Apple (1), Orange (2), Kiwi (3), Melon (4), and Nectarine (5). The list length is 5. A red arrow points from the "Grape" item in the previous list to this one.

A Scratch "replace item" block with the value "4", the list "Fruits", and the text "Melon".

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Examples

A Scratch array named "Fruits" containing 5 items: 1 Apple, 2 Orange, 3 Kiwi, 4 Melon, 5 Nectarine. The array length is 5.

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Examples

A Scratch array named "Fruits" containing 5 items: 1 Apple, 2 Orange, 3 Kiwi, 4 Melon, 5 Nectarine. The array length is 5.

Scratch code block: insert Plum at 2 of Fruits

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Examples

Two Scratch arrays named "Fruits". The left array has 5 items: 1 Apple, 2 Orange, 3 Kiwi, 4 Melon, 5 Nectarine. The right array has 6 items: 1 Apple, 2 Plum, 3 Orange, 4 Kiwi, 5 Melon, 6 Nectarine. A red arrow points from the "Orange" item in the first array to the "Plum" item in the second array, illustrating the insertion.

Scratch code block: insert Plum at 2 of Fruits

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Examples

A Scratch array named "Fruits" containing 6 items: 1 Apple, 2 Plum, 3 Orange, 4 Kiwi, 5 Melon, 6 Nectarine. The array length is 6.

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Examples

A Scratch array named "Fruits" containing 6 items: 1 Apple, 2 Plum, 3 Orange, 4 Kiwi, 5 Melon, 6 Nectarine. The array length is 6.

Scratch code block: say item 2 of Fruits for 2 secs

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Examples

A Scratch array named "Fruits" containing 6 items: 1 Apple, 2 Plum, 3 Orange, 4 Kiwi, 5 Melon, 6 Nectarine. The array length is 6.

Scratch code block: say item 2 of Fruits for 2 secs



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Examples

Fruits	
1	Apple
2	Plum
3	Orange
4	Kiwi
5	Melon
6	Nectarine

length: 6

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Examples

Fruits	
1	Apple
2	Plum
3	Orange
4	Kiwi
5	Melon
6	Nectarine

length: 6

insert item 5 of Fruits at 2 of Fruits

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Examples

Fruits	
1	Apple
2	Plum
3	Orange
4	Kiwi
5	Melon
6	Nectarine

length: 6

Fruits	
1	Apple
2	Melon
3	Plum
4	Orange
5	Kiwi
6	Melon
7	Nectarine

length: 7

insert item 5 of Fruits at 2 of Fruits

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Examples

Fruits	
1	Apple
2	Melon
3	Plum
4	Orange
5	Kiwi
6	Melon
7	Nectarine

length: 7

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Examples

Fruits	
1	Apple
2	Melon
3	Plum
4	Orange
5	Kiwi
6	Melon
7	Nectarine

length: 7

say length of Fruits for 2 secs

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Examples

Fruits	
1	Apple
2	Melon
3	Plum
4	Orange
5	Kiwi
6	Melon
7	Nectarine

length: 7

say length of FRUITS for 2 secs



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Examples



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Examples



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Examples



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Examples



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Problem

- Get the population of some states and display the average population of those states

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Problem

- Get the population of some states and display the average population of those states
- Approach
 - Get the various populations
 - Figure out Average
 - Say it

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Get Populations

- Let's place the populations in a list called Population

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Get Populations

- Let's place the populations in a list called Population
- Let's get it in millions (for example "12.3")

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Get Populations

- Let's place the populations in a list called Population
- Let's get it in millions (for example "12.3")
- We are not told how many states, so let's keep getting them until a special value is entered that is not a state - let's say "-100"

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Get Populations

- Let's place the populations in a list called Population
- Let's get it in millions (for example "12.3")
- We are not told how many states, so let's keep getting them until a special value is entered that is not a state - let's say "-100"

This is called a "sentinel" or "flag"

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Get Populations

- Let's place the populations in a list called Population
- Let's get it in millions (for example "12.3")
- We are not told how many states, so let's keep getting them until a special value is entered that is not a state - let's say "-100"
- Let's cause this script to happen when the character **a** (for "ask") is typed


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Get Populations

- Work on getting population for one state:



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Get Populations

- Work on getting population for one state:
 1. Ask 



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Get Populations

- Work on getting population for one state:
 1. Ask 
 2. Add to list 

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Get Populations

- Work on getting population for one state:
 1. Ask 
 2. Add to list 

Wait - there is a problem

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Get Populations

- Work on getting population for one state:
 1. Ask 
 2. Add to list 

Wait - there is a problem - what if they enter the sentinel -100? That isn't a real population and doesn't belong in our list.

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Get Populations

- Work on getting population for one state:
 1. Ask 
 2. Add to list 

Use IF

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Get Populations

- Work on getting population for one state:
 1. Ask 
 2. Add to list 

What condition?

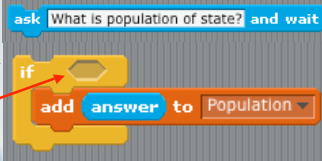
Use IF

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Get Populations

- Work on getting population for one state:
 - Ask
 - Add to list

What condition?
Hint: it uses a boolean



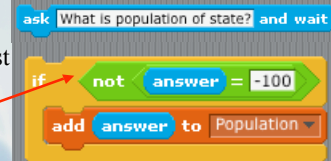
Use IF

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Get Populations

- Work on getting population for one state:
 - Ask
 - Add to list

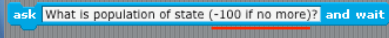
What condition?
Hint: it uses a boolean



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A more helpful Say

- Let's remind them of the sentinel in the say.



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Get Populations

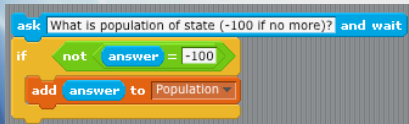
- Work on getting population for one state:



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Get Populations

- Work on getting population for one state:



- What can we use to do many states?

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Get Populations

- Work on getting population for one state:



- What can we use to do many states? Loop

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Get Populations

- Work on getting population for one state:

```
ask What is population of state (-100 if no more)? and wait
if not answer = -100
  add answer to Population
```

- What can we use to do many states? Loop
How about a Repeat Until

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Get Populations

- What can we use to do many states? Loop
How about a Repeat Until

```
repeat until
  ask What is population of state (-100 if no more)? and wait
  if not answer = -100
    add answer to Population
```

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Get Populations

- What can we use to do many states? Loop
How about a Repeat Until

```
repeat until
  ask What is population of state (-100 if no more)? and wait
  if not answer = -100
    add answer to Population
```

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Get Populations

- What can we use to do many states? Loop
How about a Repeat Until

```
repeat until
  ask What is population of state (-100 if no more)? and wait
  if not answer = -100
    add answer to Population
```

What condition needs to be
True for us to stop getting populations?

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Get Populations

- What can we use to do many states? Loop
How about a Repeat Until

```
answer = 100
repeat until
  ask What is population of state (-100 if no more)? and wait
  if not answer = -100
    add answer to Population
```

What condition needs to be
True for us to stop getting populations?

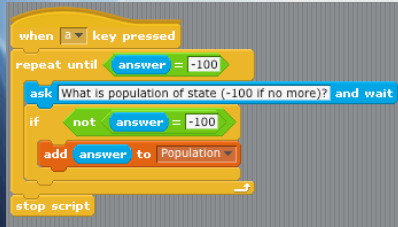
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Get Populations: Complete Script

```
when key pressed
repeat until answer = -100
  ask What is population of state (-100 if no more)? and wait
  if not answer = -100
    add answer to Population
stop script
```

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Get Populations: Complete Script



```
when green flag clicked
  repeat until answer = 100
    ask What is population of state (-100 if no more)? and wait
    if not answer = -100
      add answer to Population
  stop script
```

Demo: Populations 1

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Populations: The Rest

- Get the population of some states and display the average population of those states
- Approach
 - Get the various populations
 - Figure out Average
 - Say it

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Populations: The Rest

- Get the population of some states and display the average population of those states
- Approach
 - Get the various populations
 - Figure out Average
 - Say it

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- How can we know how many states there are?

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- How can we know how many states there are? Hint: what aspect of the Population lists tells us how many states?

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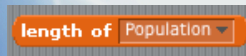
Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- How can we know how many states there are? **Hint: what aspect of the Population lists tells us how many states? It was one of the list blocks we learned before.**

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- How can we know how many states there are? **Hint: what aspect of the Population lists tells us how many states? It was one of the list blocks we learned before.**

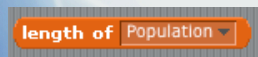


length of Population

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- How can we know how many states there are? **Let's place this in a variable called: NumberOfStates**



length of Population

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- How can we know how many states there are? **Let's place this in a variable called: NumberOfStates**




set NumberOfStates to length of Population

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- **NumberOfStates is length of Population list**



set NumberOfStates to length of Population

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- NumberOfStates is length of Population list
- **Let's call the sum of all the populations - TotalPopulation**

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- NumberOfStates is length of Population list
- Let's call the sum of all the populations - TotalPopulation (we will come back to this)

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Populations: The Rest : Average

- To get the average, we have to add up all the populations and divide by the number of states
- NumberOfStates is length of Population list
- Let's call the sum of all the populations - TotalPopulation

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Populations: The Rest : Average

- To get the Average, we have to add up all the populations and divide by the number of states ← So, what is the equation for this?
- NumberOfStates is length of Population list
- Let's call the sum of all the populations - TotalPopulation

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Populations: The Rest : Average

- To get the Average, we have to add up all the populations and divide by the number of states
- NumberOfStates is length of Population list
- Let's call the sum of all the populations - TotalPopulation

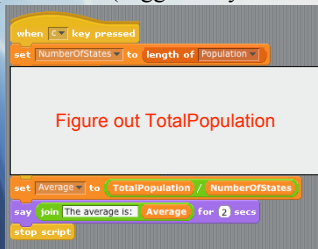


```
set Average to TotalPopulation / NumberOfStates
```

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Populations: The Rest : Average

Script skeleton (triggered by "c" for Calculate)



```
when key pressed
  set NumberOfStates to length of Population
  Figure out TotalPopulation
  set Average to TotalPopulation / NumberOfStates
  say join The average is Average for 2 secs
  stop script
```

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total



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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

What type of script block is needed?

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

What type of script block is needed?
How about a loop?

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

What type of script block is needed?
How about a loop? Do we know how many times?

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

What type of script block is needed?
How about a loop? Do we know how many times? Yes - how many?

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Populations: TotalPopulation

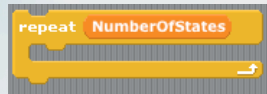
- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

What type of script block is needed?
How about a loop? Do we know how many times? Yes - how many? NumberOfStates

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total



What type of script block is needed?
How about a loop? Do we know how many times? Yes - how many? NumberOfStates

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total



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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total



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What is given State's Population?

- Given the various populations are in the Population list, what list block do we use to see a particular one?

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What is given State's Population?

- Given the various populations are in the Population list, what list block do we use to see a particular one?



Whichever state we are currently looking at

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What is given State's Population?

- Given the various populations are in the Population list, what list block do we use to see a particular one?



This is called an "index"

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What is given State's Population?

- Given the various populations are in the Population list, what list block do we use to see a particular one?



Let's make a variable for this in our script - how about: Spot

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What is given State's Population?

- Given the various populations are in the Population list, what list block do we use to see a particular one?



Let's make a variable for this in our script - how about: Spot

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total



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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total



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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

One little issue, Spot has no value yet

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

So we need to make sure we start it at zero, and then increment it right before each time we want to handle a new state

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

... increment it right before each time we want to handle a new state

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

... increment it right before each time we want to handle a new state ... that, is each time around the loop (in the loop)

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Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

Jt Scratch Lesson 7 • Summer 2012 • slide 113

Populations: TotalPopulation

- Approach:
 - Start at zero
 - Go thru all the states
 - Add state's population on to total

Jt Scratch Lesson 7 • Summer 2012 • slide 114

Populations: The Rest : Average

Script skeleton

```
when key pressed
  set NumberOfStates to length of Population
  Figure out TotalPopulation
  set Average to TotalPopulation / NumberOfStates
  say join The average is: Average for 2 secs
  stop script
```

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Populations: The Rest : Average

```
when key pressed
  set NumberOfStates to length of Population
  set Spot to 0
  set TotalPopulation to 0
  repeat NumberOfStates
    change Spot by 1
    change TotalPopulation by item Spot of Population
  Calculate TotalPopulation
  set Average to TotalPopulation / NumberOfStates
  say join The average is: Average for 2 secs
  stop script
```

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Populations: The Rest : Average

```
when key pressed
  set NumberOfStates to length of Population
  set Spot to 0
  set TotalPopulation to 0
  repeat NumberOfStates
    change Spot by 1
    change TotalPopulation by item Spot of Population
  set Average to TotalPopulation / NumberOfStates
  say join The average is: Average for 2 secs
  stop script
```

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Populations: The Rest : Average

```
when key pressed
  set NumberOfStates to length of Population
  set Spot to 0
  set TotalPopulation to 0
  repeat NumberOfStates
    change Spot by 1
    change TotalPopulation by item Spot of Population
  set Average to TotalPopulation / NumberOfStates
  say join The average is: Average for 2 secs
  stop script
```

Demo:
Populations 2

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Enhancement

- Let's add a script, triggered by **l** (for list) to say all the names of the states which have a population over a certain threshold and to tell us how many states were in that category

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Enhancement

- Since we never asked for state names, we should modify the add script:

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Enhancement

- Since we never asked for state names, we should modify the add script:

```
when green flag clicked
  repeat until (answer = 100)
    ask (What is population of state (-100 if no more)?) and wait
    if (not (answer = 100))
      add answer to Population
  stop script
```

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Enhancement

- Since we never asked for state names, we should modify the add script
- We need a place to store the state names

Jt Scratch Lesson 7 • Summer 2012 • slide 122

Enhancement

- Since we never asked for state names, we should modify the add script
- We need a place to store the state names
- Let's use a new list for this called StateNames

Jt Scratch Lesson 7 • Summer 2012 • slide 123

Enhancement

- Since we never asked for state names, we should modify the add script
- We need a place to store the state names
- Let's use a new list for this called StateNames

For example:

```
item 5 of StateNames
```

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Enhancement

- Since we never asked for state names, we should modify the add script
- We need a place to store the state names
- Let's use a new list for this called StateNames

For example:

```
item 5 of StateNames
```

would be the name of the 5th state

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Parallel Lists

- Here Population and StateNames are two separate lists that work together

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Parallel Lists

- Here Population and StateNames are two separate lists that work together
- For example, the third value in the StateNames list is the name of that state, while the third value in their Population lists is that state's population

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Parallel Lists

- Here Population and StateNames are two separate lists that work together
- For example, the third value in the StateNames list is the name of that state, while the third value in their Population lists is that state's population
- Works like fields in a record in a database

Jt Scratch Lesson 7 • Summer 2012 • slide 128

Parallel Lists

- Here Population and StateNames are two separate lists that work together
- For example, the third value in the StateNames list is the name of that state, while the third value in their Population lists is that state's population
- Works like fields in a record in a database
- In programming, this is called "parallel lists"

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Enhancement

- The old version of the script:

```
when green flag clicked key pressed
repeat until answer = -100
ask What is population of state (-100 if no more)? and wait
if not answer = -100
add answer to Population
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 130

Enhancement

- Each time, let us now ask for state name first and now make the sentinel DONE

```
when green flag clicked key pressed
repeat until answer = DONE
ask Give another state's name (Enter DONE if no more)? and wait
stop script
```

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Enhancement

- Each time, let us now ask for state name first and now make the sentinel DONE

```
when green flag clicked key pressed
repeat until answer = DONE
ask Give another state's name (Enter DONE if no more)? and wait
stop script
```

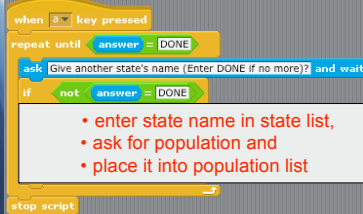
Then as long as DONE was not entered,

- enter state name in state list,
- ask for population and
- place it into population list

Jt Scratch Lesson 7 • Summer 2012 • slide 132

Enhancement

- Each time, let us now ask for state name first and now make the sentinel DONE

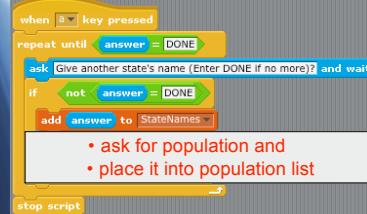


```
when green flag clicked key pressed
repeat until answer = DONE
ask Give another state's name (Enter DONE if no more)? and wait
if not answer = DONE
  • enter state name in state list,
  • ask for population and
  • place it into population list
stop script
```

Ji Scratch Lesson 7 • Summer 2012 • slide 133

Enhancement

- Each time, let us now ask for state name first and now make the sentinel DONE

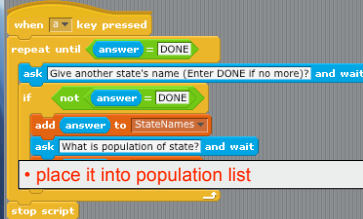


```
when green flag clicked key pressed
repeat until answer = DONE
ask Give another state's name (Enter DONE if no more)? and wait
if not answer = DONE
  add answer to StateNames
  • ask for population and
  • place it into population list
stop script
```

Ji Scratch Lesson 7 • Summer 2012 • slide 134

Enhancement

- Each time, let us now ask for state name first and now make the sentinel DONE

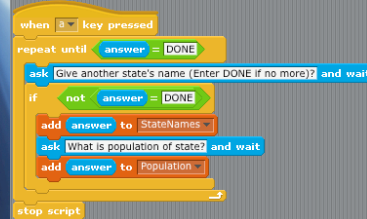


```
when green flag clicked key pressed
repeat until answer = DONE
ask Give another state's name (Enter DONE if no more)? and wait
if not answer = DONE
  add answer to StateNames
  ask What is population of state? and wait
  • place it into population list
stop script
```

Ji Scratch Lesson 7 • Summer 2012 • slide 135

Enhancement

- Each time, let us now ask for state name first and now make the sentinel DONE



```
when green flag clicked key pressed
repeat until answer = DONE
ask Give another state's name (Enter DONE if no more)? and wait
if not answer = DONE
  add answer to StateNames
  ask What is population of state? and wait
  add answer to Population
stop script
```

Ji Scratch Lesson 7 • Summer 2012 • slide 136

List Over Threshold Script

- Let's add a script, triggered by l (for list) to say all the names of the states who have a population over a certain threshold and to tell us how many states were in that category

Ji Scratch Lesson 7 • Summer 2012 • slide 137

List Over Threshold Script

- Let's add a script, triggered by l (for list) to say all the names of the states who have a population over a certain threshold ...

Ji Scratch Lesson 7 • Summer 2012 • slide 138

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
stop script
```

Announce what is going on & ask for threshold

Jt Scratch Lesson 7 • Summer 2012 • slide 139

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
stop script
```

Go thru all the states and each time a state's population is over the threshold, say the state's name

Jt Scratch Lesson 7 • Summer 2012 • slide 140

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
repeat length of StateNames
stop script
```

Go thru all the states and each time a state's population is over the threshold, say the state's name

Jt Scratch Lesson 7 • Summer 2012 • slide 141

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    each time state's population is over threshold, say the state's name
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 142

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
    say the state's name
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 143

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Notice usage of the index called Spot

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List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Notice usage of the index called Spot - just like in average script -

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List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Notice usage of the index called Spot - it walks us through the list -

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List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Notice usage of the index called Spot - initialize to 0 before loop -

Jt Scratch Lesson 7 • Summer 2012 • slide 147

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Notice usage of the index called Spot - increment in loop -

Jt Scratch Lesson 7 • Summer 2012 • slide 148

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Notice usage of the index called Spot - use as item # in lists -

Jt Scratch Lesson 7 • Summer 2012 • slide 149

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Use as item # in lists - this very interesting

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List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Use as item # in lists
- we looked in the
Population list

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List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Use as item # in lists
- before using a value
in the StateNames list

Jt Scratch Lesson 7 • Summer 2012 • slide 152

List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

This is a typical use
of parallel lists

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List Over Threshold Script

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

Demo:
Population 3

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Handling the Count

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
stop script
```

How did we
enhance this script
to handle the
counting?

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Handling the Count

```
say join join There were join Count states with a population over join Threshold million. for 3 secs
```

How did we
enhance this script
to handle the
counting?

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Handling the Count

New variable

How did we enhance this script to handle the counting?

```
say join join There were join Kount states with a population over join Threshold million for 3 secs
```

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Handling the Count

How did we enhance this script to handle the counting?

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
set Kount to 0
repeat length of StateNames
change Spot by 1
if item Spot of Population > Threshold
say item Spot of StateNames for 2 secs
change Kount by 1
say join join There were join Kount states with a populati
stop script
```

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Handling the Count

1. Kount is initialized to zero one time before the loop

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
set Kount to 0
repeat length of StateNames
change Spot by 1
if item Spot of Population > Threshold
say item Spot of StateNames for 2 secs
change Kount by 1
say join join There were join Kount states with a populati
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 159

Handling the Count

2. Kount incremented possibly over and over

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
set Kount to 0
repeat length of StateNames
change Spot by 1
if item Spot of Population > Threshold
say item Spot of StateNames for 2 secs
change Kount by 1
say join join There were join Kount states with a populati
stop script
```

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Handling the Count

2. Kount incremented possibly over and over - therefore in the loop

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
set Kount to 0
repeat length of StateNames
change Spot by 1
if item Spot of Population > Threshold
say item Spot of StateNames for 2 secs
change Kount by 1
say join join There were join Kount states with a populati
stop script
```

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Handling the Count

2. Kount incremented - but guarded by the IF, so only happens sometimes - when population was large enough

```
when key pressed
say Let's list all the states over a certain population. for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
set Kount to 0
repeat length of StateNames
change Spot by 1
if item Spot of Population > Threshold
say item Spot of StateNames for 2 secs
change Kount by 1
say join join There were join Kount states with a populati
stop script
```

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Handling the Count

```

when key pressed
say Let's list all the states over a certain population, for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
set Kount to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
    change Kount by 1
say join join There were join Kount states with a populati
stop script
  
```

2. Kount incremented - but guarded by the IF, so maybe never happens and stays at zero, or maybe gets bigger

Jt Scratch Lesson 7 • Summer 2012 • slide 163

Handling the Count

```

when key pressed
say Let's list all the states over a certain population, for 2 secs
ask What population threshold do you want to use? and wait
set Threshold to answer
set Spot to 0
set Kount to 0
repeat length of StateNames
  change Spot by 1
  if item Spot of Population > Threshold
    say item Spot of StateNames for 2 secs
    change Kount by 1
say join join There were join Kount states with a populati
stop script
  
```

3. Kount is displayed on screen AFTER loop is over

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Final Enhancement

- Add a script triggered when the sprite itself is clicked that asks for the name of a state, and then replies with the population of that state

Jt Scratch Lesson 7 • Summer 2012 • slide 165

Final Enhancement

- Add a script triggered when the sprite itself is clicked that asks for the name of a state, and then replies with the population of that state
- Approach:
 - Get name of state you are interested in

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Final Enhancement

- Add a script triggered when the sprite itself is clicked that asks for the name of a state, and then replies with the population of that state
- Approach:
 - Get name of state you are interested in
 - Go through all the states in list of StateNames

Jt Scratch Lesson 7 • Summer 2012 • slide 167

Final Enhancement

- Add a script triggered when the sprite itself is clicked that asks for the name of a state, and then replies with the population of that state
- Approach:
 - Get name of state you are interested in
 - Go through all the states in list of StateNames
 - When current state is the one being looked for, say the population using the parallel list Population

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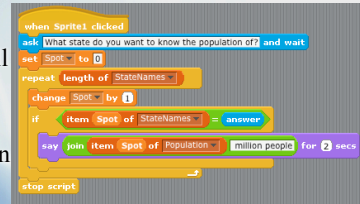
Final Enhancement

- Add a script triggered when the sprite itself is clicked that asks for the name of a state, and then replies with the population of that state
- Approach:
 - Get name of state you are interested in
 - Go through all the states in list of StateNames
 - When current state is the one being looked for, say the population using the parallel list Population
 - Use an index in standard way to walk thru list

Jt Scratch Lesson 7 • Summer 2012 • slide 169

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index



```
when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 170

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index



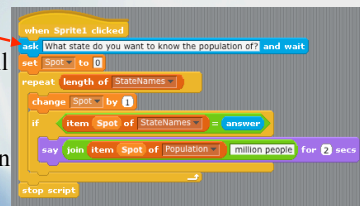
New way to trigger script

```
when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 171

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

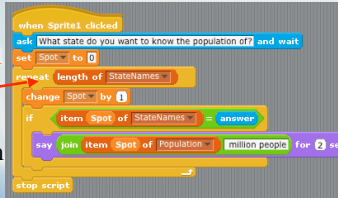


```
when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 172

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

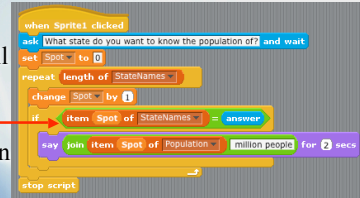


```
when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 173

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index



```
when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
```

Jt Scratch Lesson 7 • Summer 2012 • slide 174

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
    
```

Jt Scratch Lesson 7 • Summer 2012 • slide 175

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
    
```

Taking advantage of parallel lists again, looking in StateNames before saying item in same place of Population list

Jt Scratch Lesson 7 • Summer 2012 • slide 176

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
    
```

Jt Scratch Lesson 7 • Summer 2012 • slide 177

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
    
```

Jt Scratch Lesson 7 • Summer 2012 • slide 178

Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
    
```

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Final Enhancement

1. Get name of state
2. Go through all StateNames
3. When found say Population
4. Use an index

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
    
```

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Final Enhancement

Demo:
Populations 4

```
when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot to 0
repeat length of StateNames
change Spot by 1
if item Spot of StateNames = answer
say join item Spot of Population million people for 2 secs
stop script
```

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Last Look

- How did it say “I don’t know that one.”

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Last Look

- How did it say “I don’t know that one.”

```
if Found = No
say I don't know that one. for 2 secs
stop script
```

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Last Look

- How did it say “I don’t know that one.”

```
if Found = No
say I don't know that one. for 2 secs
stop script
```

This final decision is made after searching through the whole list - so AFTER the loop

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Last Look

- How did it say “I don’t know that one.”

```
if Found = No
say I don't know that one. for 2 secs
stop script
```

This final decision is made after searching through the whole list - so AFTER the loop

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Last Look

- How did it say “I don’t know that one.”

```
if Found = No
say I don't know that one. for 2 secs
stop script
```

Need to initialize found to No before the search through the list

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Last Look

- How did it say "I don't know that one."

```
if Found = No
  say I don't know that one. for 2 secs
stop script
```

Need to initialize found to No before the search through the list - if state never found, Found will remain = to No

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Last Look

- How did it say "I don't know that one."

```
if Found = No
  say I don't know that one. for 2 secs
stop script
```

Need to initialize found to No before the search through the list - if state never found, Found will remain = to No and thus at the end this will be said

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Last Look

- How did it say "I don't know that one."

```
if Found = No
  say I don't know that one. for 2 secs
stop script
```

Need to initialize found to No before the search through the list - however if state is found, need to change Found to Yes

c 189

Last Look

- How did it say "I don't know that one."

```
if Found = No
  say I don't know that one. for 2 secs
stop script
```

Need to initialize found to No before the search through the list - however if state is found, need to change Found to Yes - in loop, in other IF

c 190

Last Look

Need to initialize found to No before the search through the list
However, if state is found, need to change Found to Yes - in loop, in other IF

```
when Sprite1 clicked
  ask What state do you want to know the population of? and wait
  set Spot to 0
  set Found to NO
  repeat length of StateNames
    change Spot by 1
    if item Spot of StateNames = answer
      say join item Spot of Population million people for 2 secs
      set Found to Yes
  if Found = No
    say I don't know that one. for 2 secs
stop script
```

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Last Look

Need to initialize found to No before the search through the list
However, if state is found, need to change Found to Yes - in loop, in other IF

```
when Sprite1 clicked
  ask What state do you want to know the population of? and wait
  set Spot to 0
  set Found to NO
  repeat length of StateNames
    change Spot by 1
    if item Spot of StateNames = answer
      say join item Spot of Population million people for 2 secs
      set Found to Yes
  if Found = No
    say I don't know that one. for 2 secs
stop script
```

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Last Look

Need to initialize found to No before the search through the list

However, if state is found, need to change Found to Yes - in loop, in other IF

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot_ to 0
set Found_ to NO
repeat length of StateNames_
change Spot_ by 1
if item Spot_ of StateNames_ = answer
say join item Spot_ of Population_ million people for 2 secs
set Found_ to Yes
if Found_ = No
say I don't know that one. for 2 secs
stop script
    
```

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Last Look

Need to initialize found to No before the search through the list

However, if state is found, need to change Found to Yes - in loop, in other IF

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot_ to 0
set Found_ to NO
repeat length of StateNames_
change Spot_ by 1
if item Spot_ of StateNames_ = answer
say join item Spot_ of Population_ million people for 2 secs
set Found_ to Yes
if Found_ = No
say I don't know that one. for 2 secs
stop script
    
```

Only set to Yes when state is indeed found

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Last Look

Need to initialize found to No before the search through the list

However, if state is found, need to change Found to Yes - in loop, in other IF

After search loop is finished, so Don't Know said only when not found

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot_ to 0
set Found_ to NO
repeat length of StateNames_
change Spot_ by 1
if item Spot_ of StateNames_ = answer
say join item Spot_ of Population_ million people for 2 secs
set Found_ to Yes
if Found_ = No
say I don't know that one. for 2 secs
stop script
    
```

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The Four Scripts

```

when key pressed
repeat until answer = DONE
ask One another state's name (enter DONE if no more) and wait
if not answer = DONE
add answer to StateNames_
ask (What population entered) and wait
add answer to Population_
stop script
    
```

On "a": add items to list until DONE entered

```

when key pressed
set NumberofStates_ to length of Population_
set TotalPopulation_ to 0
repeat NumberofStates_
change Spot_ by 1
say join item Spot_ of Population_ million people for 2 secs
change TotalPopulation_ by item Spot_ of Population_
set Average_ to TotalPopulation_ / NumberofStates_
say join The average is: Average_ for 2 secs
stop script
    
```

On "c": calculate average & display

```

when key pressed
say Let's see all the states over a certain population. for 2 secs
ask (Enter population threshold do you want to use) and wait
set Threshold_ to answer
set Spot_ to 0
set Count_ to 0
repeat length of StateNames_
change Spot_ by 1
if item Spot_ of Population_ > Threshold_
say item Spot_ of StateNames_ for 2 secs
change Count_ by 1
say join join There were join Count_ states with a population over Threshold_ for 2 secs
stop script
    
```

On "l": list & count states over threshold

```

when Sprite1 clicked
ask What state do you want to know the population of? and wait
set Spot_ to 0
repeat length of StateNames_
change Spot_ by 1
say join item Spot_ of Population_ million people for 2 secs
set Found_ to Yes
if Found_ = No
say I don't know that one. for 2 secs
stop script
    
```

When sprite clicked: display given state's population

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Availability of Slides

Go to

nbc.rutgers.edu/~jt

to see the powerpoint slides and/or podcasts for this lecture

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