Complex decisions with code

and/or, nested if, elif

D EXPLORE X

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

because you really only have one condition to check

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")
```

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 t
rue
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

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 t
rue
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

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?")
```

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

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?")
```

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

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.

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

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)