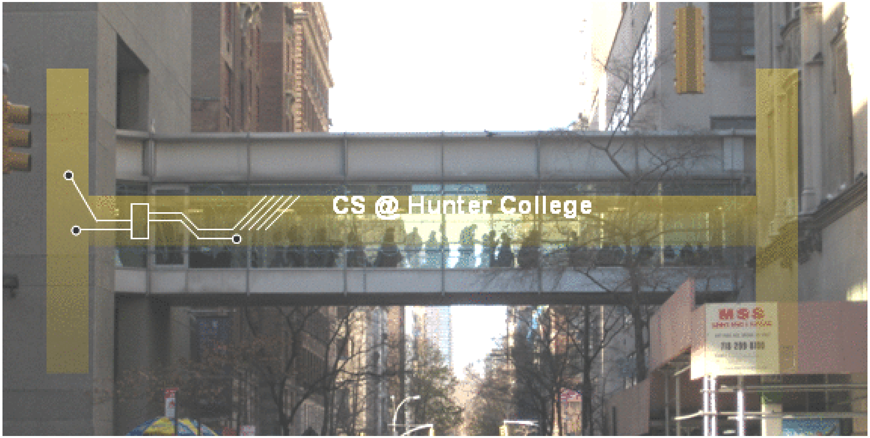
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

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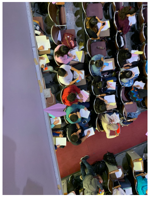

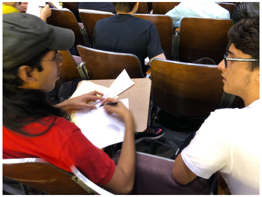
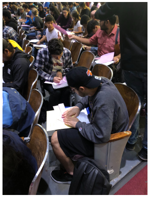

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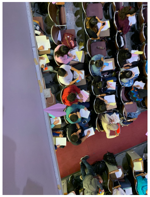

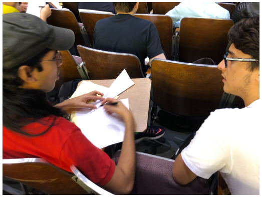
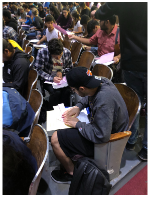

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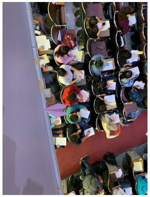

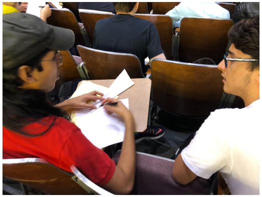
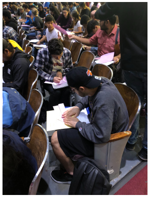

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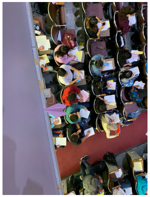

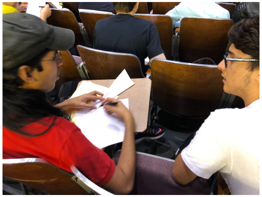
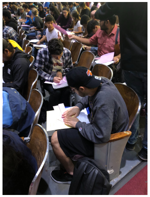

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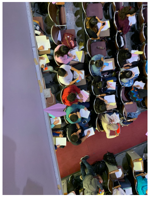

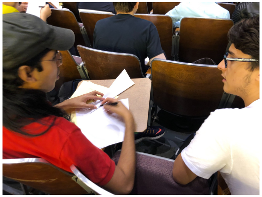
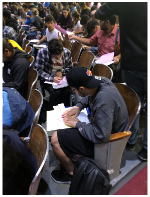

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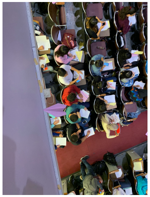

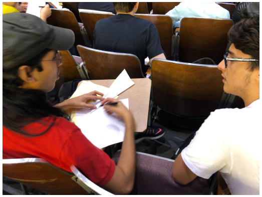
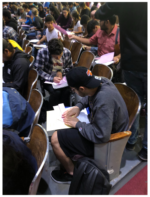

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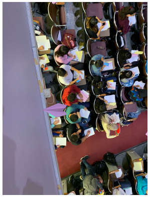

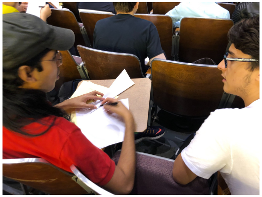
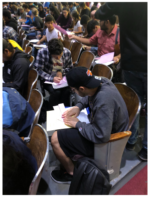

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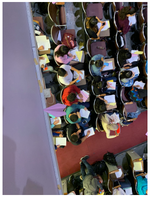

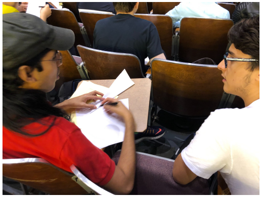
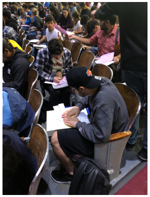

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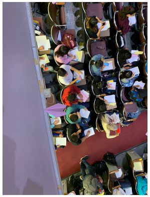

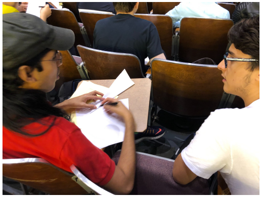
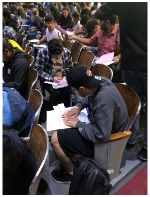

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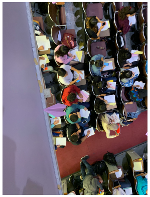

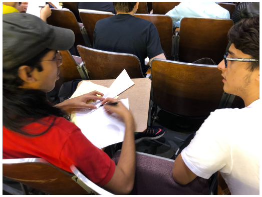
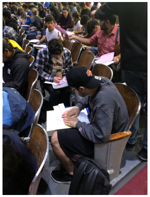

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Today's Topics

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- Logical Expressions
- Circuits
- Binary Numbers
- Tech Interview Classic

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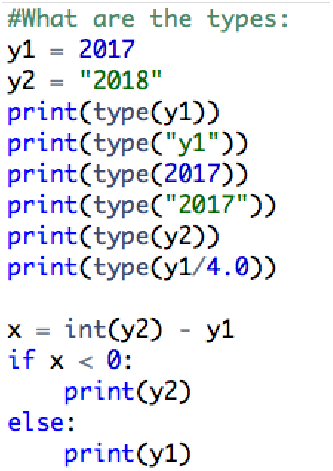
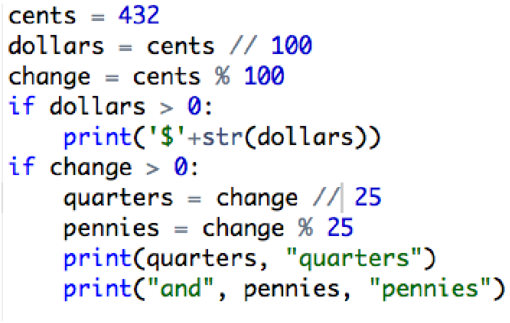
Challenge Problem...

Some challenges with types & decisions:



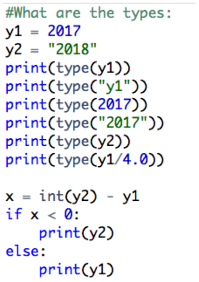
```python
#What are the types:
y1 = 2017
y2 = "2018"
print(type(y1))
print(type("y1"))
print(type(2017))
print(type("2017"))
print(type(y2))
print(type(y1/4.0))

x = int(y2) - y1
if x < 0:
    print(y2)
else:
    print(y1)
```



```python
cents = 432
dollars = cents // 100
change = cents % 100
if dollars > 0:
    print('$'+str(dollars))
if change > 0:
    quarters = change // 25
    pennies = change % 25
    print(quarters, "quarters")
    print("and", pennies, "pennies")
```

Python Tutor



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(Demo with `pythonTutor`)

Decisions

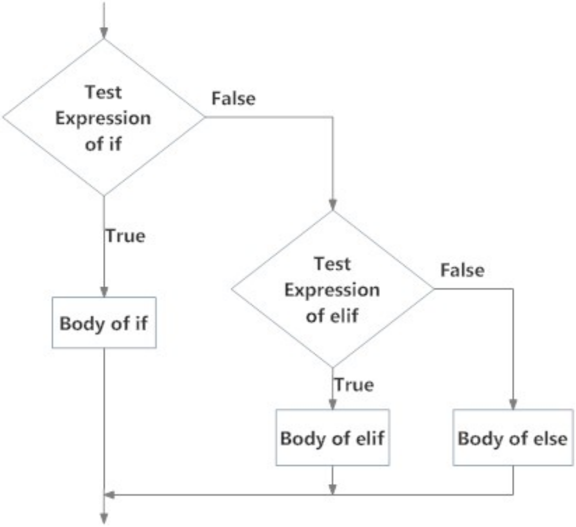
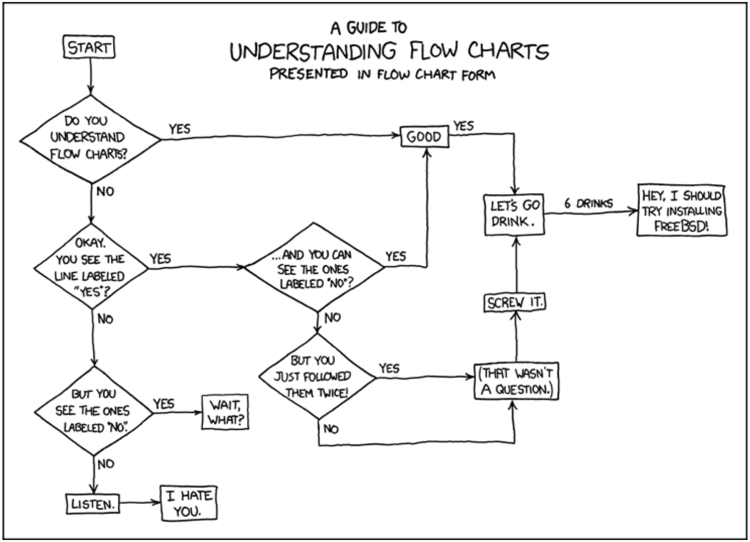


Fig: Operation of if...elif...else statement

(programiz)

Side Note: Reading Flow Charts


A GUIDE TO
UNDERSTANDING FLOW CHARTS
PRESENTED IN FLOW CHART FORM
START
DO YOU UNDERSTAND FLOW CHARTS?
YES
GOOD
YES
NO
OKAY. YOU SEE THE LINE LABELED "YES"?
YES
...AND YOU CAN SEE THE ONES LABELED "NO"?
YES
LET'S GO DRINK.
6 DRINKS
HEY, I SHOULD TRY INSTALLING FREEBSD!
NO
NO
BUT YOU JUST FOLLOWED THEM TWICE!
YES
(THAT WASN'T A QUESTION.)
SCREW IT.
NO
BUT YOU SEE THE ONES LABELED "NO".
YES
WAIT, WHAT?
NO
LISTEN.
I HATE YOU.

(xkcd/518)

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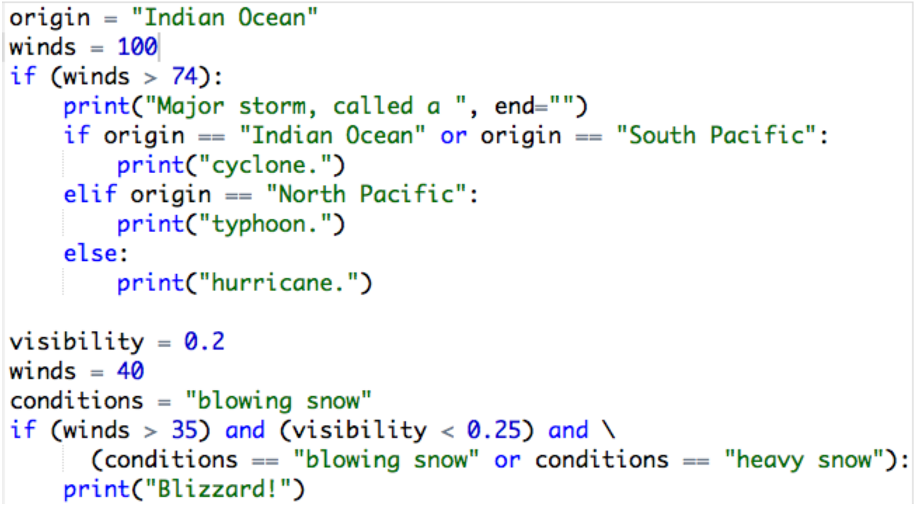
Challenge Problem

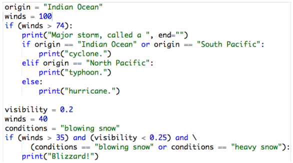
Predict what the code will do:



```
origin = "Indian Ocean"
winds = 100
if (winds > 74):
    print("Major storm, called a ", end="")
    if origin == "Indian Ocean" or origin == "South Pacific":
        print("cyclone.")
    elif origin == "North Pacific":
        print("typhoon.")
    else:
        print("hurricane.")

visibility = 0.2
winds = 40
conditions = "blowing snow"
if (winds > 35) and (visibility < 0.25) and \
      (conditions == "blowing snow" or conditions == "heavy snow"):
    print("Blizzard!")
```

Python Tutor



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Logical Operators

and

in1		in2	*returns:*
`False`	`and`	`False`	`False`
`False`	`and`	`True`	`False`
`True`	`and`	`False`	`False`
`True`	`and`	`True`	`True`

Logical Operators

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in1		in2	*returns:*
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or

in1		in2	*returns:*
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True	or	False	True
True	or	True	True

Logical Operators

and

in1		in2	*returns:*
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True	and	False	False
True	and	True	True

or

in1		in2	*returns:*
False	or	False	False
False	or	True	True
True	or	False	True
True	or	True	True

not

	in1	*returns:*
not	False	True
not	True	False

Challenge Problem

Predict what the code will do:

```
semHours = 18
reqHours = 120
if semHours >= 12:
     print('Full Time')
else:
     print('Part Time')

pace = reqHours // semHours
if reqHours % semHours != 0:
     pace = pace + 1
print('At this pace, you will graduate in', pace, 'semesters,')
yrs = pace / 2
print('(or', yrs, 'years).')


for i in range(1,20):
     if (i > 10) and (i % 2 == 1):
          print('oddly large')
     else:
          print(i)
```

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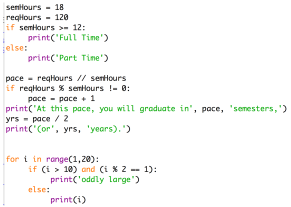

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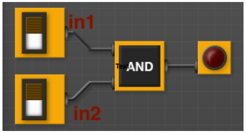
```

(Demo with `pythonTutor`)

Today's Topics

- Recap: Decisions
- Logical Expressions
- **Circuits**
- Binary Numbers
- Tech Interview Classic

Circuit Demo

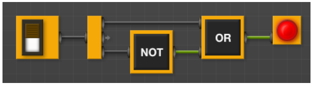


(Demo with `neuroproductions`)

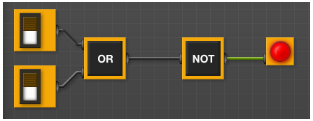
Challenge Problem

Predict when these expressions are true:

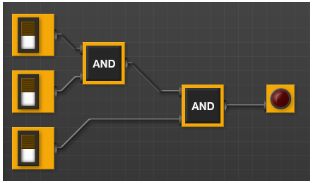
- `in1 or not in1`:



- `not(in1 or in2)`:



- `(in1 and in2) and in3`:



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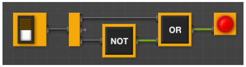

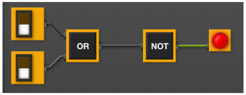

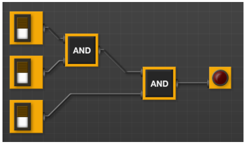

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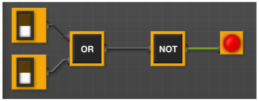
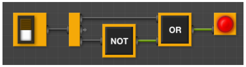
Challenge Problem

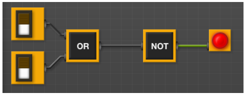


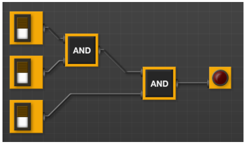
Draw a circuit that corresponds to each logical expression:

- `in1 or in2`
- `(in1 or in2) and (in1 or in3)`
- `(not(in1 and not in2)) or (in1 and (in2 and in3))`

Circuit Demo







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Binary Numbers

- Logic $\rightarrow$ Circuits $\rightarrow$ Numbers

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Binary Numbers

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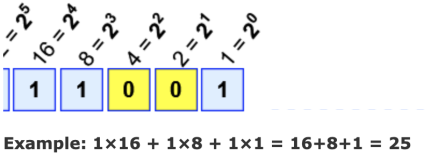
- Computers store numbers using the Binary system (base 2)

Binary Numbers

- Logic $\rightarrow$ Circuits $\rightarrow$ Numbers
- Digital logic design allows for two states:
  - True / False
  - On / Off (two voltage levels)
  - 1 / 0
- Computers store numbers using the Binary system (base 2)
- A **bit** (binary digit) being 1 (on) or 0 (off)

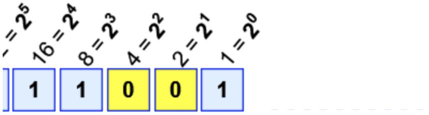
Binary Numbers



Example: 1×16 + 1×8 + 1×1 = 16+8+1 = 25

- Two digits: **0** and **1**

Binary Numbers



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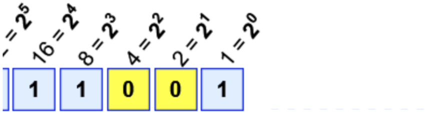

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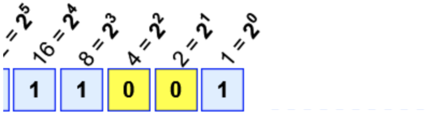

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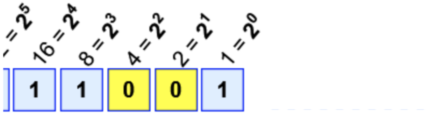

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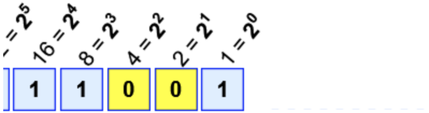

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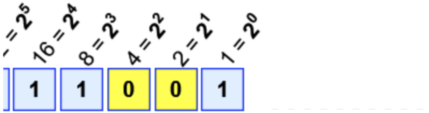

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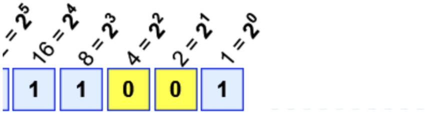
Binary Numbers



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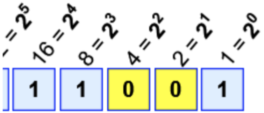
Binary Numbers



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- **Example:**

$$11001_{base2} = 16 + 8 + 1 = 25_{base10}$$

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- **Tech Interview Classic**

Tech Interview Classic

- Write a program that prints the numbers from 1 to 100. But for multiples of three print “Fizz” instead of the number and for the multiples of five print “Buzz”. For numbers which are multiples of both three and five print “FizzBuzz”.

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```
1
2
Fizz
```

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```
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Fizz
4
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    Order matters!!! To print FizzBuzz when i is divisible by both it should be checked first, otherwise it will never get to this case!

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for i in range(1,101):
    if i%3 == 0 and i%5 == 0:
        print("FizzBuzz")
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Recap

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Recap

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- Log in to Gradescope for Quiz 5.