

## 2. A tutorial on notebooks

- If you want to read this book “live” (as intended) you will need to read this chapter on screen and with *Mathematica* running, and do the things it says to do. You won't get much out of it by just reading the hard copy, but here it is for quick reference :

### 2.1. What are *Mathematica* notebooks?

Every document produced by the *Mathematica* front end is a “notebook”, and every chapter of the CD version of this book is a “notebook”. The notebook allows a document to present itself in outline form, with each topic and subtopic opening up for reading on command, or closing up again on command. Notebooks require a little explanation, but they soon seem very natural.

Notebooks are divided into cells, which are rather like paragraphs. The individual cells are usually grouped by enclosing brackets of increasing length. When you read this book on-screen, you will see nested blue brackets on the right side of the screen. In the printed book, this chapter is the only one that displays the nested brackets. Look →

This paragraph-like cell is grouped by a secondary Section bracket that encloses all of Section 2.1. All Section brackets are in turn enclosed by an outer bracket that begins at the top of the notebook and runs all the way to the bottom, enclosing all of Chapter 2. If you click once on the outer bracket, it will turn dark and you will have “selected” the whole notebook, as if for Copying or (God forbid!) Deleting. Well, of course, you can delete the loaded copy from RAM, but not from the CD.

If you click *twice* on the outermost bracket, the notebook will fold up and you will be left with only the Chapter title showing. To reopen, click twice on the outer folded bracket (with a small dark triangle, like a down-pointing half arrow), and the notebook will reappear.

Go ahead. Do it. The whole reason for putting this book on a computer is to let you try things as we go.

To open the Section heading below (“2.2. A basic notebook tutorial”), click twice on the middle bracket to its right, the one with the little dark

triangle at the bottom. It will unfold, showing the subsection headers. They open similarly.

To fold it up again, click twice on the same (but now expanded) bracket. It will shrink and the little dark triangle (or downward half-arrow) will reappear, indicating that the bracket is expandable. All multiply bracketed cells can be unfolded and folded up again in this way.

## 2.2. A basic notebook tutorial

### 2.2.1. Magnification

Every notebook window has a magnification option on its bottom edge, just left of the horizontal scroll bar. By default, the chapters of this book are set for 200%. Click the little dark triangle and other magnification choices will drop down. Try some other sizes.

### 2.2.2. Make a new cell with **1+1** in it

Move the cursor around until, between two existing cells, it turns to a horizontal bar with split ends. Click once, and it turns to a long horizontal “insertion line”. This is where the new cell will appear, if you start typing. For instance, you can do it just below, typing “1+1” (without the quotes) :

The “1+1” you just typed is in an **Input** cell, distinguished its **Bold Courier** type face. This is the kind of cell you want when preparing input for calculations. (Go ahead, do it! Nothing terrible can happen!)

Now we discuss how to get *Mathematica* to compute **1+1** for you.

### 2.2.3 The initial computation

Put your cursor anywhere in the **Input** cell you just created, and hit `SHIFT-ENTER` or `SHIFT-RET`. One of these should cause something to happen; remember which one does the job. We will call it the **Process** command.

In this book, the **Process** command will be represented by  $\leftarrow$ .

On a Macintosh, you may use `ENTER` by itself, or the `SHIFT-ENTER` combination, or the `SHIFT-RET` combination. On PCs, the `SHIFT` is required.

If you are starting up a new notebook, you may now experience a little distraction. A question will appear in a box :

*Do you want to evaluate all the initialization cells in this notebook?*

For notebooks from this book, you must always click YES. Otherwise, the notebook may not work properly.

In this book, the initialization cells are mostly in the **Preliminaries** section at the top of every chapter. (You can open them and see them, but they are hard to understand; don't try until you know more.)

After the question disappears, an **Output** cell appears, bracketed with its **Input** cell. These cell types can be distinguished at a glance:

**Input** cells have **Bold Courier** typeface;

Output cells have Plain Courier typeface.

After processing, notice the appearance of the blue `In[ ]` and `Out[ ]` cell labels. These will prove very useful. Unprocessed **Input** cells (a major cause of error for beginners) will not have the blue label.

Try a few other simple sums until you are very familiar with the **Process** command. On a Macintosh note that both `ENTER` and `SHIFT-ENTER` can act as a Process command. Then clean up after yourself. Select *the innermost bracket* of each new cell and hit the **delete** key. Or, leave one example standing. It's up to you.

## 2.2.4 Text cells

Notebooks have **Text** cells as well as **Input** and **Output** cells. **Text** cells provide a place for commentary on your calculation (or for most of the text of this book). This cell is a **Text** cell. All **Text** cells have a short horizontal line near the top of the innermost cell bracket.

To make a new **Text** cell, make an insertion line and start typing. A new cell will appear, and it will be, by default, an **Input** cell. After a few characters, stop and issue **Option-Command-7** (that's `[OPTION]-[CMD]-7`, or `[OPTION]-⌘-7`). The cell will turn to a **Text** cell, distinguished by its 10-point Times type face.

## 2.2.5 Heading cells

Notebooks also have heading cells of several different types. Make an insertion line and start typing a heading. After a few characters stop and issue **Option-Command-4** (`[OPTION]-[CMD]-4`, or `[OPTION]-⌘-4`). It will become a cell of type **Section**, in 14 point type.

Other headings are made by commands of the form **Option-Command-digit** (`[OPTION]-[CMD]-digit` or `[OPTION]-⌘-digit`), where **digit** is any digit from 1 to 7. In the *vonFoerster* style sheet used by this book, digits 1-6 are headings of decreasing rank, and 7 is **Text**, 8 is a magnification toggle, and 9 is **Input**. You may switch a cell freely among any of these types by putting the cursor anywhere inside it, holding down **Option-Command** (`[OPTION]-[CMD]`, or `[OPTION]-⌘`), and typing different digits. Try it.

In this book every chapter uses the hierarchy

**ChapterLine** (autonumbered, `[OPTION]-⌘-1`)

**Section** (autonumbered, `[OPTION]-⌘-4`)

**Subsection** (autonumbered, `[OPTION]-⌘-5`)

**Subsubsection** (not numbered, `[OPTION]-⌘-6`)

## 2.2.6 Processing cell groups

Select any grouping bracket, open or not, and issue a **Process** command. This will processing all the selected cells. If you select the outermost bracket that encloses the whole notebook, you will **Process** the whole notebook with one hit.

### 2.2.7 The active way to read a notebook

With the cursor right here in this cell, do a `[SHIFT]-[ENTER]`. The **1+1** below will be selected and another `[SHIFT]-[ENTER]` sends it to the processor. A third selects the next evaluable cell, and a fourth evaluates that. Try it :

**1 + 1**

**2 + 2**

You can click down the whole notebook by keeping the **Shift** key depressed and repeatedly typing **Enter**. This is a good way to evaluate a pre-written notebook at a human pace, following the logic as you click down. You can stop at any point and carry out experiments of your own.

If you want to do further work in a newly opened notebook, select everything above your starting point and `⌘`. It will run down to your starting point, making all necessary the definitions as it goes. Then you can start work.

### 2.2.8 Fold and unfold groups of cells

Select a grouping bracket and do a `[SHIFT]-⌘-}` (shift-command-close-Bracket). The selected bracket (and all sub-brackets within it) will close. If you select the whole notebook, you can close the whole notebook with one stroke, leaving only the title showing. Then click twice on the outermost bracket, and you get a nice compact index of Sections for the whole notebook.

Similarly, `[SHIFT]-⌘-{` (shift-command-openBracket) opens a selected section, and all its subsections.

This is really all you need to know to get started using notebooks.

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