

BOOLEANS AND LOGICAL TESTS

A Boolean is an object which has the value **TRUE** or **FALSE**. If the Boolean is the result of an operation which cannot be performed (an example will be given below) then the Boolean will be displayed as “?” and does not have a value.

Booleans may be free (independent of any other object) or the result of an operation, in which case the Boolean is dependent on the objects used in the operation.

1. CREATING A FREE BOOLEAN

Choose the **Number** tool.



Click on the page to place the Boolean and type true/True/TRUE or false/False/FALSE.

True

To finish entering the value, press **return**, click elsewhere on the page or select another tool.

True

Booleans may also be entered in an input box. See the **INPUT BOXES** documentation for further details.

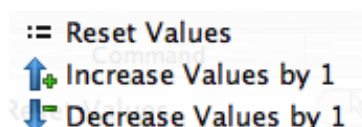
True

2. CHANGING A FREE BOOLEAN

If the Boolean is free, double-click on it and change its text.

Warning: do NOT attempt to change any other Boolean: the result will be treated as text only.

Free Booleans may also be changed using the actions below:



Increasing and decreasing have the following results:

Increase Values by 1

Decrease Values by 1

TRUE	TRUE	FALSE
FALSE	TRUE	FALSE

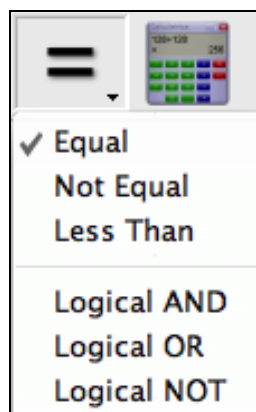
See the [ACTIONS](#) documentation for further details.

3. OPERATIONS WITH BOOLEANS

Booleans are also the result of Boolean operators which use either numbers or Booleans. Note that if the input to a Boolean operation is changed to a form that the operator cannot deal with (for example if a number is changed to text), then the Boolean will change to ? and no longer has a value. See Cabri Author file *booleans*.

The available operators are “**Equal**”, “**Not Equal**”, “**Less Than**”, “**Logical AND**”, “**Logical OR**” and “**Logical NOT**”.

3.1 Boolean operations using the **Logical Operators** toolbox



To apply the **AND** (or **OR**) operator to two Booleans:

1. Select the **Logical AND** (or **Logical OR**) tool.
2. Click on the first Boolean, then on the second one.
3. Click to place the Boolean result in the view.

To apply the **NOT** operator to a Boolean:

1. Select the **Logical NOT** tool.
2. Click on a Boolean.
3. Click to place the Boolean result in the view.

To test the equality (or inequality) of two numbers or Booleans:

1. Select the **Equal** (or **Not Equal**) tool.
2. Click on the first number or Boolean, then on the second one.
3. Click to place the Boolean result in the view.

To test if one number is less than another number:

1. Select the **Less Than** tool.
2. Click on the first number (p), then on the second one (q).
3. Click to place the Boolean result ($p < q$) in the view.

Other inequalities:

1. To test whether $p > q$, select the **Less Than** tool, then select q and then p.
2. To test whether $p \leq q$, use the **Less Than** tool to find the Boolean for $q < p$, and then select the **Logical Not** tool and apply it to this Boolean.
3. To test whether $p \geq q$, use the **Less Than** tool to find the Boolean for $p < q$, and then select the **Logical Not** tool and apply it to this Boolean.

Note: The **MACROS** documentation gives an example of creating macros involving these inequalities.

3.2 Boolean operations with the calculator

The operations **AND** and **OR** are supported by the calculator. Click on the first Boolean to enter it in the calculator, then enter “*” (or click on the x button) for **AND** or “+” for **OR** and then click to enter the second Boolean.

3.3 Boolean operations in expressions

Use the symbols “*” for **AND** and “+” for **OR** as with the calculator. Use the function “*not()*” for the **NOT** operator. In addition, the symbol “^” may

be used for the **XOR** (exclusive or) operator. See details in the [CALCULATIONS AND EXPRESSIONS](#) documentation.

4. USING BOOLEANS

The main use of Booleans is to control actions. If, for example, you want to give students feedback as to whether they have entered the correct answer, you can create a Boolean which is **TRUE** when the student response and the correct answer are equal and is **FALSE** when they are not. This Boolean may then have actions attached, which will show the text “Correct” when the Boolean becomes **TRUE** and “Try again” when the Boolean becomes **FALSE**. The [ACTIONS](#) documentation shows how to attach such actions to a Boolean and the [INPUT BOXES](#) documentation gives an example of such a use. The [STOPWATCHES](#) documentation gives an example of using a Boolean to control the start of a race.

Note that if a Boolean has actions attached to it, and a macro is created with the Boolean as result, the Boolean created by the macro will have the same actions attached as the original Boolean. See the [MACROS](#) documentation for details.

5. COPYING BOOLEANS

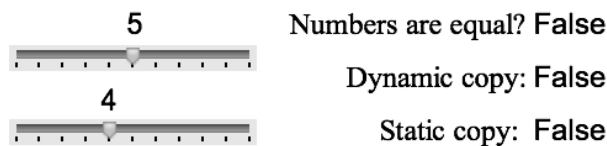
To copy a Boolean, select the Boolean (or Booleans) and press [Ctrl-C](#) ([apple-C](#) on a Mac) or use [Edit – Copy](#). Booleans may then be pasted to any page in the activity book.

There are two choices for pasting the Boolean.

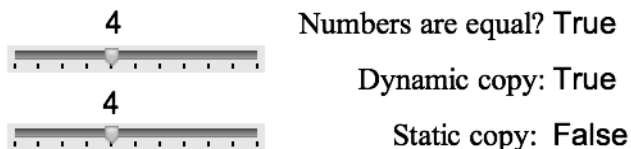
1. Static. Paste using [Ctrl-V](#) ([apple-V](#) on the Mac) or [Edit – Copy](#). This creates a free Boolean with the value that the original Boolean had when copied. The new Boolean will not change when the original Boolean changes, but may be edited. (This is a useful short-cut to create a new free Boolean.) Static copies may be copied to other Cabri files, and are unaffected by deletion of the original Boolean.
2. Dynamic. Paste using [Ctrl-Shift-V](#) ([⌘-V](#) [alt-apple-V](#) on the Mac) or [Edit – Clone Copied Value](#). This creates a dynamic copy or clone of the original Boolean, which will change when the original Boolean changes. Dynamic copies may only be created

within the file containing the original Boolean, and will be deleted if the original Boolean is deleted.

The difference is illustrated in the two screenshots below. In the first screenshot, a Boolean has been created to represent whether or not the two numbers are equal. A dynamic copy and also a static copy of this Boolean have been made.



The top slider has now been changed to make the numbers equal.



Note that the original Boolean and the dynamic copy have both changed, while the static copy has remained the same.

6. CHANGING THE APPEARANCE OF A BOOLEAN

The colour, size, font, etc. of any Boolean may be changed by selecting the Boolean and using the **Attributes** panel in the Inspector.

7. EMBEDDING A BOOLEAN IN TEXT AND TABLE CELLS

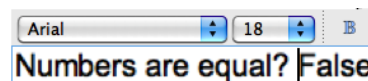
7.1 Surrounding a Boolean by text

Dependent Booleans may easily be surrounded by text.

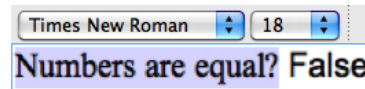
Double-click on the Boolean. A cursor will appear either to the right or left of the Boolean.



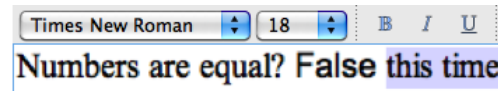
Type in the text that you want.



This text may be formatted differently from the Boolean itself.



Text may also be entered to the left of the Boolean.



WARNING: Use the keyboard arrow to move the cursor across the Boolean to make sure that you do not accidentally try to enter text on top of the Boolean. If the drop-down font menu disappears do not try to edit the Boolean.

Click outside the text to finish editing.

Numbers are equal? False this time

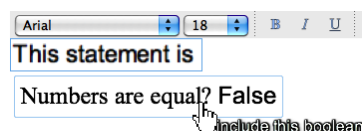
If you copy this Boolean, the text will also be copied (statically). The Boolean may be used in further operations, or included in text as below. If the Boolean is deleted, the text will disappear.

WARNING : Free Booleans may not be surrounded by text in this manner.

7.2 Inserting a Boolean into text

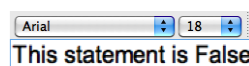
All types of Booleans may be inserted into text.

Use the **Text** tool and enter some text.

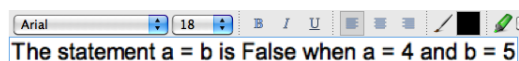


Move the cursor over a Boolean. Make sure the tooltip says « include this boolean » rather than « edit this boolean »

Click on the Boolean. A copy of the Boolean (but not any text surrounding it) will appear in the text.



You may insert further Booleans or numbers in the same text. Here, the slider numbers 4 and 5 have been inserted.



The Booleans and numbers represented in the text will change as the originals change, but may not be selected for any further operations.

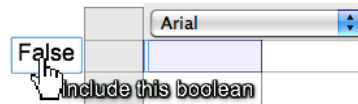
The statement $a = b$ is True when $a = 3$ and $b = 3$

If the original numbers or Booleans are deleted their copies will disappear from the text but the text will remain. The text to the right is what remains if the original number representing b is deleted.

The statement $a = b$ is when $a = 3$ and $b =$

7.3 Embedding a Boolean into a table cell

To enter a Boolean into a table cell, the Boolean must already exist elsewhere on the page. Select the cell and then click on this Boolean to place a copy of it in the cell.



If you type **TRUE** or **FALSE** directly into the cell (or into any text) it will be treated as text only.