Do Now

bigd103.link/student-loan-calculator

Conditionals

Making Decisions in Code

Why Do Programs Need to Make Decisions?

Think about real life decisions:

- "If the bill is over $50, I'll leave a tip"
- "If it's raining, I'll take an umbrella"
- "If I have enough money, I'll buy coffee"

Programs need to make similar decisions based on conditions!

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Comparison Operators

Tools for creating conditions:

Operator	Meaning	Example	Result
`==`	Equal to	`5 == 5`	`True`
`!=`	Not equal to	`5 != 3`	`True`
`>`	Greater than	`5 > 3`	`True`
`<`	Less than	`5 < 3`	`False`
`>=`	Greater than or equal	`5 >= 5`	`True`
`<=`	Less than or equal	`5 <= 3`	`False`

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Common Mistake: = vs ==

```
# Assignment (giving a value)
age = 18

# Comparison (checking equality)
if age == 18:
    print("You just became an adult!")
```

Remember:

- One `=` assigns a value
- Two `==` compares values

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Combining Conditions with `or`

At least one condition must be True:

```
day = "Saturday"
is_holiday = False

if day == "Saturday" or day == "Sunday" or is_holiday:
    print("No school today!")
else:
    print("Time for school")
```

Truth Tables

A	B	A and B	A or B
True	True	True	True
True	False	False	True
False	True	False	True
False	False	False	False

YES

INPUT	OUTPUT
A	
0	0
1	1

NOT

INPUT	OUTPUT
A	
0	1
1	0

AND

INPUT		OUTPUT
A	B	
0	0	0
1	0	0
0	1	0
1	1	1

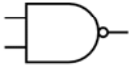
OR

INPUT		OUTPUT
A	B	
0	0	0
1	0	1
0	1	1
1	1	1

XOR

INPUT		OUTPUT
A	B	
0	0	0
1	0	1
0	1	1
1	1	0

NAND



INPUT		OUTPUT
A	B	
0	0	1
1	0	1
0	1	1
1	1	0

NOR

INPUT		OUTPUT
A	B	
0	0	1
1	0	0
0	1	0
1	1	0

XNOR

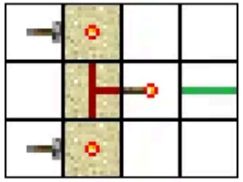
INPUT		OUTPUT
A	B	
0	0	1
1	0	0
0	1	0
1	1	1

MineCraft Logic Gates

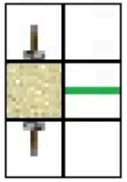
Input/Output Gate

NOT Gate
(Inverter)

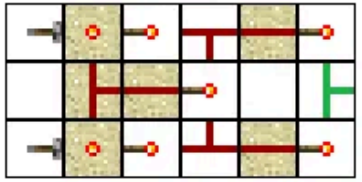
AND Gate



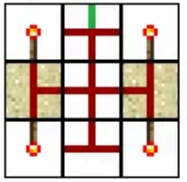
OR Gate



XOR Gate

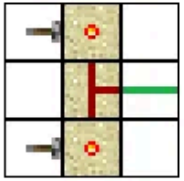


Rapid Pulser

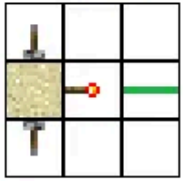


Double NOT
(Repeater)

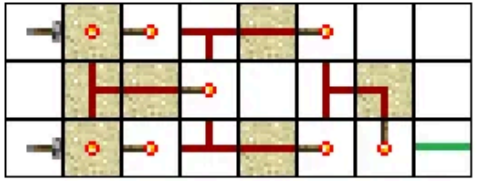
NAND Gate



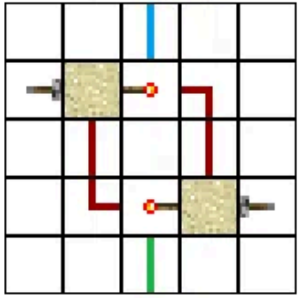
NOR Gate



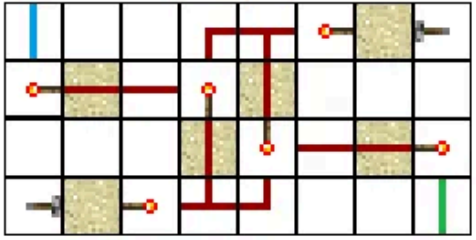
XNOR Gate



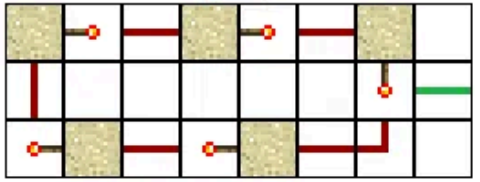
RS NOR Latch
(Memory Cell)



RS NAND Latch
(Memory Cell)



5-Clock
(Pulser)



Nested Conditionals

We can put `if` statements inside `if` statements:

```
has_money = True
amount = 50

if has_money:
    if amount >= 100:
        print("You're rich!")
    elif amount >= 20:
        print("You have some spending money")
    else:
        print("You're almost broke")
else:
    print("You have no money")
```

This is often cleaner to many `and` statements:

```
if has_money and amount >= 100:
    print("You're rich!")
elif has_money and amount >= 20:
    print("You have some spending money")
elif has_money and amount < 20:
    print("You're almost broke")
else:
    print("You have no money")
```

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Exercise: Grade Calculator

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