

# Complex decisions with code

and/or, nested if, elif

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Sometimes there are multiple conditions that affect the outcome of a decision

- If you are in England say hello, if you are in Germany say guten tag, if you are in France say bonjour, ...
- If you win the lottery and the prize is over a million dollars then retire to a life of luxury
- If it is Monday, check to see if there is fresh coffee. If there is no fresh coffee go to the nearest café

If, then, otherwise...

If you are in Canada say hello, if you are in Germany say guten tag, if you are in France say bonjour, ...

- This is an interesting situation because you really only have one condition to check, but that one condition could have many different values

The "elif" allows you to check for different values

```
country = input("Where are you from? " )
```

```
if country == "CANADA" :  
    print("Hello")  
elif country == "GERMANY" :  
    print("Guten Tag")  
elif country == "FRANCE" :  
    print("Bonjour")
```

Note that the elif statement is not indented!  
"elif" is short for Else if

# What if someone enters Japan or Italy?

We should add an “**else**” statement to catch any conditions we didn’t list

```
country = input("Where are you from? " )
```

```
if country == "CANADA" :  
    print("Hello")  
elif country == "GERMANY" :  
    print("Guten Tag")  
elif country == "FRANCE" :  
    print("Bonjour")  
else :  
    print("Aloha/Ciao/G'Day")
```

# DEMO

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elif

# Combining conditions



If you win the lottery and the prize is over a million dollars then retire to a life of luxury

- Sometimes the decision on whether to take the next step depends on a combination of factors
- If I win the lottery, but only win \$5 I can't retire
- If the lottery gives out a million dollars but I didn't win, I can't retire
- I can only retire if I win the lottery **and** the prize was over a million dollars

When you use "and" you are saying  
all the conditions must be true

The "and" is only evaluated as True if both conditions are True.

```
#Imagine you have code that ran earlier which
```

```
#set these two variables
```

```
wonLottery = True
```

```
bigWin = True
```

```
#print statement only executes if both conditions are true
```

```
if wonLottery and bigWin :
```

```
    print("you can retire")
```

# Here are all the possible combinations

`if firstCondition and secondCondition :`

First Condition is	Second Condition is	Statement is
True	True	True
True	False	False
False	True	False
False	False	False

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# DEMO

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and

Sometimes we want to do something if either condition is true

- If it is Saturday **or** Sunday I can sleep in
- If it is raining **or** snowing don't bike to work

When you use "or" you are saying  
please do the following if either  
condition is true

The "or" is evaluated as True if either of the conditions is True.

```
#Imagine you have code that ran earlier which  
#set these two variables
```

```
saturday = True
```

```
sunday = False
```

```
#print statement executes if either condition is true
```

```
if saturday or sunday :
```

```
    print("you can sleep in")
```



# Here are all the possible combinations

`if firstCondition or secondCondition :`

First Condition is	Second Condition is	Statement is
True	True	True
True	False	True
False	True	True
False	False	False

# DEMO

---

or

You can combine multiple "and"/"or" in a single if statement

```
if month == "Sep" or month == "Apr" \
    or month == "Jun" or month == "Nov" :
    print("There are 30 days in this month")
```

```
if favMovie == "Star Wars" \
    and favBook == "Lord of the Rings" \
    and favEvent == "ComiCon" :
    print("You and I should hang out")
```

You can combine "and"/"or" in a single statement

```
if country == "CANADA" and \
    pet == "MOOSE" or pet == "BEAVER" :
    print("Do you play hockey too?")
```

Make sure you test all the different combinations

- Country = CANADA, Pet = MOOSE
- Country = CANADA, Pet = BEAVER
- Country = VIETNAM, Pet = MOOSE
- Country = VIETNAM, Pet = BEAVER

This one doesn't seem to work the way you would expect!

# DEMO

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Combining and/or

Do you remember learning order of operations for math in school?

- $8+5*2=?$
- Multiplication and Division are done before addition and subtraction
- $8+5*2 = 18$

There is an order of operations for "and"/"or"  
"and" are evaluated first

```
if country == "CANADA" and pet == "MOOSE" \
    or pet == "BEAVER":
    print("Do you play hockey too?")
```

In math, how can you specify that you want to do addition before multiplication?

- Use parentheses!
- $(8+5)*2 = 26$



We can use parentheses to execute “or” before “and”

```
if country == "CANADA" and \
    (pet == "MOOSE" or pet == "BEAVER") :
    print("Do you play hockey too")
```

When in doubt, just add parentheses whenever you combine and/or in a single if statement.

It might be redundant, but it will be easier for someone to read your code and you are less likely to make mistakes.

Sometimes we have multiple conditions but just using and "and"/"or" may not work

- How could you handle this in code?
- If it is Monday, go check to see if there is fresh coffee. If there is no fresh coffee go to the nearest café
- In this situation you have to check a condition, if it is true you want to check another condition.

# Nested if statements

# You can nest if statements inside each other

```
monday = True
freshCoffee = False
if monday :
    #you could have code here to check for fresh coffee

    # the if statement is nested, so this if statement
    # is only executed if the other if statement is true
    if not freshCoffee :
        print("go buy a coffee!")
    print("I hate Mondays")
print("now you can start work")
```

You have to be VERY careful with how the code is indented, because that determines which code goes with which if statement

# DEMO

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Nested if statements

# Your challenge

- Calculate the total to charge for an order from an online store in Canada
- Ask user what country they are from and their order total
- If the user is from Canada, ask which province
- If the order is from outside Canada do not charge any taxes
- If the order was placed in Canada calculate tax based on the province
  - Alberta charge .05% General sales Tax (GST)
  - Ontario, New Brunswick, Nova Scotia charge .13% Harmonized sales tax
  - All other provinces charge .06% provincial sales tax + .05% GST tax
- Tell the user the total with taxes for their order

# Testing your challenge

- What do you need to test to ensure your code works correctly?
  - Someone who is from outside Canada (no tax)
  - Someone from Alberta, Canada (5% tax)
  - Someone from Ontario, Canada (13% tax)
  - Someone from Canada from a different province (e.g. Quebec) (11% tax)

# Congratulations

- You can now write code that solves problems requiring more complex decision making







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