Chapter 7 in Zelle
Bits, binary switch

Relational Operators

Boolean Operators

Teller Machine Revisited

Exercises
Bits & Boolean Values

• Bits: 0 and 1

• Boolean values: True and False

• Boolean switches: Imagine a world where every decision has a binary outcome:
  • Do you want to go out or do you want to stay in?
  • If you go out, do you walk or do you take the car?
? True False
if boolean expression:
    True
else:
    False
Example

Amount to withdraw? 71
3  $20-bill(s)
1  $10-bill(s)
0  $5-bill(s)
1  $1-bill(s)
amount = int( input( "Amount? " ) )

no20s = amount // 20
amount = amount % 20

no10s = amount // 10
amount = amount % 10

no5s = amount // 5
no1s = amount % 5

print( no20s, "$20-bill(s)" )
...

Example
amount = int(input("Amount? "))
no20s = amount // 20
amount = amount % 20

no10s = amount // 10
amount = amount % 10

no5s = amount // 5
nols = amount % 5

if no20s == 1:
    print(no20s, "$20-bill")
else:
    print(no20s, "$20-bills")

...
Assume no20s contains 1...

```python
if no20s == 1:
    print( no20s, "$20-bill" )
else:
    print( no20s, "$20-bills" )
```
Assume no20s contains 3…

```python
if no20s == 1:
    print( no20s, "$20-bill" )
else:
    print( no20s, "$20-bills" )
```
Demo Time!

Revisit Teller Machine program and make it display “bill” or “bills”…
Bits, binary switch

Boolean Operators

Logical Operators

Teller Machine Revisited

Exercises
# Relational Operators

<table>
<thead>
<tr>
<th>Operator</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>==</td>
<td>equal to</td>
</tr>
<tr>
<td>!=</td>
<td>not equal to</td>
</tr>
<tr>
<td>&lt;</td>
<td>less than</td>
</tr>
<tr>
<td>&lt;=</td>
<td>less than or equal to</td>
</tr>
<tr>
<td>&gt;</td>
<td>greater than</td>
</tr>
<tr>
<td>&gt;=</td>
<td>greater than or equal to</td>
</tr>
</tbody>
</table>
Examples

```python
if no20s == 1:
    print( no20s, "$20-bill" )
else:
    print( no20s, "$20-bills" )

num = input( "guess a number" )
if num == secretNumber:
    print( "Congratulations!" )
else:
    print( "Sorry, that was not correct!" )
```
Coding Exercise

Recode the Teller-Machine program, so that

• the output correctly displays "bill" or "bills"
• a number of bills of 0 is not displayed
• only an amount less than $400 is allowed
• only amounts multiples of $5 are allowed.
We stopped here last time...
Exercises (Group 1)

http://cs.smith.edu/dftwiki/index.php/CSC111_Exercises_with_If_Statements_(Python_3)

```python
def f0():
    a = 3
    b = 5
    c = 10

    if a < b:
        print( "statement 1" )
    else:
        print( "statement 2" )

    print( "f0 done!" )
```
def f0():
a = 30  # <= changed!
b = 5
c = 10

if a < b:
    print( "statement 1" )
else:
    print( "statement 2" )

print( "f0 done!" )
def f0():
a = 30  # <= changed!
b = 5
c = 10
if a < b:

else:

print( "f0 done!" )
def f0():
    a = 3  # <= changed again!
    b = 5
    c = 10
    if a < b:
        if c == 10:
            print("statement 1")
        else:
            print("statement 2")
    else:
        print("statement 3")
    print("f0 done!")
def f0():
    a = 3
    b = 1  # <= changed!
    c = 101  # <= changed!
    if a < b:
        if c == 10:
            print( "statement 1" )
        else:
            print( "statement 2" )
    else:
        print( "statement 3" )

print( "f0 done!" )
def f0():
a = 3
b = 1  # == changed!
c = 101  # == changed!
if a < b:
    if c == 10:
        print("statement 1")
    else:
        print("statement 2")
else:
    print("statement 3")
print("f0 done!")
Bits, binary switch

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Exercises

Practice Functions
Practice, Practice, Practice: Writing Functions

Preparation for Homework #6
Exercise 1

```
def stripState(townState):
    return townNoState
```

"Northampton, MA"

"Northampton"
```python
def stripState( townState ):
    return townNoState
```

Exercise 1 (cont’d)

Test your function

1) from a main() function
2) from the Python console
3) with strings that have extra spaces at the front and back.
"Maria, Box [3494], Smith College"

Exercise 2

```python
def anonymizeBox(address):
    return anonAddress
```

"Maria, Box [XXXX], Smith College"
def firstAndLast( line ):
    return listFirstLast

Exercise 3

[ "Knox", "2017" ]
def lastLine(fileName):
    return lastLine

"poem.txt"

"the quick red fox jumped over the brown sleeping dog."

"dog."
Exercise 5

def get024( animalList ):
    return newList

["dog", "cat", "horse", "fly", "mouse", "goat",...]

["dog", "horse", "mouse"]
We stopped here last time...
Bits, binary switch

Relational Operators

**Boolean Operators**

Teller Machine Revisited

Exercises
Boolean Operators

And, Or, Not
if expression1 and expression2:
    statement
    statement
    statement
else:
    statement
    statement
    statement
if expression1 and expression2:
    statement
    statement
    statement
    statement
else:
    statement
    statement
    statement
    statement
```python
if expression1 and expression2:
    statement
    statement
    statement
else:
    statement
    statement
    statement
```
if `expression1` and `expression2`:

`statement`
`statement`
`statement`
else:

`statement`
`statement`
`statement`
`statement`
if expression1 and expression2:
    statement
    statement
    statement
else:
    statement
    statement
    statement
if expression1 and expression2:
  statement
  statement
  statement

else:
  statement
  statement
  statement

False

False True

if expression1 and expression2:
    statement
    statement
    statement
else:
    statement
    statement
    statement
if expression1 and expression2:
    statement
    statement
    statement
else:
    statement
    statement
    statement
    statement
if expression1 and expression2:
  statement
  statement
  statement
else:
  statement
  statement
  statement

True  True
False  True
False  False
False  False
if expression1 or expression2:
    statement
    statement
    statement
else:
    statement
    statement
    statement
if not expression:
    statement
    statement
    statement
else:
    statement
    statement
    statement
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Exercises
Coding Exercise

Recode the Teller-Machine program, with And, Or, and Not

• the output correctly displays "bill" or "bills"
• a number of bills of 0 is not displayed
• only an amount less than $400 is allowed
• only amounts multiples of $5 are allowed.
else is not always used...

```python
if no20s == 1:
    print( no20s, "$20-bill" )
else:
    print( no20s, "$20-bills" )
```
else is not always used...

caption = "$20\text{-bill}"
if no20s != 1:
    caption = caption + "s"

print( no20s, caption )
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Exercises —> Turing Test & Eliza