

Logical operations

ESS 116 | Fall 2024

Prof. Henri Drake, Prof. Jane Baldwin, and Prof. Michael Pritchard

(Modified from Ethan Campbell and Katy Christensen's materials for UW's Ocean 215)

Logical operations

Comparison operators

Operation	
==	Equal
!=	Not Equal
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to

Using the comparison operators we can add more parameters to our comparisons using logical operators...

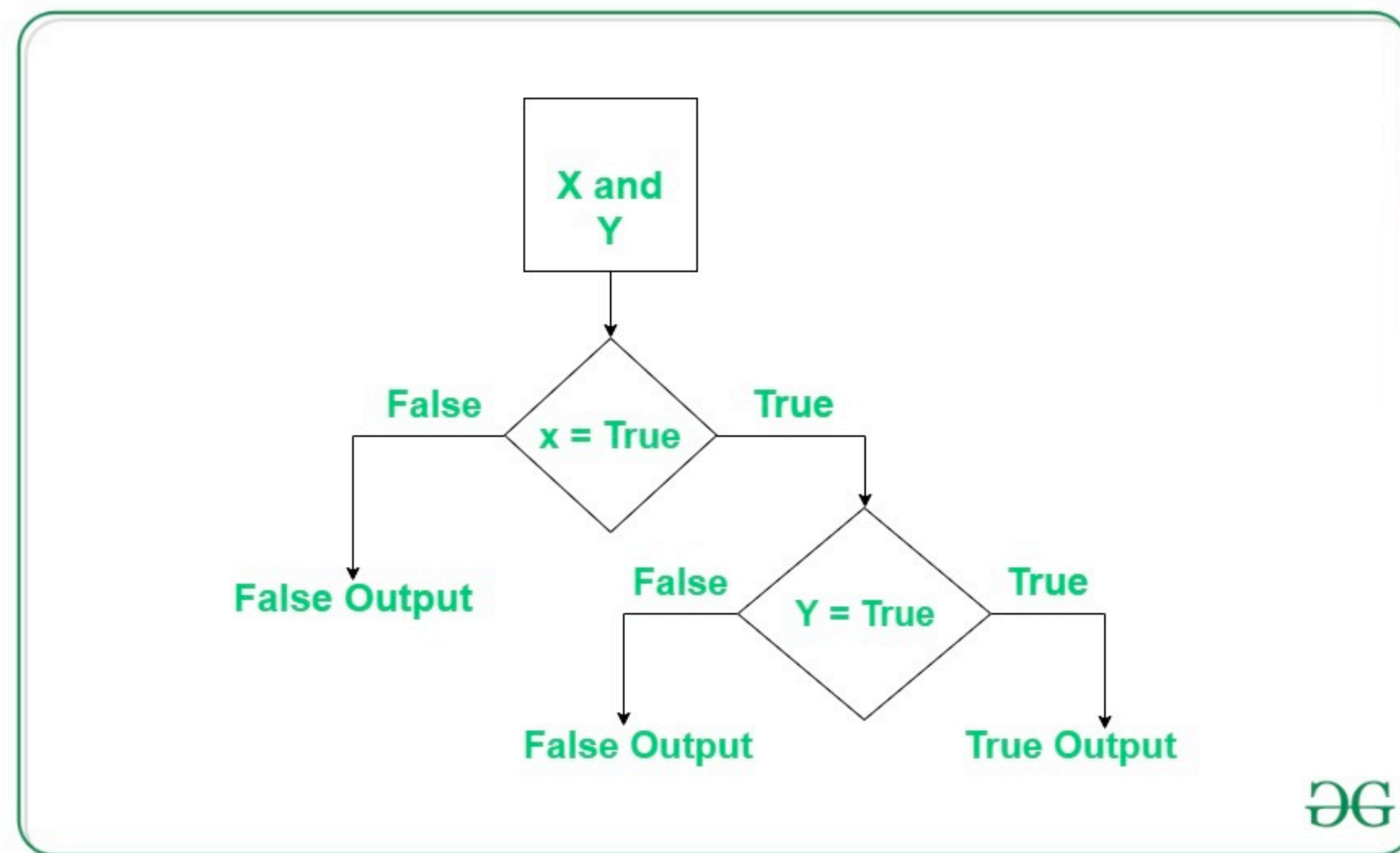
Logical operations

Comparison operators

Operation	
==	Equal
!=	Not Equal
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to

Using the comparison operators we can add more parameters to our comparisons using logical operators...

and



Logical operations

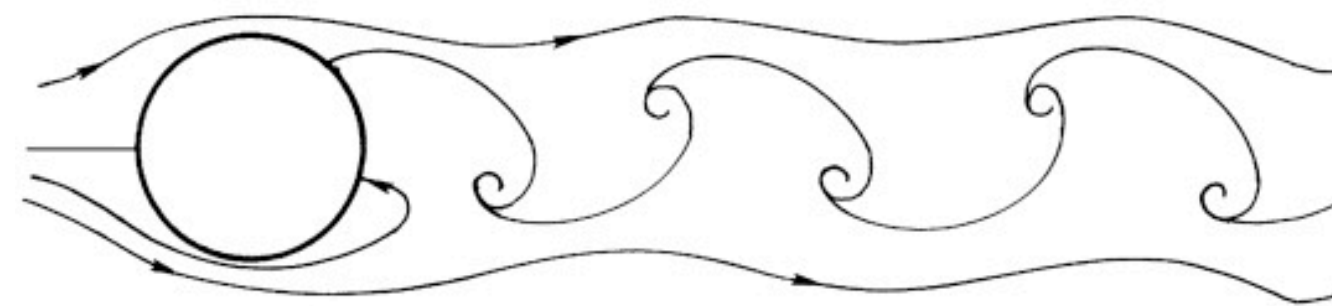
Comparison operators

Operation	
<code>==</code>	Equal
<code>!=</code>	Not Equal
<code>></code>	Greater than
<code>>=</code>	Greater than or equal to
<code><</code>	Less than
<code><=</code>	Less than or equal to

Using the comparison operators we can add more parameters to our comparisons using logical operators...

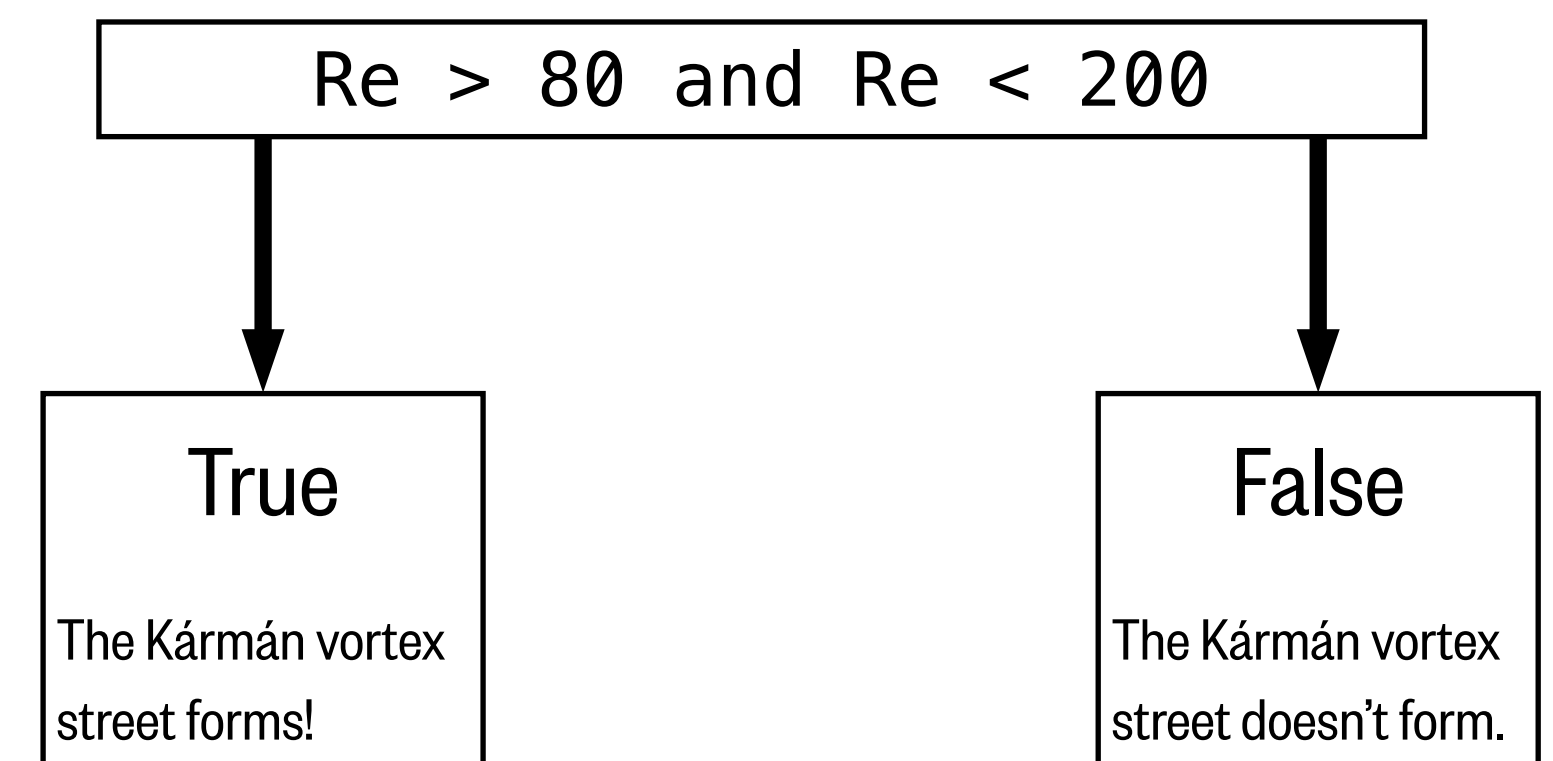
and

Example: Reynold's number



The relationship between the Reynold's number and the turbulence of a flow have been well established. The Kármán vortex street is estimated to occur when the Reynold's number is between 80 - 200.

Given an unknown Reynold's number, we can test if the Kármán vortex street will occur.



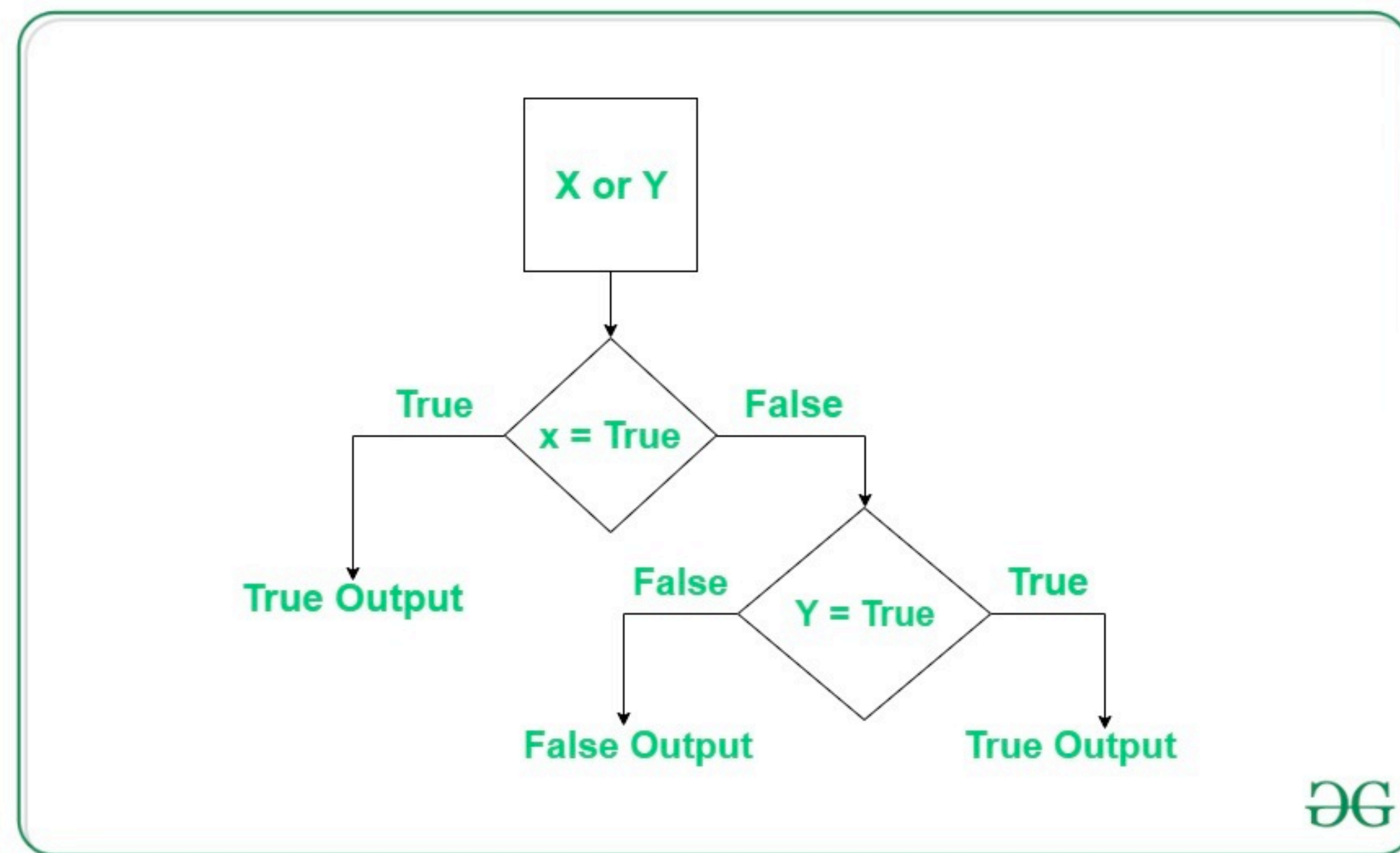
Logical operations

Comparison operators

Operation	
==	Equal
!=	Not Equal
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to

Using the comparison operators we can add more parameters to our comparisons using logical operators...

or



Logical operations

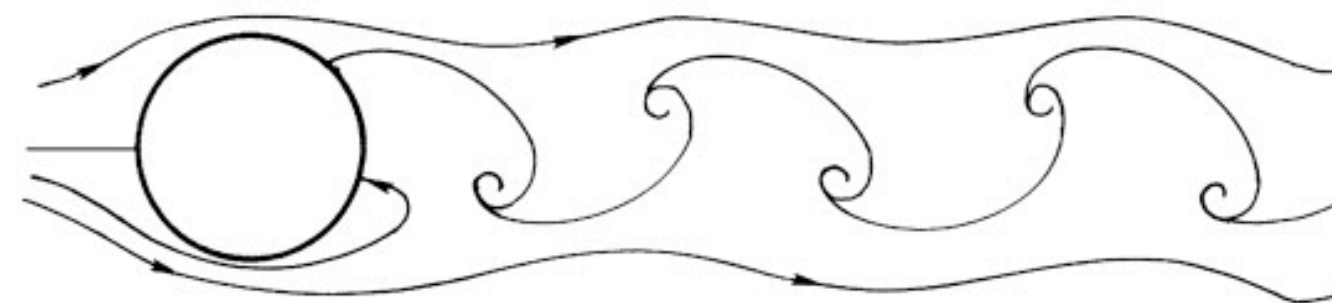
Comparison operators

Operation	
<code>==</code>	Equal
<code>!=</code>	Not Equal
<code>></code>	Greater than
<code>>=</code>	Greater than or equal to
<code><</code>	Less than
<code><=</code>	Less than or equal to

Using the comparison operators we can add more parameters to our comparisons using logical operators...

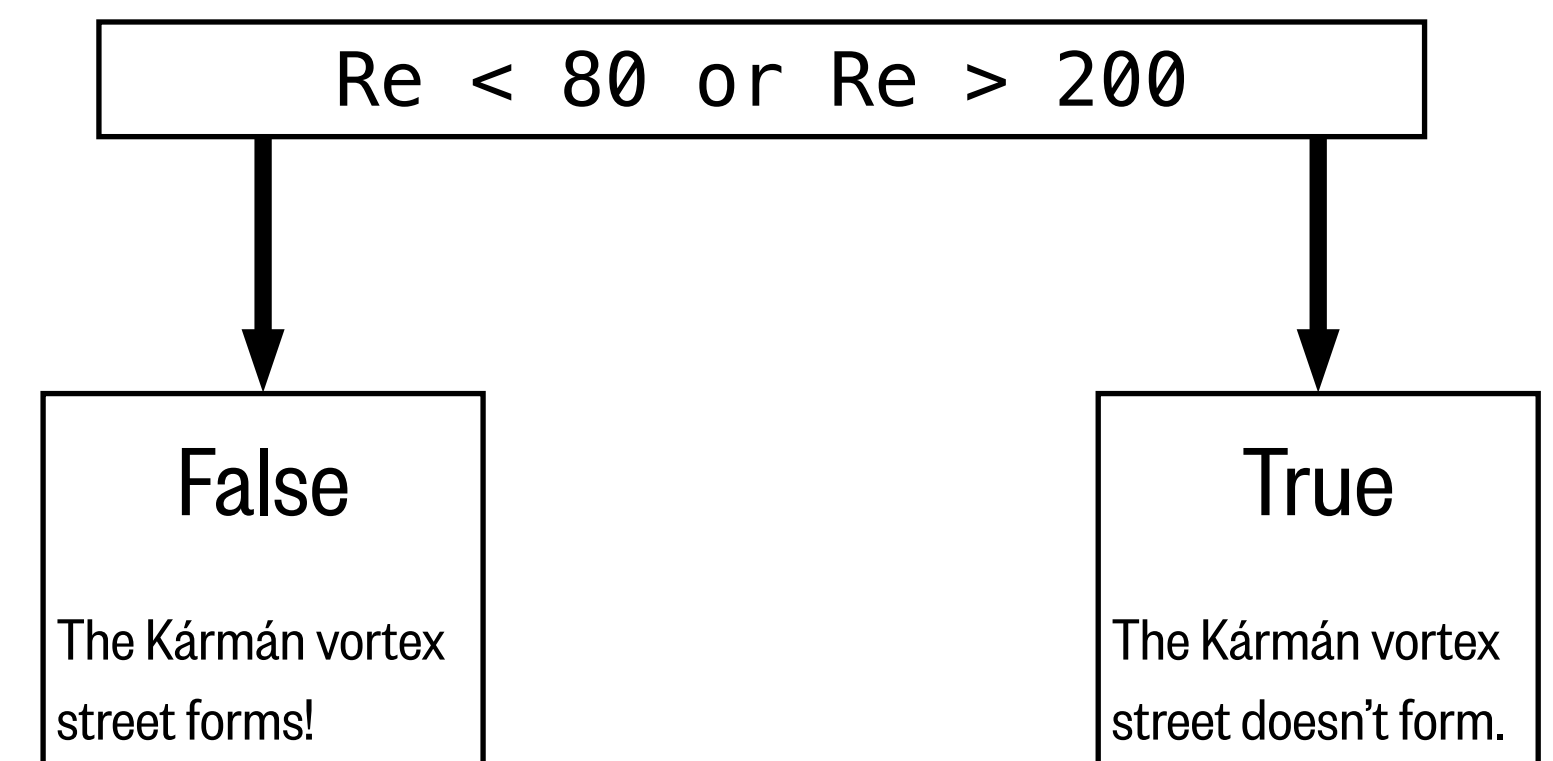
or

Example: Reynold's number



The relationship between the Reynold's number and the turbulence of a flow have been well established. The Kármán vortex street is estimated to occur when the Reynold's number is between 80 - 200.

Given an unknown Reynold's number, we can test if the Kármán vortex street will occur.



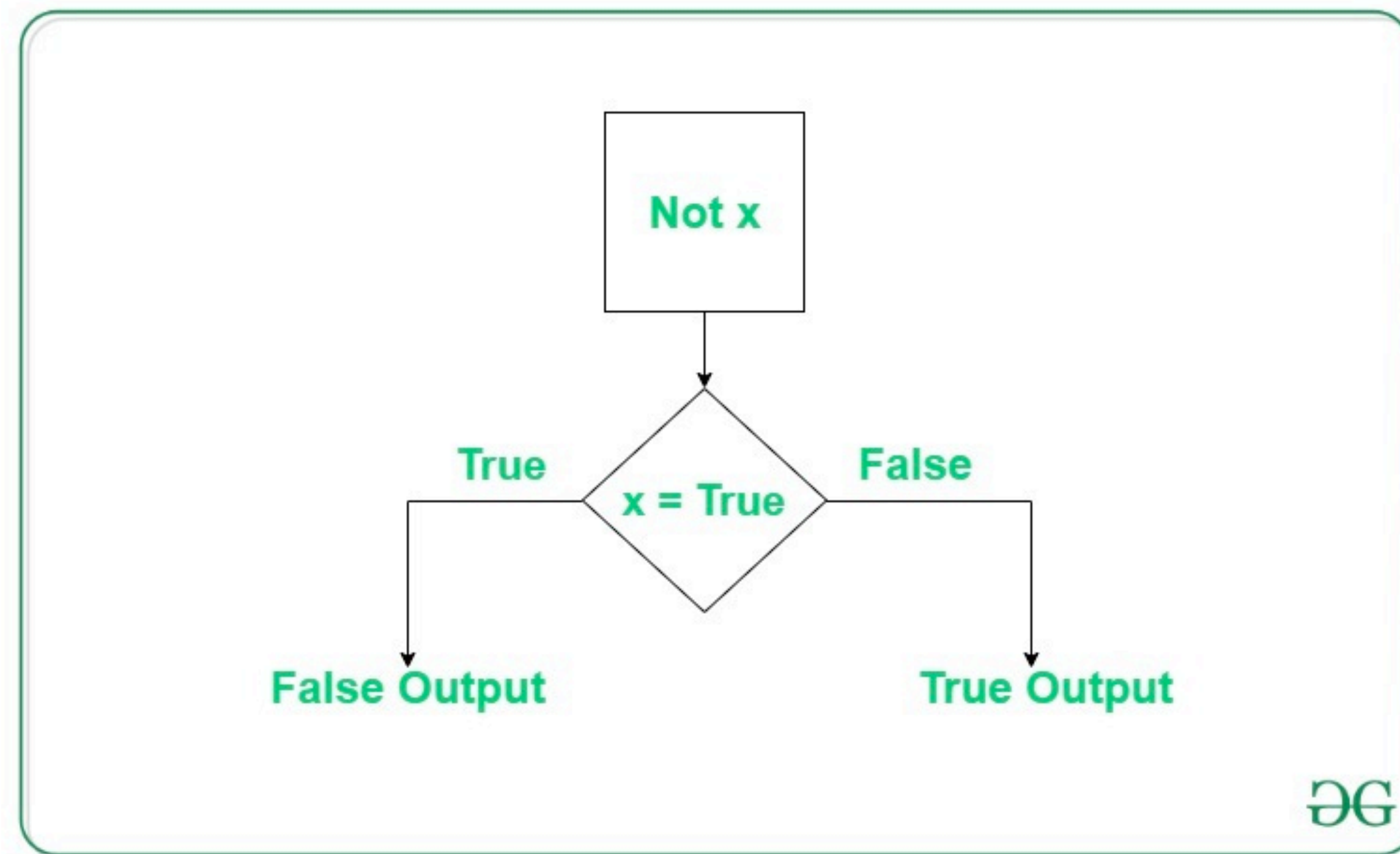
Logical operations

Comparison operators

Operation	
==	Equal
!=	Not Equal
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to

Using the comparison operators we can add more parameters to our comparisons using logical operators...

not



not True	not False
False	True

is

Test if two variables refer to the same object. This is useful when you assign variables to lists.

If you assign a variable to a list, it “is” that list
(no matter what, even if things are added or removed from the list)

```
1 sample_list = ['Apples', 'Oranges', 'Bananas']
2 list_var = sample_list
3
4 print(list_var is sample_list)
5
6 sample_list.append('Strawberries')
7 print(list_var is sample_list)
8
```

```
☞ True
   True
```

If you assign a variable to a copy of a list, it “is”
not that list

```
1 sample_list = ['Apples', 'Oranges', 'Bananas']
2 print(sample_list)
3 print()
4
5 list_var = sample_list.copy()
6
7 print(list_var is sample_list)
8
9 sample_list.append('Strawberries')
10 print(list_var is sample_list)
11
12 print()
13 print(sample_list)
14
```

```
☞ ['Apples', 'Oranges', 'Bananas']
```

```
False
False
```

```
['Apples', 'Oranges', 'Bananas', 'Strawberries']
```

If you assign a variable to an identical, but
separate list, it “is” not that list

```
1 sample_list1 = ['Apples', 'Oranges', 'Bananas']
2 print(sample_list1)
3 print()
4
5 sample_list2 = ['Apples', 'Oranges', 'Bananas']
6 print(sample_list2)
7 print()
8
9 print(sample_list1 is sample_list2)
10
```

```
☞ ['Apples', 'Oranges', 'Bananas']
```

```
['Apples', 'Oranges', 'Bananas']
```

```
False
```


Resources

Logical operator flowcharts - <https://www.geeksforgeeks.org/python-logical-operators-with-examples-improvement-needed/>