COMP 141

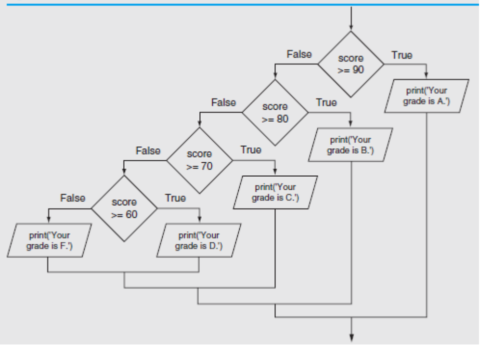
if-elif-else, and/or

Rhodes College

Announcements

- Reminders:
  - Program 1 due tomorrow night by 11:55pm

Figure 4-17 Nested decision structure to determine a grade


score >= 90
False
True
print('Your grade is A.')
score >= 80
False
True
print('Your grade is B.')
score >= 70
False
True
print('Your grade is C.')
score >= 60
False
True
print('Your grade is F.')
print('Your grade is D.')

```
# This program gets a numeric test score from the
# user and displays the corresponding letter grade.

# Constants for the grade thresholds
A_SCORE = 90
B_SCORE = 80
C_SCORE = 70
D_SCORE = 60

# Get a test score from the user.
score = int(input('Enter your test score: '))

# Determine the grade.
if score >= A_SCORE:
    print('Your grade is A.')
else:
    if score >= B_SCORE:
        print('Your grade is B.')
    else:
        if score >= C_SCORE:
            print('Your grade is C.')
        else:
            if score >= D_SCORE:
                print('Your grade is D.')
            else:
                print('Your grade is F.')
```

The `if-elif-else` Statement

- **`if-elif-else` statement**: special version of a decision structure
  - Makes logic of nested decision structures simpler to write
    - Can include multiple `elif` statements
  - Syntax:

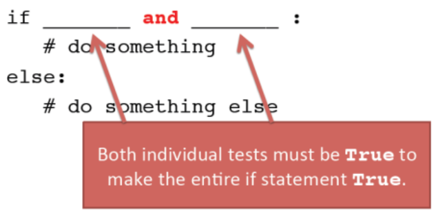
```
if condition1:
      statements
elif condition2:
      statements
else:
      statements
```

```
# This program gets a numeric test score from the
# user and displays the corresponding letter grade.
# It is equivalent to the program in the previous slide

# Constants for the grade thresholds
A_SCORE = 90
B_SCORE = 80
C_SCORE = 70
D_SCORE = 60

# Get a test score from the user.
score = int(input('Enter your test score: '))

# Determine the grade.
if score >= A_SCORE:
    print('Your grade is A.')
elif score >= B_SCORE:
    print('Your grade is B.')
elif score >= C_SCORE:
    print('Your grade is C.')
elif score >= D_SCORE:
    print('Your grade is D.')
else:
    print('Your grade is F.')
```

Logical Operators

- **Logical operators**: operators that can be used to create complex Boolean expressions
  - **`and`** operator and **`or`** operator: binary operators, connect two Boolean expressions into a compound Boolean expression
  - **`not`** operator: unary operator, reverses the truth of its Boolean operand

The `and` Operator

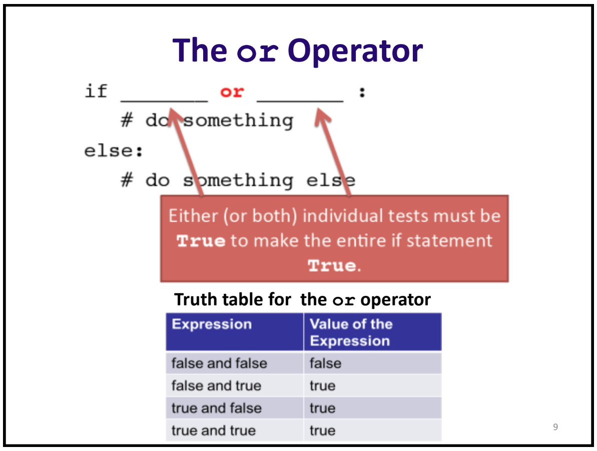


```
if ________ and ________ :
   # do something
else:
   # do something else
```

Both individual tests must be **`True`** to make the entire if statement **`True`**.

Truth table for the `and` operator

Expression	Value of the Expression
false and false	false
false and true	false
true and false	false
true and true	true



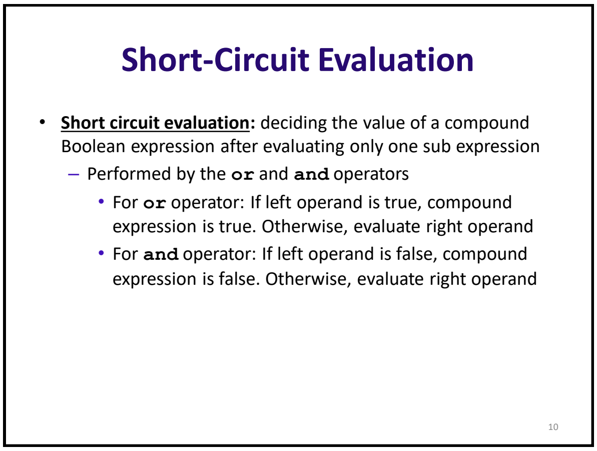
The `or` Operator

```
if _______ or _______ :
   # do something
else:
   # do something else
```

Either (or both) individual tests must be **`True`** to make the entire if statement **`True`**.

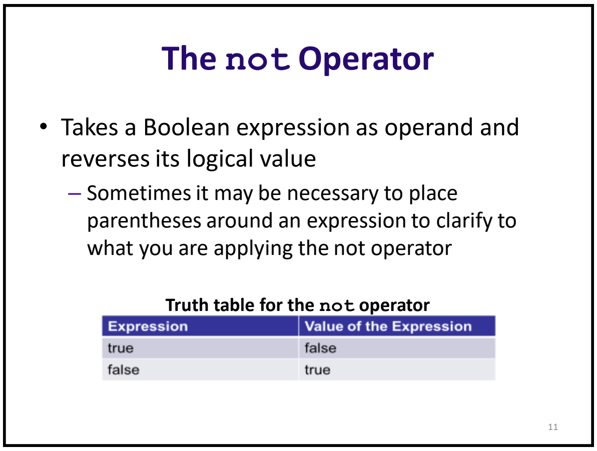
Truth table for the `or` operator

Expression	Value of the Expression
false and false	false
false and true	true
true and false	true
true and true	true



Short-Circuit Evaluation

- **<u>Short circuit evaluation</u>:** deciding the value of a compound Boolean expression after evaluating only one sub expression
  - Performed by the **`or`** and **`and`** operators
    - For **`or`** operator: If left operand is true, compound expression is true. Otherwise, evaluate right operand
    - For **`and`** operator: If left operand is false, compound expression is false. Otherwise, evaluate right operand

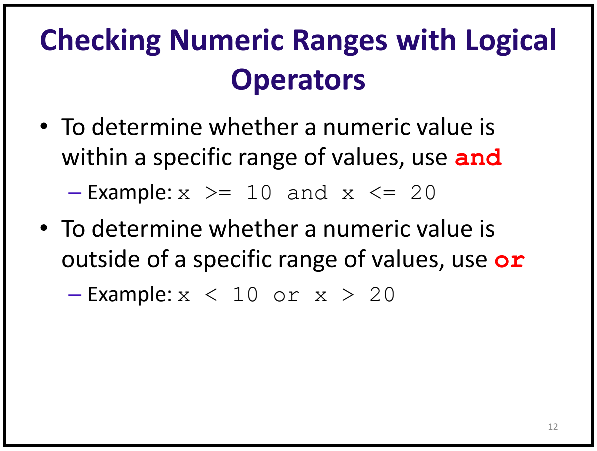


The `not` Operator

- Takes a Boolean expression as operand and reverses its logical value
  - Sometimes it may be necessary to place parentheses around an expression to clarify to what you are applying the not operator

Truth table for the `not` operator

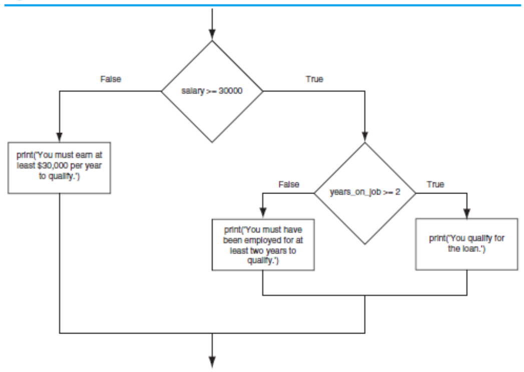
Expression	Value of the Expression
true	false
false	true



Checking Numeric Ranges with Logical Operators

- To determine whether a numeric value is within a specific range of values, use **`and`**
  - Example: `x >= 10 and x <= 20`
- To determine whether a numeric value is outside of a specific range of values, use **`or`**
  - Example: `x < 10 or x > 20`

Figure 4-14 A nested decision structure


salary >= 30000
False
True
print('You must earn at least $30,000 per year to qualify.')
years_on_job >= 2
False
True
print('You must have been employed for at least two years to qualify.')
print('You qualify for the loan.')

```
# This program determines whether a bank customer
# qualifies for a loan.

# Constants for minimum salary and minimum
# years on the job
MIN_SALARY = 30000.0
MIN_YEARS = 2


# Get the customer's annual salary.
salary = float(input('Enter your annual salary: '))

# Get the number of years on the current job.
years_on_job = int(input('Enter the number of ' +
                         'years employed: '))

# Determine whether the customer qualifies.
if salary >= MIN_SALARY:
    if years_on_job >= MIN_YEARS:
        print('You qualify for the loan.')
    else:
        print('You must have been employed', \
              'for at least', MIN_YEARS, \
              'years to qualify.')
else:
    print('You must earn at least $', \
          format(MIN_SALARY, ',.2f'), \
          ' per year to qualify.', sep='')
```

```
# This program determines whether a bank customer
# qualifies for a loan.

# Constants for minimum salary and minimum
# years on the job
MIN_SALARY = 30000.0
MIN_YEARS = 2

# Get the customer's annual salary.
salary = float(input('Enter your annual salary: '))

# Get the number of years on the current job.
years_on_job = int(input('Enter the number of ' +
                         'years employed: '))

# Determine whether the customer qualifies.
if salary >= MIN_SALARY and years_on_job >= MIN_YEARS:
    print('You qualify for the loan.')
else:
    print('You do not qualify for this loan.')
```

Review Questions

1. Does an `if` statement **always** need to be followed by an `else` statement?

2. If you write an `if-else` statement, under what circumstances do the statements that appear after the `else` clause execute?

3. Assume the variables a = 2, b = 4, c = 6. What do the following statements evaluate to (true or false)?
   a) a == 4 or b > 2
   b) 6 <= c and a > 3
   c) 1 != b and c != 3
   d) a >= -1 or a <= b
   e) not (a > 2)

In-Class Lab

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