GSET - Intro to Programming with Python

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Summer 2023

Module 6 - Conditionals

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- Logical Statements
- Comparison Operations
- Branching and Program Flow
- Conditional Statements in Python
- Logical Operators and Compound Statements

Logical Statements

What are the four types of sentences?

1.
2.
3.
4.

We are going to discuss one of these in detail.

Logical Statements

A logical statement is a statement that can be evaluated as true or false.

Why are we discussing this? How are logical statements used in programming?

Logical Statements

A Classic Riddle: Knights and Knaves

John and Bill are standing at a fork in the road. John is standing in front of the left road, and Bill is standing in front of the right road. One of them is a knight (truth-teller) and the other a knave (liar), but you don't know which. You also know that one road leads to good, and the other leads to bad. By asking one yes–no question, can you determine the road to good?

modified from: wikipedia

Comparison Operations

If you studied mathematics, then you are familiar with these operators.

Name	Symbol	Example
strictly less than	$<$	
less than or equal to	$<=$	
strictly greater than	$>$	
greater than or equal to	$>=$	
equal (is equals to)	$==$	
not equal (is not equal to)	$!=$	
object identity	*is*	
negated object identity	*is not*	

reference: docs.python.org - Built-in Types

Comparison Operations

Relational operators are used to create logical statements.

Branching and Program Flow

Previously the programs we have written look like a single line.

. . .

. . .

Branching and Program Flow

Commonly Used Flowchart Symbols

- Flowline
- Terminal
- Process
- Decision
- Input/Output
- and many more ...

Flowcharting is a tool for brainstorming and it can be used for communication and education. A flowchart is not a program.

ref: wikipedia

Conditional Statements in Python

quadratic equation example:

```
# get string from user
coefs=input('Type a,b,c and press enter: ')
a=float(coefs.split(',')[0]) # split items by commas
b=float(coefs.split(',')[1]) # access with index
c=float(coefs.split(',')[2]) # convert string to float

x1=(-b+(b**2-4*a*c)**(0.5))/(2*a) # calculate root values
x2=(-b-(b**2-4*a*c)**(0.5))/(2*a)

print('The first root is:', x1)
print('The second root is:', x2)
```

docs.python.org - More Flow Control Tools

Conditional Statements in Python

quadratic equation example continued:

```
# determine case from sign of descriminant
if (b**2-4*a*c)>0:
   print('The roots are real numbers')
else:
   print('The roots are complex numbers')
```

docs.python.org - More Flow Control Tools

Logical Operators and Compound Statements

If you studied programming, then you are probably familiar with these operators.

Name	Symbol	Example
conjunction	$\wedge$	
disjunction	$\vee$	
negation	$\sim$	

Logical Operators and Compound Statements

Compound Logical Statements as conditionals in Python

docs.python.org - Compound Statements

Logical Operators and Compound Statements

Compound Statements and Truth Tables.

—	—	Cmpd. Stmt. C	Cmpd. Stmt. D	Cmpd. Stmt. E
Stmt. A	Stmt. B			

Hint: Use a truth table to solve the Knights and Knaves riddle.