

CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Frequently Asked Questions

From previous semesters.

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Input is data provided to a program each time it runs, it may change at each run. In this course we have used the `input()` function.
- Should I have received email for this course?
Absolutely!!! We often send important communication by email. If you have not been receiving email from us weekly, please check your spam folder.

Today's Topics



- Recap: Logical Expressions & Circuits
- Design: Cropping Images
- Accessing Formatted Data
- Design Challenge: Astrophysics and astropy

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Recap: Logical Operators

and

i n1		i n2	<i>returns:</i>
False	and	False	False
False	and	True	False
True	and	False	False
True	and	True	True

Recap: Logical Operators

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i n1		i n2	<i>returns:</i>
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True	and	False	False
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or

i n1		i n2	<i>returns:</i>
False	or	False	False
False	or	True	True
True	or	False	True
True	or	True	True

Recap: Logical Operators

and

i n1		i n2	<i>returns:</i>
False	and	False	False
False	and	True	False
True	and	False	False
True	and	True	True

or

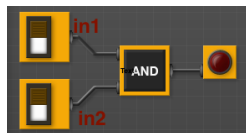
i n1		i n2	<i>returns:</i>
False	or	False	False
False	or	True	True
True	or	False	True
True	or	True	True

not

	i n1	<i>returns:</i>
not	False	True
not	True	False

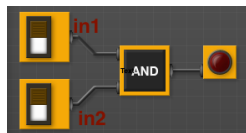
Logical Operators & Circuits

- Each logical operator (and, or, & not) can be used to join together expressions.



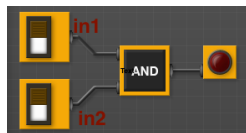
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Example: $in1$ and $in2$

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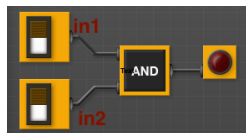


- Each logical operator (and, or, & not) can be used to join together expressions.

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- Each logical operator (and, or, & not) has a corresponding logical circuit that can be used to join together inputs.

Logical Operators & Circuits

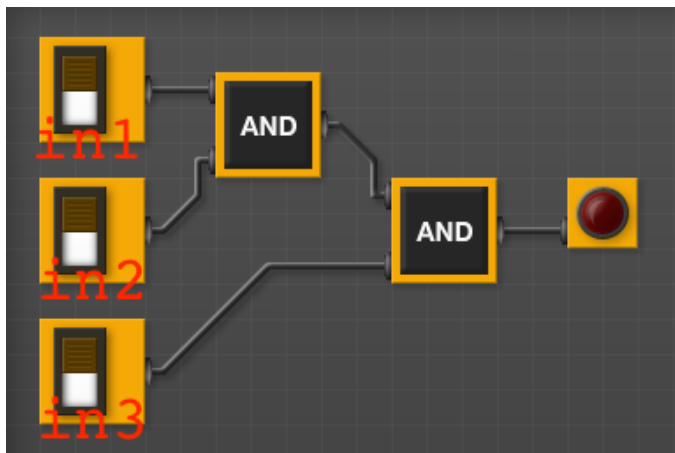


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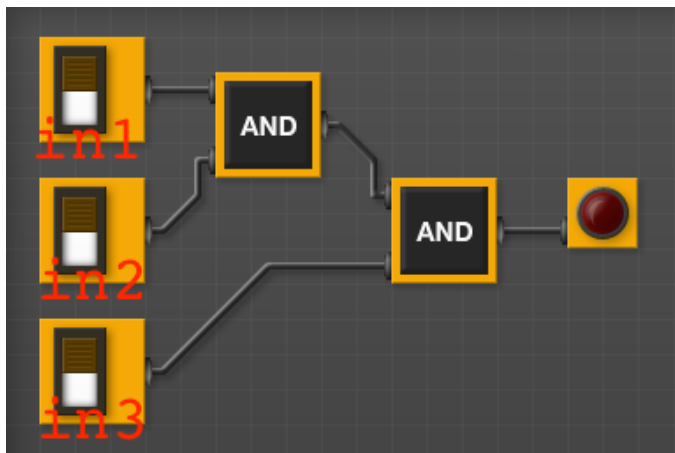
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- Each logical operator (and, or, & not) has a corresponding logical circuit that can be used to join together inputs.

Examples: Logical Circuit



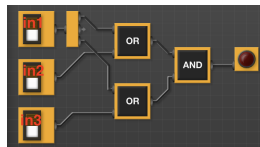
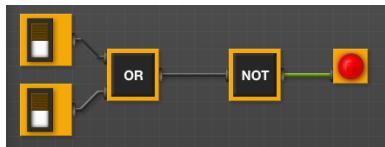
Examples: Logical Circuit



$(in1 \text{ and } in2) \text{ and } in3$

More Circuit Examples

Examples from last lecture:



Draw a circuit that corresponds to each logical expression:

- $\text{not}(\text{in1 or in2})$
- $(\text{in1 or in2}) \text{ and } (\text{in1 or in3})$
- $(\text{not}(\text{in1 and not in2})) \text{ or } (\text{in1 and } (\text{in2 and in3}))$

Challenge Problem:

Predict what the code will do:

```
x = 6
y = x % 4
w = y**3
z = w // 2
print(x,y,w,z)
x,y = y,w
print(x,y,w,z)
x = y / 2
print(x,y,w,z)
```

```
sports = ["Field Hockey","Swimming","Water Polo"]
mess = "Qoauxca BrletRce crcx qvBnqa ocUxk"
result = ""
for i in range(len(mess)):
    if i % 3 == 0:
        print(mess[i])
        result = result + mess[i]
print(sports[1], result)
```

Python Tutor

```
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x,y = y,w
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(Demo with pythonTutor)

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Challenge Problem: Design Question

From Final Exam, Fall 2017, V4, #6.

Design an algorithm that reads in an image and displays the lower left corner of the image.

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Input:

Output:

Process: (*Brainstorm for a "To Do" list to accomplish this.*)

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Read through the problem, and break it into "To Do" items.

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- 6 Display the new image.

```
plt.imshow(img2) #Load our new image into pyplot
plt.show() #Show the image (waits until closed to continue)
```

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To use, add to the top of your file:

```
import pandas as pd
```

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Each row is a line in the file.

Columns are separated by commas on each line.

CSV Files

nycHistPop.csv

Reading in CSV Files

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Pandas has its own type `DataFrame`, that is perfect for holding a sheet of data.

Often abbreviated: `df`.

It also has `Series`, that is perfect for holding a row or column of data.

Example: Reading in CSV Files

nycHistPop.csv

In Lab 6

Example: Reading in CSV Files

```
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import matplotlib.pyplot as plt  
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```
pop = pd.read_csv('nycHistPop.csv',skiprows=5)
```

nycHistPop.csv

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Example: Reading in CSV Files

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import matplotlib.pyplot as plt  
import pandas as pd
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```
pop = pd.read_csv('nycHistPop.csv',skiprows=5)
```

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pop.plot(x="Year")  
plt.show()
```

nycHistPop.csv

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In Lab 6

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Example:

```
print("The largest number living in the Bronx is",  
pop["Bronx"].max())
```

Challenge Problem

Predict what the following will do:

```
print("Queens:", pop["Queens"].min())
```

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Predict what the following will do:

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print("Queens:", pop["Queens"].min())  
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pop.plot.bar(x="Year")
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pop.plot.bar(x="Year")  
pop.plot.scatter(x="Brooklyn", y= "Total")
```

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pop.plot.bar(x="Year")
pop.plot.scatter(x="Brooklyn", y= "Total")
pop["Fraction"] = pop["Bronx"]/pop["Total"]
```

Solutions

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Standard deviation of values in the column \Staten Island".

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Average of values in the column \Staten Island".  
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Bar chart with x-axis "Year".

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Bar chart with x-axis "Year".

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pop.plot.scatter(x="Brooklyn", y= "Total")
```

Solutions

Predict what the following will do:

```
print("Queens:", pop["Queens"].min())
```

Minimum value in the column with label \Queens".

```
print("S I:", pop["Staten Island"].mean())
```

Average of values in the column \Staten Island".

```
print("S I :", pop["Staten Island"].std())
```

Standard deviation of values in the column \Staten Island".

```
pop.plot.bar(x="Year")
```

Bar chart with x-axis "Year".

```
pop.plot.scatter(x="Brooklyn", y= "Total")
```

Scatter plot of Brooklyn versus Total values.

Solutions

Predict what the following will do:

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Standard deviation of values in the column \Staten Island".

```
pop.plot.bar(x="Year")
```

Bar chart with x-axis "Year".

```
pop.plot.scatter(x="Brooklyn", y= "Total")
```

Scatter plot of Brooklyn versus Total values.

```
pop["Fraction"] = pop["Bronx"]/pop["Total"]
```

Solutions

Predict what the following will do:

```
print("Queens:", pop["Queens"].min())
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Minimum value in the column with label \Queens".

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Standard deviation of values in the column \Staten Island".

```
pop.plot.bar(x="Year")
```

Bar chart with x-axis "Year".

```
pop.plot.scatter(x="Brooklyn", y= "Total")
```

Scatter plot of Brooklyn versus Total values.

```
pop["Fraction"] = pop["Bronx"]/pop["Total"]
```

New column with the fraction of population that lives in the Bronx.

Challenge Problem

Write a complete Python program that reads in the file, `cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file, `cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file, `cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

- 1 Include pandas & pyplot libraries.

`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file, `cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

- 1 Include pandas & pyplot libraries.
- 2 Read in the CSV file.

`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file, `cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

- 1 Include pandas & pyplot libraries.
- 2 Read in the CSV file.
- 3 Set up a scatter plot.

`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file, `cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

- 1 Include pandas & pyplot libraries.
- 2 Read in the CSV file.
- 3 Set up a scatter plot.
- 4 Display plot.

`cunyF2016.csv`

Challenge Problem

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`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file `le_cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

- 1 Include pandas & pyplot libraries.
`import matplotlib.pyplot as plt`
`import pandas as pd`

`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file `le_cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

- 1 Include pandas & pyplot libraries.
`import matplotlib.pyplot as plt`
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`cunyF2016.csv`

Challenge Problem

Write a complete Python program that reads in the file `le_cunyF2016.csv`, and produces a scatter plot of full-time versus part-time enrollment.

Solution:

- 1 Include pandas & pyplot libraries.
`import matplotlib.pyplot as plt`
`import pandas as pd`
- 2 Read in the CSV file.
`pop=pd.read_csv('cunyF2016.csv',skiprows=1)`
- 3 Set up a scatter plot.

`cunyF2016.csv`

Challenge Problem

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`pop.plot.scatter(x="Full-time",y="Part-time")`
- 4 Display plot.

`cunyF2016.csv`

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- 4 Display plot.
`plt.show()`

`cunyF2016.csv`

groupby()

Sometimes you have recurring values in a column and you want to examine the data for a particular value.

AustraliaRain.csv

groupby()

Sometimes you have recurring values in a column and you want to examine the data for a particular value.

For example, find the average rainfall at each location :

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For example, find the average rainfall at each location :

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`import pandas as pd`

AustraliaRain.csv

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Sometimes you have recurring values in a column and you want to examine the data for a particular value.

For example, find the average rainfall at each location :

- 1 Import libraries.
`import pandas as pd`
- 2 Read in the CSV file.
`rain = pd.read_csv('AustraliaRain.csv',skiprows=1)`

AustraliaRain.csv

groupby()

Sometimes you have recurring values in a column and you want to examine the data for a particular value.

For example, find the average rainfall at each location :

- 1 Import libraries.
`import pandas as pd`
- 2 Read in the CSV file.
`rain = pd.read_csv('AustraliaRain.csv',skiprows=1)`
- 3 Group the data by location averages.
`groupAvg = rain.groupby('Location').mean()`

AustraliaRain.csv

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For example, to find the average rainfall at one location, e.g. Moree :

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- 1 Import libraries.
`import pandas as pd`
- 2 Read in the CSV file.
`rain = pd.read_csv('AustraliaRain.csv',skiprows=1)`
- 3 Group the data by location get averages for group Moree.
`MoreeAvg = rain.groupby(['Location']).get_group('Moree') .mean()`

AustraliaRain.csv

groupby()

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For example, to find the average rainfall at one location, e.g. Moree :

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`print(MoreeAvg['Rainfall'])`

AustraliaRain.csv

Today's Topics

Recap: Logical Expressions & Circuits

Design: Cropping Images

Accessing Formatted Data

Design Challenge: Astrophysics and
astropy

Design Challenge

On a piece of paper, design an algorithm that:

Prints the luminosity of the brightest star.

Prints the temperature in Kelvin (K) of the coldest star.

Prints the temperature in Fahrenheit of the coldest star. **New:**
astropy.units will seamlessly convert!!!

Prints the average radius of a Hypergiant

Design Challenge - Solution

Libraries: pandas and astropy

Design Challenge - Solution

Libraries: pandas and astropy

Process:

- | Print max of 'Luminosity' column

Design Challenge - Solution

Libraries: pandas and astropy

Process:

- | Print max of 'Luminosity' column
- | Prints min of 'Temperature' column and store it in temp variable

Design Challenge - Solution

Libraries: pandas and astropy

Process:

- | Print max of 'Luminosity' column
- | Prints min of 'Temperature' column and store it in temp variable
- | Use astropy to convert temp variable to Fahrenheit and print

Design Challenge - Solution

Libraries: pandas and astropy

Process:

- | Print max of 'Luminosity' column
- | Prints min of 'Temperature' column and store it in temp variable
- | Use astropy to convert temp variable to Fahrenheit and print
- | groupby 'Star Type' and take averages, then print max of 'Radius' column

Design Challenge - Solution

Libraries: pandas and astropy

Process:

- | Print max of 'Luminosity' column
- | Prints min of 'Temperature' column and store it in temp variable
- | Use astropy to convert temp variable to Fahrenheit and print
- | groupby 'Star Type' and take averages, then print max of 'Radius' column
- | OR groupby 'Star Type' and get group 'Hypergiant' to print average 'Radius'

Design Challenge - Code

Libraries: pandas and astropy

```
import pandas as pd
```

```
import astropy.units as u
```

```
stars = pd.read_csv('Stars.csv')
```


Design Challenge - Code

Libraries: pandas and astropy

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import pandas as pd
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stars = pd.read_csv('Stars.csv')
```

Process:

- | Print max of 'Luminosity' column
`print(stars['Luminosity(L/Lo)'].max())`

Design Challenge - Code

Libraries: pandas and astropy

```
import pandas as pd
import astropy.units as u
stars = pd.read_csv('Stars.csv')
```

Process:

- | Print max of 'Luminosity' column
`print(stars['Luminosity(L/Lo)'].max())`
- | Prints min of 'Temperature' column and store it in temp variable
`minTempK = stars['Temperature (K)'].min()`
`print(minTempK)`

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`print(minTempK)`
- | Use astropy to convert temp variable to Fahrenheit and print
`KUnit = minTempK * u.K`
`print(KUnit.to(u.imperial.deg_F, equivalencies = n`
`u.temperature()))`

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- | groupby 'Star Type' and take averages, then print max of 'Radius' column
`print(stars.groupby(['Star type']).mean()['Radius(R/Ro)'].max())`

Design Challenge - Code

Libraries: pandas and astropy

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- | Use astropy to convert temp variable to Fahrenheit and print
`KUnit = minTempK * u.K`
`print(KUnit.to(u.imperial.deg_F, equivalencies = u.temperature()))`
- | OR groupby 'Star Type' and get group 'Hypergiant' to print average 'Radius'
`print(stars.groupby(['Star type']).n`
`.get_group('Hypergiant').mean()['Radius(R/Ro)'])`

Recap

Recap: Logical Expressions & Circuits

Recap

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Accessing Formatted Data:

- ▮ Pandas library has elegant solutions for accessing & analyzing structured data.

Recap

Recap: Logical Expressions & Circuits

Accessing Formatted Data:

- | Pandas library has elegant solutions for accessing & analyzing structured data.
- | Can manipulate individual columns or rows ('Series').

Recap

Recap: Logical Expressions & Circuits

Accessing Formatted Data:

- | Pandas library has elegant solutions for accessing & analyzing structured data.
- | Can manipulate individual columns or rows ('Series').
- | Has useful functions for the entire sheet ('DataFrame') such as plotting.

Recap

- Recap: Logical Expressions & Circuits
- Accessing Formatted Data:
 - | Pandas library has elegant solutions for accessing & analyzing structured data.
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 - | Has useful functions for the entire sheet ('DataFrame') such as plotting.
- [Log in to Gradescope for Quiz 6.](#)