

# Data structures

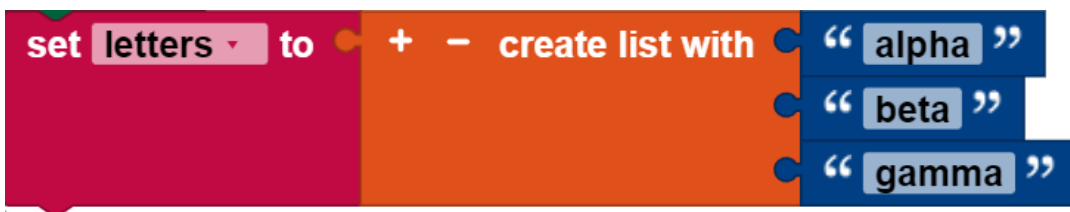
## Lists

As in everyday language, in ROBO Pro Coding a list is an ordered collection of elements, such as a “to do” list or a shopping list. Elements in a list can be of any type, and the same value can appear in a list multiple times.

## Creating a list

### create list with

You can use the **create list with** block to enter the initial values in a new list. In this example, a list of words is created and saved in a variable named **letters**:



We designate this list as ["alpha," "beta," "gamma"].

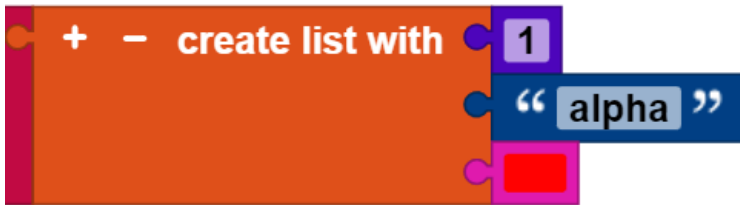
This shows the block for creating a list of **numbers**:



Here is how to create a list of **colors**:



It is less common, but possible to create a list of values of different types:



## Change number of inputs

To change the number of inputs, click or touch the gear symbol. This will open a new window. You can drag element sub-blocks from the left side of the window to the list block on the right side to add a new input:

While the new element in this example is inserted at the bottom, it can be added anywhere. Similarly, element sub-blocks that are not desired can be dragged to the left and out of the list block.

## Create list with item

You can use the **create list with item** block to create a list containing the indicated number of copies of an item. The following blocks, for example, set the variable **words** on the list ["very," "very," "very"].



## Check the length of a list

### is empty

The value of an **is empty** block is **true** if its input is the empty list, and **false** if it is anything else. Is this input **true**? The value of the following block would be **false**, because the variable **color** is not empty: It has three items.



Note how similar this is to the **is empty** block for text.

### Length of

The value of the **length of** block is the number of elements that are in the list used as the input. The value of the following block would be 3, for instance, since **color** has three elements:



The value of the **length of** block is the number of items in the list used as the input. The value of the following block would be 3, for example, although **words** consists of three copies of the same text:



Note how similar this is to the block **length of** for the text.

# Searching for items in a list

These blocks find the position of an item in a list. The following example has a value of 1, because the first occurrence of “very” is at the start of the list of words ([“very,” “very,” “very”]).



The result of the following is 3, because the last occurrence of “very” in the **words** is at position 3.



If the item is not in the list at all, then the result is a value of 0, as in this example:

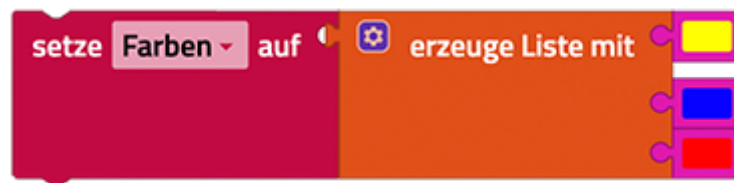


These blocks behave the same way as the blocks for finding letters in text.

## Getting items from a list

### Getting a single element

Remember the definition of the list **colors**:



The following block contains the color blue, because it is the second item in the list (starting from the left):



This one contains green, because it is the second element (starting from the right end):



This contains the first item, red:



This contains the last item, yellow:



This one chooses a random item from the list, with the same probability of returning one of the items red, blue, green or yellow.

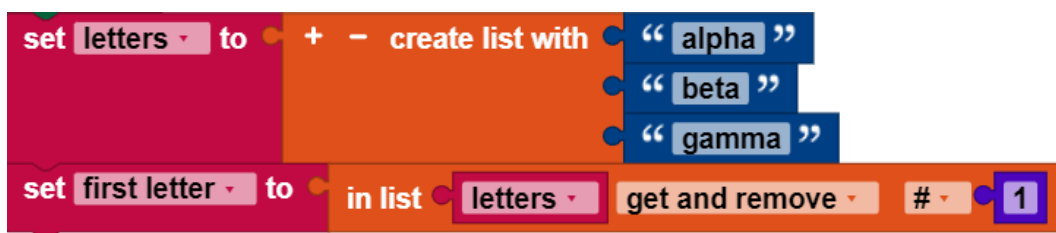


## Get and remove an item

You can use the drop down menu to change the block **in list ... get** to the block **in list ... get and remove**, which delivers the same output, but also changes the list:



this example sets the variable **first letter** to “alpha” and leaves the remaining letters ([“beta,” “gamma”]) in the list.



## Removing an entry

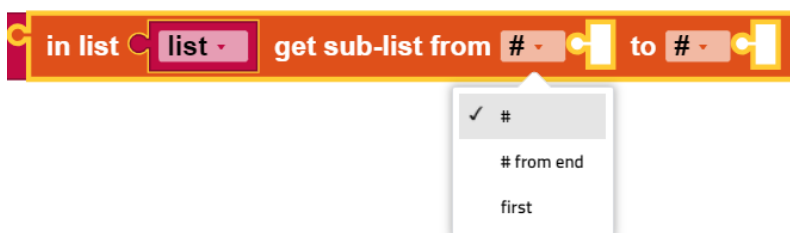
If you select **remove** from the drop down menu, the tab at the left of the block will be removed:

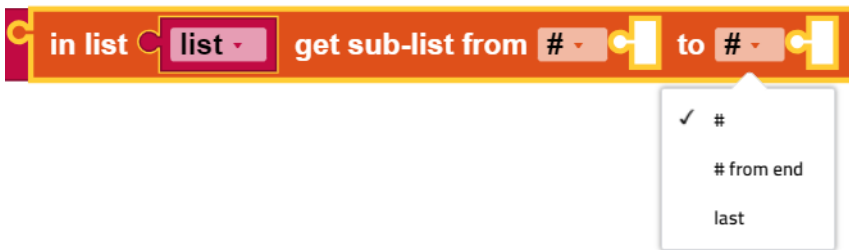


Then, the first item from **letter** will be removed.

## Get a sub-list

The block **in list ... get sub-list** is similar to the block **in list ... get**, with the difference that it extracts a sub-list and not an individual item. There are multiple options to enter the start and end of the sub-list:





In this example, a new list **first letters** is created. The new list has two items: ["alpha," "beta"].

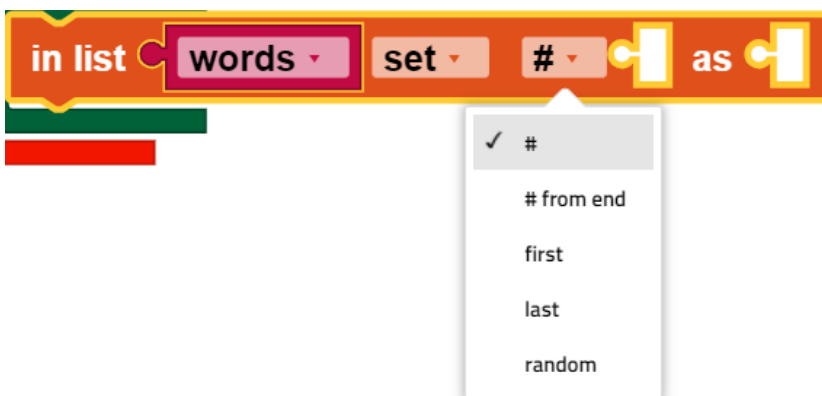


Please note that this block does not change the original list.

## Adding items to a list

### Replacing items in a list

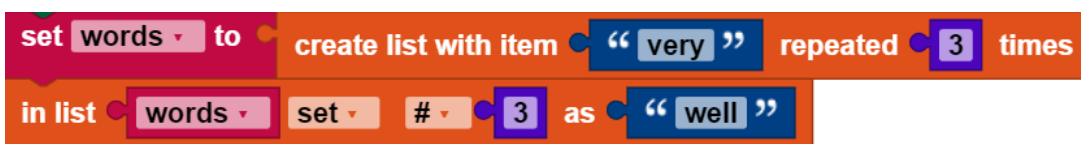
The block **in list ... set** replaces the item at a certain point in a list with another item.



The meanings of the individual drop down options are outlined in the previous section.

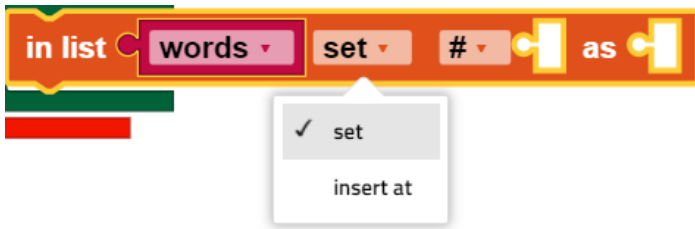
The following example does two things:

1. The list **words** is created with 3 items: ["very," "very," "very"].
2. The third item in the list is replaced with "good." The new value of **words** is ["very," "very," "good"]



### Insert items from a certain point into a list

The **in list ... insert at** block is accessed via the drop down menu for the **in list ... set** block:



It inserts a new item at the indicated point into the list, before the element that was previously located there. The following example (which builds on an earlier example) does three things:

1. The list **words** is created with 3 items: ["very," "very," "very"].
2. The third item in the list is replaced with "good." The new value of **words** is therefore ["very," "very," "good"].
3. The word "Be" is inserted at the start of the list. The final value of **words** is therefore ["Be," "very," "very," "good"].



## Divide character strings and merge lists

### Make list from text

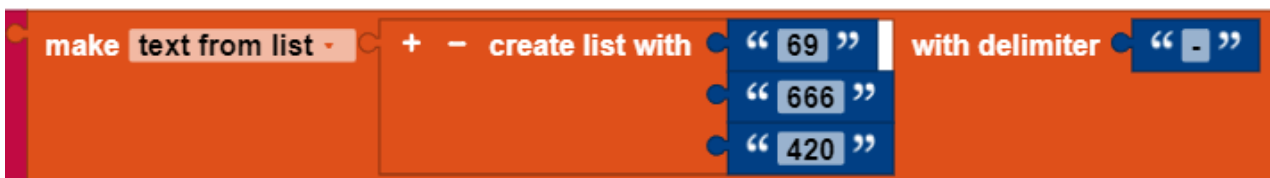
The block **make list from text** uses a delimiter to divide the given text into parts:



In the example above, a new list will be returned containing three segments of text: "311," "555" and "2368".

### Make text from list

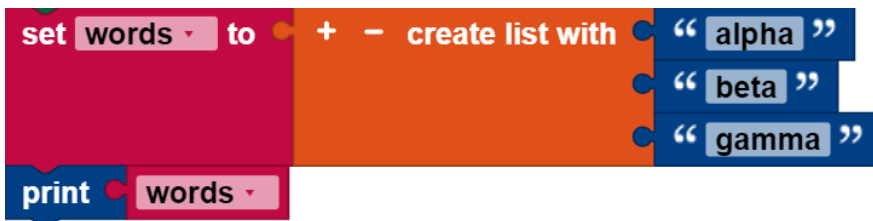
This block **make text from list** assembles a list into a single text using a delimiter:



## Related blocks

### Printing a list

The **print** block in the text category can output lists. The result of the following program is the console output shown:



Console

Program starts ...

['alpha', 'beta', 'gamma']

Program finished.

## Complete something for each element in a list

The **for each** block in the controller category executes an operation for each element in a list. This block, for example, prints each item in the list individually:



The items in this case are not removed from the original list.

See also the examples for [break out blocks](#).

# Map

# JSON

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