# Informatics for Musicology (IPM) 2024/25

Jupyter Notebooks

## Teacher: JN Oliveira

Department of IT at U. Minho, in collaboration with  ENSICO
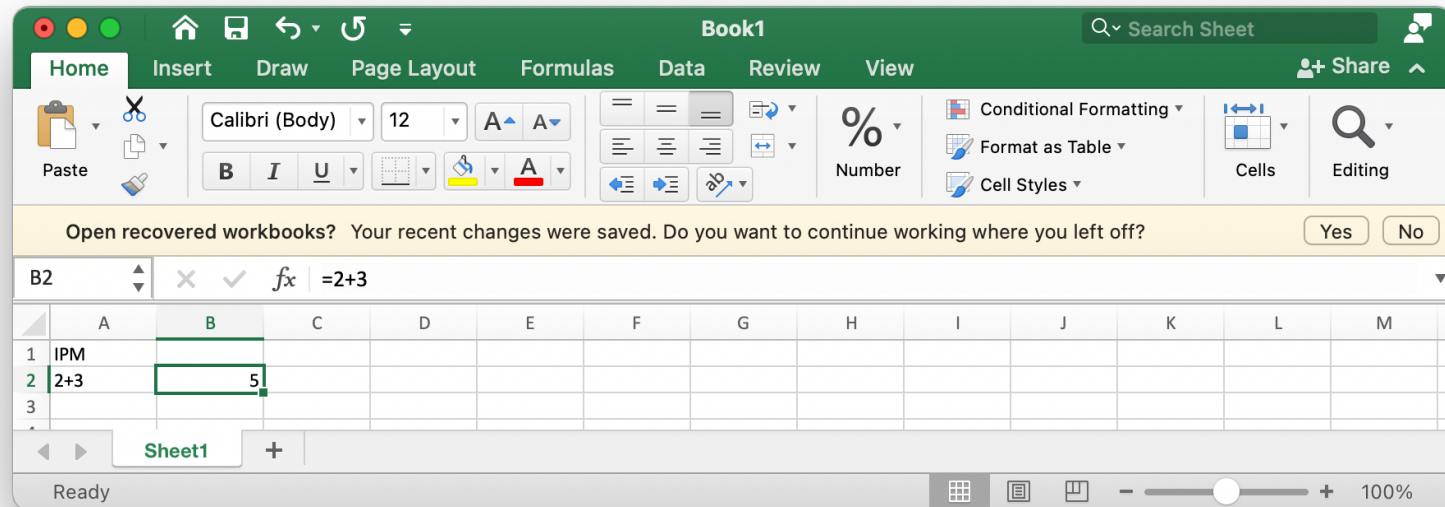
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## PL Class from 01-Oct : Laboratory practice in Jupyter Notebook
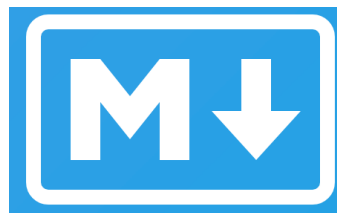


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## 1st part – Jupyter lab

- Jupyter lab = "Virtual computer"

- Jupyter notebooks ( **.ipynb** ) – " *electronic diary notebook* "

- Paradigm: inspiration from

- Document based on interpretable **cells** .

- Cell types.

- Cell operations.

- Navigation.

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## 2nd part – Jupyter notebook: Markdown notation (MD)



- Use the next cell to experiment as you explain the notation.

. . .

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1.1 – Edit the mechanographic number and name as appropriate.

| N.M. | Name |
|------|------|
| d88 | *José Nuno Fonseca de Oliveira* |

---

1.2 – Format in **bold** and associate the link *https://www.markdownguide.org/getting-started/* with the second occurrence of the word *Markdown* in the following cell.

- Markdown is a simple text formatting language. Created by John Gruber in 2004, Markdown is now one of the most popular text formatting languages in the world.

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1.3 – **Executable cells** : calculate  2+3 in the next cell.

In [ ]:

---

1.4 – Reproduce the following in a new text cell:

# 'BabeliUM' de IPM

- DSL **Domain Specific Languages**
  - Música
    - ABC
  - Texto
    - MD
    - HTML
    - LaTeX
- PL **Linguagens de Programação**
  - Haskell

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1.5 – By inspecting the alignments in the following table,

| THE | B | W | D | AND |
|---|---|---|---|---|
| abcd | efkg | | k | h |
| ij | | 1234 | | |
| | the | k | lmnopq | |
| z | | | | |

edit the cell below so that the mechanographic numbers are centered and the names are aligned to the left.

```
In [ ]:  |  Nr      |  Name                            |
         |---------|-------------------------------|
         |  a101935 |  Ana  Bárbara  Francisco  Gabriel  |
         a101938  Dinis  Cunha  Andrade
         a105279  João  Jorge  Soares  Moreira
         a102204  João  Henrique  Mestre  Conceição  Inácio
         a105602  João  Miguel  Pereira  de  Oliveira
         a105810  Mohammad  Najib  Angar
         a102201  Inês  Beatriz  Martins  Neves
         a102220  Matilde  Sampaio  Teixeira
```

1.6 – Edit the next cell so that it is associated with a button like this ⏯ the music graduation promotional video .

....

1.7 – By inspection of this cell,



Place below the photograph of the famous painting by JS Bach (1748) found on this page .



1.8 – Example of a local image

Add any other local image to this cell by simple **copy/paste** : ...

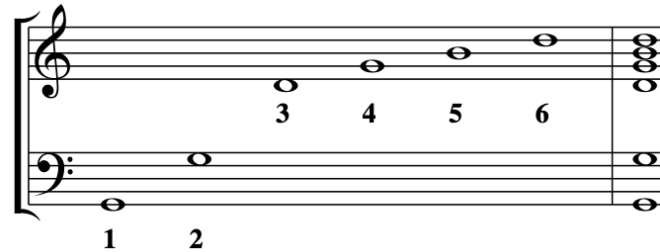1.9 – **Mathematical text** . Taking as an example the mathematical text that appears in

- farm = $\frac{3}{2}$

write in the next cell the fraction whose numerator is 2 and the denominator is the sum of 1 with the fraction one third.

> ….

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## 3rd part – Jupyter notebook: Executable cells

Range calculations in executable cells (from " sestina "):



Start by executing the next cell, which "teaches" Jupyter how to work with **fractions** (rational numbers).

In [ ]:
```
: opt  no – lint
: m   Data . Ratio
```

---

1.10 – The following ranges are given (run the next cell):

In [ ]:
```
octave  =  2  %  1
fifth  =  3  %  2
```

Confirm that `oitava` and `quinta` are well defined:

In [ ]:
```
eighth
fifth
```
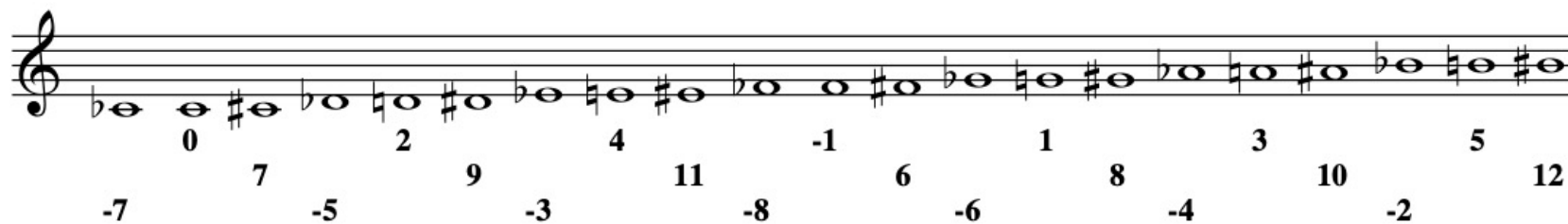
Looking at the figure above, define the intervals:

In [ ]:
```
Wednesday     =  undefined
Tuesday   =  undefined
Third  =  undefined
```

---

1.11 – Calculate, using only octaves and fifths,

- the second major interval
- the major sixth interval

In [ ]:
```
Monday  =  undefined
Friday  =  undefined
```

---

1.12 – In an alternative system, we will represent all the notes of an octave by the number of accidents of the tonality of which it is fundamental (positive if sharp, negative if flat):



(This is an additive system, that is, the intervals are obtained by additions (or subtractions) and not by multiplications or divisions.)

In [ ]:
```
do       =    0
dó_bem   = − 7
do_sus   =    7
re       =    2
re_bem   = − 5
re_sus   =    9
mi       =    4
mi_bem   = − 3
mi_sus   =   11
fa       = − 1
fa_bem   = − 8
fa_sus   =    6
sol      =    1
sol_bem  = − 6
sol_sus  =    8
there      =    3
there_bem  = − 4
there_sus  =   10
si       =    5
si_bem   = − 2
si_sus   =   12
```

Evaluate the following expressions and draw conclusions:

In [ ]:
```
mi  −  do
do  −  lá_bem
sol_sus  −  mi
```

In [ ]:
```
sol  −  mi
do  +  ( mi  −  do )  +  ( sol  −  mi )  ==  sol
```

In [ ]:
```
do_sus  −  do
do_sus  −  re_bem
```

Transpose the C major chord  [ dó, mi, sol ]  a major third below:

In [ ]:

Define the D-flat major chord and transpose it to its enharmonic C-sharp major:

Carry out other experiments with this system of representing musical notes.

In [ ]: