CONTAINERS AND TOKENS

In Cabri, a container represents a set, displayed as a rectangle. Tokens are possible elements of the set, and can be put in one or more containers. For example, the container below represents a fruit basket, and the apples and bananas are tokens. See Cabri Author file **container_and_tokens** page 1.

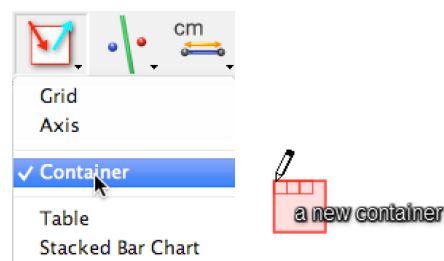# Apple(s): 1
Banana(s): 2
Fruit(s): 3

Fruit basket

The apples and bananas can be dragged into the fruit basket. The counters above the fruit basket container show the number of apples, bananas, and fruits in the container.

We will explain here how to create such a "fruit basket".

1. CREATING A CONTAINER AND DEFINING TOKENS

Select the **Container** tool.

A new container will appear attached to the cursor.

Click to place the top left corner of the container rectangle.

Move and then click to place the bottom right corner of the rectangle.

Using the **Point** tool, create six points: three for the apples, and three for the bananas.
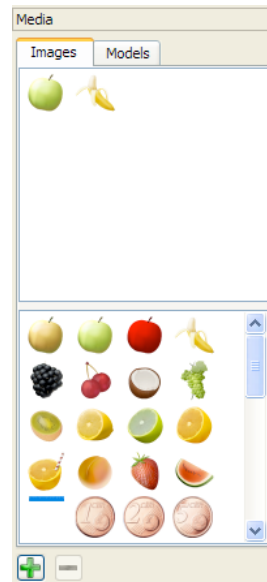
Next, click on the grey arrow on the right of the view window to open the Inspector.

Now select the **Media** panel,

and the **Images** pane.

Click to select the "green apple" image (note that this may only appear in the bottom half of the pane), move the mouse to a point and click on it to attach the image to the point.

As a shortcut, move the mouse (do not drag!) to the location where you want to attach the apple to a new point, hold down the `Ctrl` key (`alt` on a Mac) and click to create a new point with the image attached.

When you have attached apples to three points, select the "banana" image, and repeat to attach bananas to three points.
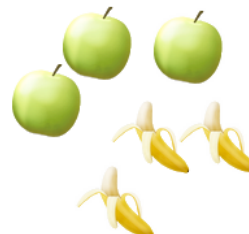
The next step is to turn these points with images into tokens. We would like the three points with the apple images to become tokens belonging to an "APPLE" class and the three points with the banana image to become tokens belonging to a "BANANA" class.

NOTE: Only points or images (or models) attached to points can be made into tokens. An image on its own cannot become a token.
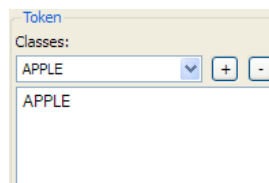
Activate the **Tokens and Containers** panel in the Inspector.
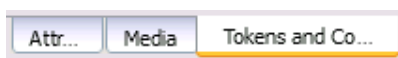
Now select all the apple images (hold `shift` or use a selection rectangle to select multiple objects).
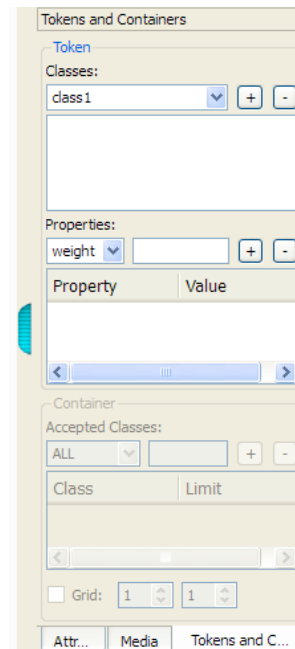
In the Classes edit field at the top of the panel, type "APPLE" and press the ⊞ button to create the APPLE class and make the selected apples into tokens in this class.

Repeat to create the BANANA class and make the bananas tokens in this class.

Now drag a fruit token over the container. The border of the container will highlight to show that the token can be dropped in. Drop the token into the container and drag the container: the token will remain inside.

You may also drag the token out of the container.

In contrast, if you drag an object that has not been defined as a token over the container, the border will not light up. The object may be dropped on top of the container, but will not remain on top of the container as the container is dragged.
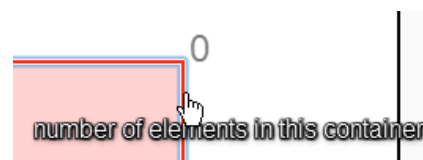
2. COUNTING THE CONTENTS OF A CONTAINER

Let's now create counters to count the numbers of apples, bananas, and fruits in the container.

Select the **Count** tool.
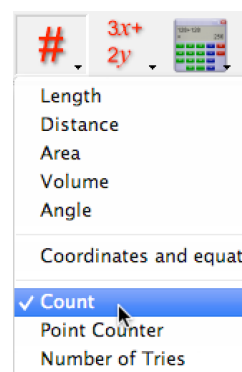
Click on the container. The number, attached to the container, is the total number of tokens in the container.
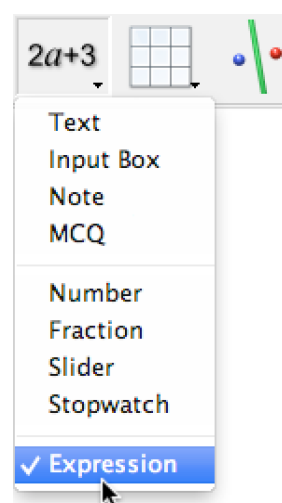
Drag an apple into the container to see this number change.

It is also possible to display the number of apples and the number of bananas in the container.

We first need to create an expression.
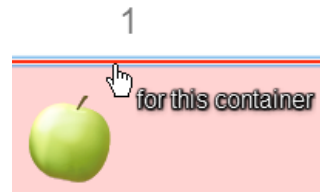
Select the **Expression** tool.

Click on the page and then type "APPLE", the name of the class of tokens. Press `return` when you have finished.

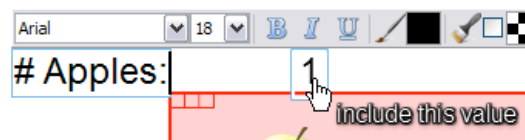Now select the **Count** tool and click on the "APPLE" expression.

Now click on the container.

The number that appears is the number of apple tokens within the container.

Repeat with a "BANANA" expression to get the number of banana tokens in the container.

To label these numbers, use the **Text** tool to enter appropriate text, and then click on the number to include it in the text.

To test the construction, drop some fruit in the basket and then take some out. The counters will display the total number of fruits in the basket, and also the number of apples and bananas.

3. ADDING AND DELETING TOKENS: THE TOKEN DISPENSER

To add a token to either class, select the point or image attached to a point, return to the **Token** pane of the **Tokens and Containers** panel, scroll to the required class name and click on the + button.
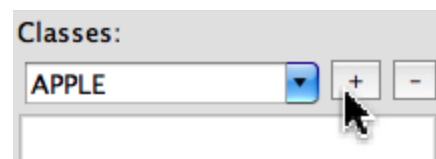
An alternative, which will give you an unlimited supply of tokens belonging to a particular class is to define a point with an image as a token belonging to a particular class, and then turn this token into a dispenser.

Select the **Turn into Dispenser** tool and click on the token. See Cabri Author file *container_and_tokens* page 2.

Each time the new token dispenser is dragged a new token will appear. See the **DISPENSERS** documentation for further details.

If you click again on the token using the **Turn into Dispenser** tool, the token will cease to be a dispenser.

A single token may be added to more than one class: the token selected belongs to each of the three classes listed.
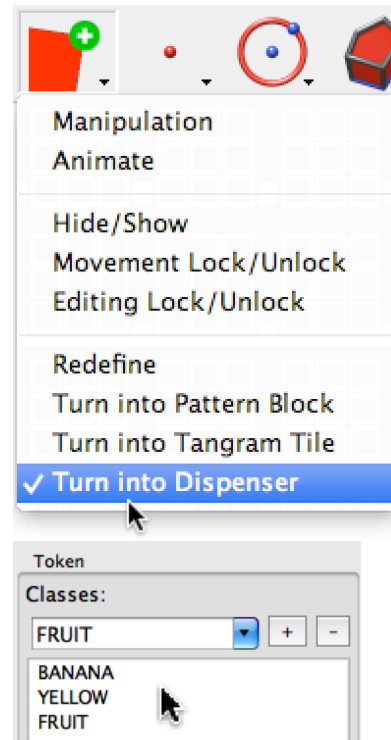
To stop a point or image attached to a point from being a token for a class, select the point or image attached to a point, return to the **Token** pane of the **Tokens and Containers** panel, scroll to the required class name and click on the button.
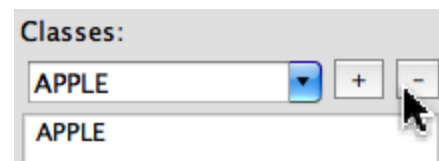
4. CONTROLLING THE NUMBER OF TOKENS THAT CAN BE DROPPED INTO A CONTAINER

Let's say that we want to limit the basket to hold a maximum of three fruits (e.g. three bananas, two bananas and one apple, etc).

First, select the **Manipulation** tool and remove all tokens from the container. Now select the container and open the **Tokens and Containers** panel.

In the **Container** pane, note that currently ALL is shown under Class, with no limit given. This is the default when a container is created, and means that any number of tokens from any class may be placed in the container.

Make sure that "ALL" is selected in the Accepted Classes drop-down menu and enter "3" (the maximum number of tokens for the container). Now press the ⊞ button to set this limit.
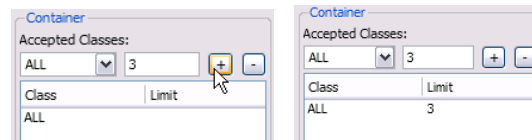
Now let's further limit the container to a maximum of two apples or bananas. Scroll to the appropriate classes and enter the limits as above.
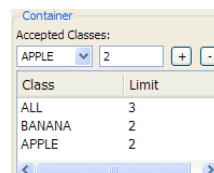
Try to drop some fruit into the basket. When you try to drop in more fruit than is allowed, instead of going into the container the rejected fruit is automatically replaced at its previous location.

To remove a class limit, select the class in the list, delete the corresponding number and press the ⊞ button.

5. GIVING VALUES TO TOKENS

Individual tokens may be assigned a value, and the value of all tokens within a container may be found. See Cabri Author file *containers_and_tokens* page 2.

Select the tokens or token dispenser to which you want to assign a value. Note that individual tokens within a class may be assigned different values, but all tokens which come from a dispenser will have the same value as the dispenser.

In this case, the apple token dispenser has been chosen.
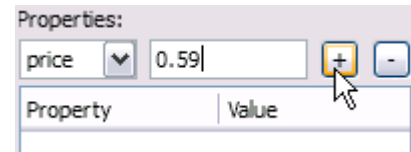
Open the **Tokens and Container** panel in the Inspector and go to the Properties box, halfway down the panel.
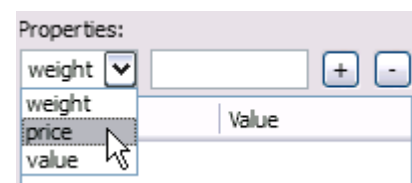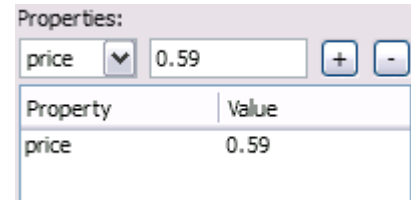
Choose the name of the value you want to assign (in this case price) or type in the name for a new value (e.g. cost).

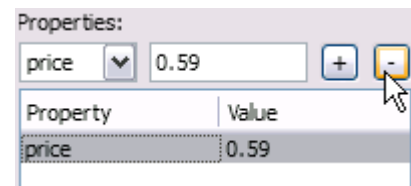Type in the value per token and click on the + button.

All apples taken from the apple token dispenser will now have a price of 0.59.

Repeat this for the banana token dispenser to give banana tokens a cost of 0.39.

To remove a property, select the token or tokens and then click on the property in the list and press the - button.

Now use the **Expression** tool to create the expression "price". Press enter when you have finished.

Put some of the apples or bananas to which you have assigned a price into the container.

Now select the **Count** tool and click on the "price" expression.
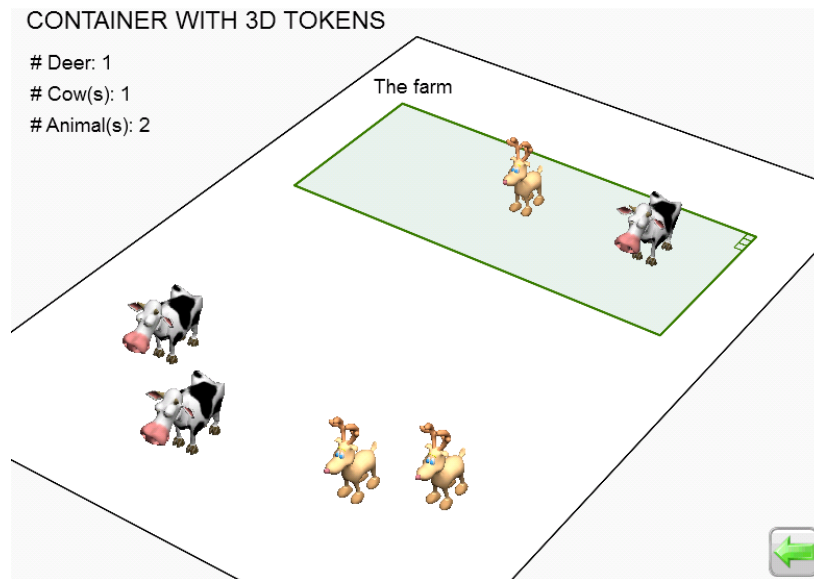
Now click on the container.

The number that appears is the total price of the tokens within the container.

It is possible to create text and embed this number.

5. THE FARM EXAMPLE: 3D TOKENS

CONTAINER WITH 3D TOKENS

\# Deer: 1
\# Cow(s): 1
\# Animal(s): 2

The farm

As shown in the "farm" example, 3D objects may also be defined to be tokens. See Cabri Author file ***container_and_tokens*** page 3.

The first step is to attach appropriate 3D models to points. Select the Inspector **Media** panel as before, but this time click on the **Models** tab.

Click to select a model, such as the "deer" , then move the cursor and click on a point to attach the model to the point. As a shortcut, note that a click with the `Ctrl` key down (`alt` on a Mac) will directly create an object attached to a point.
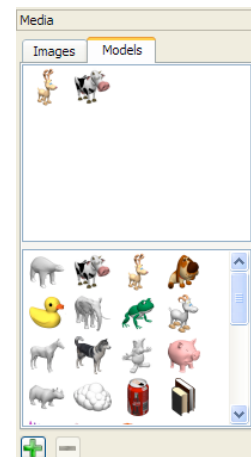
model attached to a new point

When you have attached the models that you want, proceed exactly as for the fruit basket, to define classes, make the selected models into tokens in particular classes and to give values to the tokens.

6. GRID FOR A CONTAINER

A rectangular grid may be associated with a container. Tokens dropped into the container will then be automatically placed within the grid, which prevents overlapping and ensures that tokens are always fully displayed.
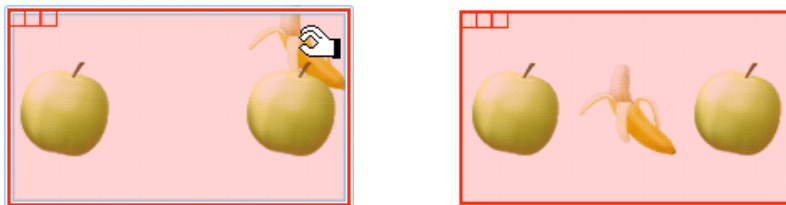
To enable the container grid:

Choose the **Manipulation** tool and then remove all tokens from the container.

Select the container, and open the **Tokens and Containers** Panel.

Check the Grid checkbox in the lower part of the panel, and choose the number of rows and then the number of columns.

The appearance of the container will not change, but when an acceptable token is dropped in, it will automatically be placed in the grid.

To disable the container grid, empty the container, select it, and uncheck the Grid checkbox.

6. STATES OF A CONTAINER

When a container is unlocked, at the top left corner of the container three checkboxes are visible, which give access to three specific states of the container.

From left to right, these are the *Reduced* state, the *Closed* state and the *Opaque* state. By default, all states are disabled, and clicking on a box toggles the corresponding state.

Reduced state   When reduced, the container rectangle is reduced to a small square. The user can drop in tokens as usual, but the embedded tokens are not displayed.

Closed state   When closed, the container rejects all tokens a user attempts to drop in.

Opaque state   When opaque, the user can drop in tokens as usual, but the embedded tokens are not displayed.

Notes:

- The appearance of a container may be modified by selecting the container, choosing the **Attributes** panel of the Inspector and changing colour, fill, etc as desired. An image and/or a model may also be attached to a container.

- To change the size and/or shape of a container, move the cursor to its bottom left corner until a double-headed arrow appears. Now click, hold down, and drag.

- Tokens may not be added to the container if it is hidden. If you want the container to be invisible, choose a white colour and no fill for the container. In Student mode, the container by default cannot be selected by the student and hence will not appear if the cursor is near it.

———