Note on Mathematica Programming

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July 12, 2019

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Part I

Basics of Wolfram Language

Chapter 1

Features of Mathematica

1.1 Evaluating Commands

On desktop and web, you may press **Shift+Enter**. On mobile, press the Wolfram icon vbutton

1.2 Auto Complete

Within the Mathematica notebook, you'll see a variety of aids to help you enter the Wolfram Language.

1.3 Studying Resources

You may RTFM(Read The F***ing Manual) or visit Wolfram website to equip essential skills on Wolfram Language. Or you can JFGI(Just F***ing Google It) if your problem can't be solved. Note that you need to use Google instead of Baidu due to study efficiency and you'd better use English to search for help.

1.4 Elementary Arithmetic

Command	Expression	Example
Add	+	2+2
Subtract	-	2-2
Multiply	*	2*2
Division	/	2/2
Power	^	2^2
Brackets	(and)	(2+3)/5

Chapter 2

First glance at the Functions

2.1 Usage

Functions names are all started with capital letters. To use a function, attach a "[]" behind the name of function and input parameters separated with "," into the brackets. Tip: insert a single space after the comma to make your code more visualized.

Example **Plus** [3,4,5] *Output:* 12

You may use the output of function as a parameter of other functions.

Example **Times**[2,**Plus**[2,3]] *Output:* 7

2.1.1 Some basic functions

Plus[2, 3]
Subtract[2, 3]
Times[2, 3]
Divide[2, 3]
Power[2, 3]
Max[2, 3]
Min[2, 3]
RandomInteger[100]

Chapter 3

Introduction to Lists

3.1 List is a way to store numbers

Example {1,2,3,4,5} is a list

3.2 Create a List

3.2.1 Range[] is a function to create lists

Example **Range**[10] *Output:* $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

Note **Range**[m,n,p] means a list start with m, end with n, in step of p
Example **Range**[3,7] *Output:* $\{3, 4, 5, 6, 7\}$
Example **Range**[2,10,3] *Output:* $\{2, 5, 8\}$

3.2.2 Use Join[] to join Lists together

Example **Join**[**Range**[3],**Range**[5],**Range**[3]] *Output:* $\{1, 2, 3, 1, 2, 3, 4, 5, 1, 2, 3\}$

3.3 Visualizing Lists

3.3.1 ListPlot

Example **ListPlot** [1,2,3,4,3,4]

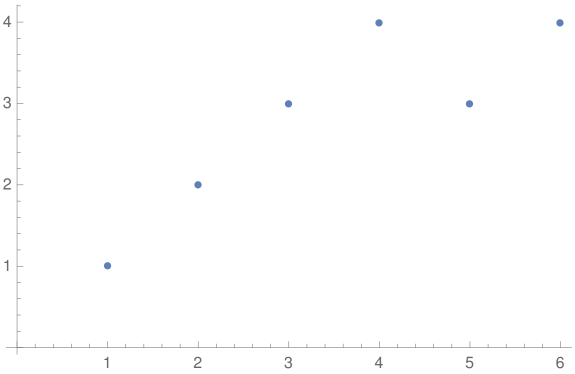

Figure 3.1: ListPlot

Example **ListPlot**[**Join**[**Range**[20]], **Reverse**[**Range**[20]], **Range**[30]]

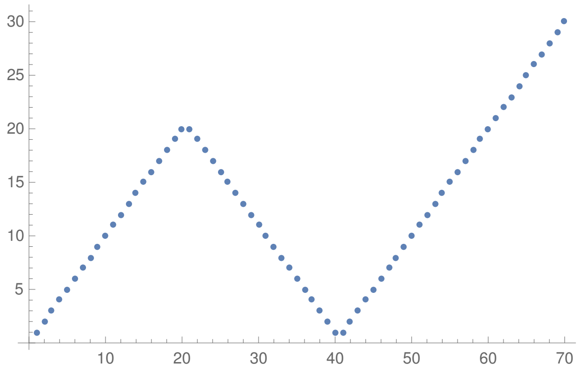

Figure 3.2: ListPlot

3.3.2 ListLinePlot

Example **ListLinePlot** [{1.5, 2, 4, 2.3, −9}]

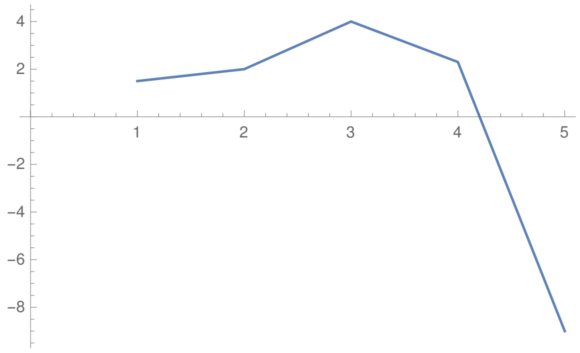

Figure 3.3: ListLinePlot

3.3.3 BarChart

Example **BarChart** [{1.5, 2, 4, 2.3, −9}]

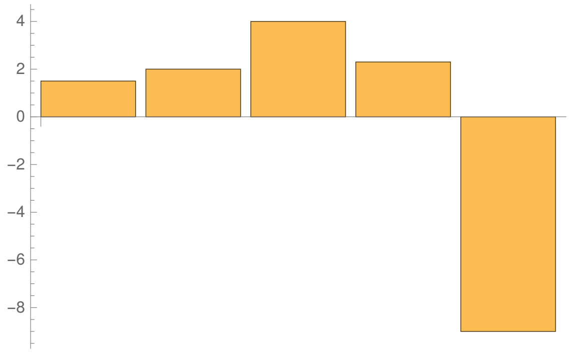

Figure 3.4: BarChart

3.3.4 PieChart

Example **BarChart** [{1, 3, 5, 4}]

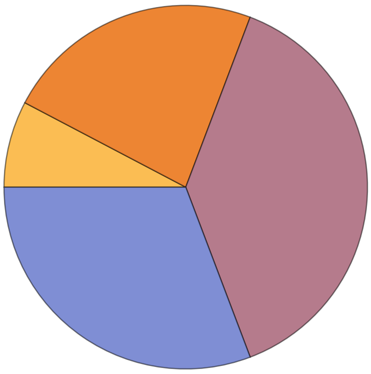

Figure 3.5: PieChart

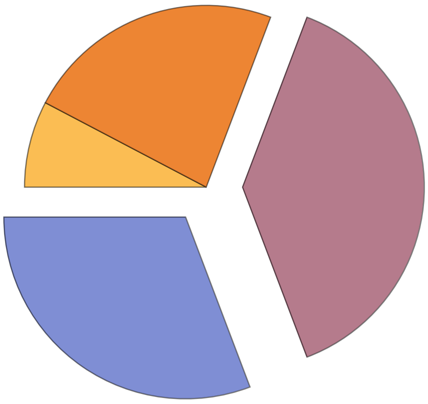

Figure 3.6: Interact with PieChart segments

Note that You can also left click on the chart to interact with the segments

3.3.5 NumberLinePlot

Example **NumberLinePlot**[{2, 3, 1, 5, −6.2}]

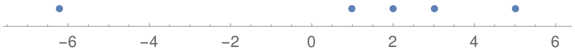

Figure 3.7: NumberLinePlot

3.4 Advanced Operation on List

3.4.1 Operate with Basic arithmetic operators

Operate with numbers

Example {1, 2, 3} + 10 *Output:* {11,12,13}
Example {1,2,3}−10 *Output:* {−9,−8,−7}
Example {1,2,3}∗10} *Output:* {10,20,30}
Example {1,2,3}/10 *Output:* $\{\frac{1}{10}, \frac{1}{5}, \frac{3}{10}\}$

Operate with other lists

Example {1,2,3}+{1,2,3} *Output:* {2,3,4}
Example {1,2,3}−{2,3,4} *Output:* {-1,-1,-1}
Example {1,2,3}∗{1,2,3} *Output:* {1,4,9}
Example {1,2,3}/{2,3,4} *Output:* $\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}\}$

3.4.2 Operate with Functions

Whole list operation

Reverse elements
Example **Reverse**[\{1,2,3\}] *Output:* $\{3, 2, 1\}$

Length of the list
Example **Length**[{5,3,4,2,3,4}] *Output:* 6

Sum up

Example **Total**[{1,2,3}] *Output:* 6

Sort the elements
Example **Sort**[{6,7,1}] *Output:* {1,6,7}

Elements operation

See how many times an element appears
Example **Count**[{a,b,a,a,c,b,a},a] *Output:* 4

Extract elements
Part[list , position]
Example **Part**[{7,6,5},2] *Output:* 6

Extract the first Element
Example **First** [{7,6,5}] *(∗The same as Part[list,1]∗)* *Output:* 7

Extract the last element
Example **Last**[{7,6,5}] *Output:* 5

Extract the Max and the Min
Example **Min**[{6,7,1}] *Output:* 1
Example **Max**[{6,7,1}] *Output:* 7