

Conditions and if/else

Conditions

score > 90

- Evaluates to true (1) or false (0)
- Generally ...
variable operator variable
variable operator constant

Comparison Operators

- <
- >
- <=
- >=
- ==
– NOT the same as =
- !=

Examples

• x=5 y=8 z=5 MAX=10 initial='s'

```
x<y  
y>MAX  
x<=z  
z>=MAX  
initial=='r'  
x!=z
```

Logical Operators

- and
 - or
 - not
- x=5 y=8 z=5 MAX=10 initial='s'
- ```
x<y and z>MAX
x<y or z>MAX
not (x>y)
```

## Precedence

- function calls
- unary operators and binary power (-, \*\*)
- \* / %
- + -
- < <= >= > == !=
- not
- and
- or

## Short-Circuit Evaluation

- Stop evaluation when true/false value is determined

- $x=6$   $y=9$

$x > 2$  or  $y > 13$

$x < 2$  and  $y > 13$

## Logical Assignment and Negation

```
in_range = (x>0 and x<=10) # 1 if x between 1-10, 0 otherwise
in_range = 0<x<=10 #Java does not allow this!!!
```

```
same_initials = (first_initial=='S' and last_initial=='R')
```

```
not_same_initials = not(first_initial=='S' and last_initial=='R')
not_same_initials = (first_initial!='S' or last_initial!='R')
```

## DeMorgan's Theorem

- $\text{not}(a \text{ and } b) \Rightarrow (\text{not}(a) \text{ or } \text{not}(b))$
- $\text{not}(a \text{ or } b) \Rightarrow (\text{not}(a) \text{ and } \text{not}(b))$

## Exercises

1. Determine the results of the following statements given  $a=6$   $b=9$   $c=12$   $d=-7$   $e=0$   $f=12$ .

1. print  $a > d$
2. print  $c \leq f$
3. print  $d > e$
4. print  $c = f$
5. print  $c == f$
6. print  $c > b$  and  $e > f$
7. print  $c > b$  or  $e > f$
8. print  $a$  or  $e$
9. print  $e$  and  $a$

## if Statement

- Statements **MUST** be indented

```
if condition:
 statements
```

```
if age >= 16:
 print "You can get a driver's license."
```

```
if age > 21:
 print "You can purchase alcohol."
 print "You can gamble."
```

```
if age >= 16 and age < 21:
 print "You can drive but you cannot gamble."
```

## if/else Statement

```
if condition:
 statements
else:
 statements
```

```
if grade > 60:
 print "You passed the class."
 print "Next up, CS112."
```

```
else:
 print "Sorry, you did not pass."
 print "Try again next semester."
```

## Nested if Statements

```
if condition:
 if condition:
 statement
 else:
 statement
else:
 statement

if grade > 60:
 print "You passed the class."
 if grade > 90:
 print "You passed with an A!"
else:
 print "Sorry, you did not pass."
```

## Example

```
if num > 0 and num <= 10:
 print "Your number is between 1 and 10"
else:
 if num > 10:
 print "Your number is too high"
 else:
 print "Your number is too low"
```

## Chained Conditionals

```
if num > 0 and num <= 10:
 print "Your number is between 1 and 10"
else:
 if num > 10:
 print "Your number is too high"
 else:
 print "Your number is too low"

if num > 0 and num <= 10:
 print "Your number is between 1 and 10"
elif num > 10:
 print "Your number is too high"
else:
 print "Your number is too low"
```

## Example

```
if grade > 60:
 print "You passed the class."
 if grade > 90:
 print "You passed with an A!"
else:
 print "Sorry, you did not pass."

#Does this work???
if grade > 60:
 print "You passed the class."
elif grade > 90:
 print "You passed with an A!"
else:
 print "Sorry, you did not pass."
```

## Using Functions

```
def getGrade(score):
 if score > 90:
 return "A"
 elif score > 80:
 return "B"
 elif score > 70:
 return "C"
 elif score > 60:
 return "D"
 else:
 return "F"
```

## Exercises

1. Write an if statement that compares two integer variables x and y and prints the largest. For example, your program would print "X is larger than Y" or "Y is larger than X".
2. Modify your program above so that it compares three integers x, y, and z and prints the largest.
3. Write a function that takes as input a year and returns true if the year is a leap year and false otherwise. A year is a leap year if it is divisible by four, except that any year divisible by 100 is a leap year only if it is divisible by 400 as well. -Problem Solving and Program Design in C Hanly and Koffman