Week 5 Asynchronous Materials Guide

Conditional Logic

This Week's Topics Overview

Building on Week 4's boolean expressions and operators, you'll now learn to:

- Use basic if statements to execute code conditionally
- Handle two-way decisions with if-else statements
- Create multiple branches with if-elif-else chains
- Combine conditions using logical operators (and, or, not)
- Nest conditionals for complex decision-making
- Understand Python's indentation requirements

Start Here: Video Tutorial

Corey Schafer Python Conditionals Tutorial

Python Tutorial: Conditionals and Booleans - If, Elif, Else Statements

- **Duration:** 16 minutes
- **What you will learn:** If, elif, else statements and boolean logic
- **Why this helps:** Clear explanations with practical coding examples
- **Study approach:** Pause and code along with each example

Basic If Statements

W3Schools Python If Statements

https://www.w3schools.com/python/python_conditions.asp

- Basic if statement syntax and structure
- Understanding indentation requirements

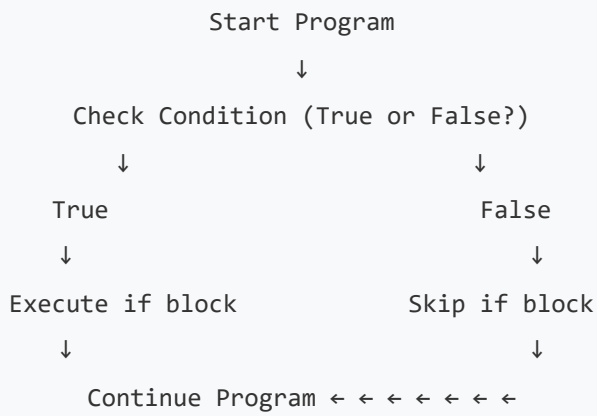
- Simple examples you can test immediately

LearnPython.org Conditions

https://www.learnpython.org/en/Conditions

- Interactive tutorial with exercises
- Covers if, elif, and else statements
- Complete the exercise at the end

How If Statements Work



Basic If Statement Examples

```
# Simple if statement
age = 20
if age >= 18:
    print("You can vote!")
    print("You are an adult.")

print("This always runs regardless of age")

# Multiple separate if statements
temperature = 85
if temperature > 80:
    print("It's hot outside!")
if temperature > 90:
    print("It's very hot!")
if temperature < 32:
    print("It's freezing!")
```

```python
# Using boolean variables
has_license = True
is_adult = age >= 18

if has_license and is_adult:
    print("You can drive legally!")

# Common pattern: validating input
user_name = input("Enter your name: ")
if len(user_name) >= 2:
    print("Name length is acceptable")
if user_name.isalpha():
    print("Name contains only letters")
if user_name.istitle():
    print("Name is properly capitalized")
```

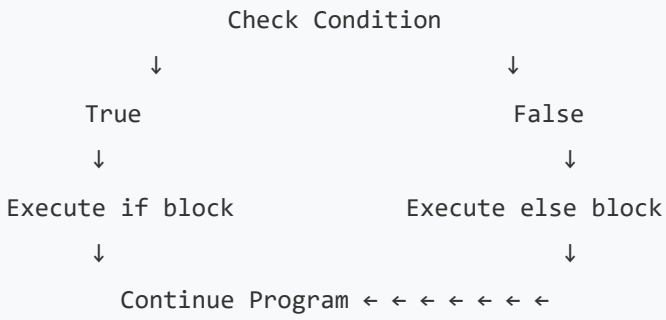
If-Else Statements

Real Python Conditional Statements

https://realpython.com/python-conditional-statements/

- Comprehensive guide to all conditional statements
- Advanced examples and best practices
- Read sections on "if" and "if...else" statements

How If-Else Statements Work



Key Point: Exactly one block always executes - either if or else, never both, never neither.

If-Else Examples

```python
# Basic if-else
number = 17
if number % 2 == 0:
    print(f"{number} is even")
else:
    print(f"{number} is odd")

# Grade checker
score = 72
if score >= 60:
    print("You passed!")
    status = "PASS"
else:
    print("You failed.")
    status = "FAIL"
print(f"Final status: {status}")

# Store hours checker
current_hour = 14  # 2 PM
if 9 <= current_hour <= 21:  # Using chained comparison
    print("Store is open")
    print("Come on in!")
else:
    print("Store is closed")
    print("Please come back during business hours: 9 AM - 9 PM")

# User authentication
username = input("Enter username: ")
expected_user = "admin"

if username == expected_user:
    print("Login successful!")
    print("Welcome to the admin panel")
else:
    print("Invalid username")
    print("Access denied")
```

If-Elif-Else Chains

Python elif Statements

https://www.programiz.com/python-programming/if-elif-else

- When to use elif instead of multiple if statements
- Order of evaluation in elif chains
- Examples with multiple conditions

How If-Elif-Else Works

```
Check first condition (if)
↓
True? → Execute if block → Continue
↓ False
Check second condition (elif)
↓
True? → Execute elif block → Continue
↓ False
Check third condition (elif)
↓
True? → Execute elif block → Continue
↓ False
Execute else block (if present)
↓
Continue program
```

Important: Only the first True condition executes. Once a condition is True, the rest are skipped.

If-Elif-Else Examples

```python
# Grade calculator
score = 87
if score >= 90:
    grade = "A"
    print("Excellent work!")
elif score >= 80:
    grade = "B"
    print("Good job!")
elif score >= 70:
    grade = "C"
    print("Satisfactory")
elif score >= 60:
    grade = "D"
    print("Needs improvement")
else:
    grade = "F"
```

```
    print("Failed")

print(f"Your grade: {grade}")

# Age categorization
age = int(input("Enter your age: "))
if age < 0:
    print("Invalid age")
elif age <= 12:
    category = "Child"
    ticket_price = 5
elif age <= 19:
    category = "Teenager"
    ticket_price = 8
elif age <= 64:
    category = "Adult"
    ticket_price = 12
else:
    category = "Senior"
    ticket_price = 8

print(f"Category: {category}, Ticket: ${ticket_price}")

# Weather clothing advisor
temp = float(input("Enter temperature (°F): "))
if temp >= 80:
    print("Wear shorts and t-shirt")
    print("Don't forget sunscreen!")
elif temp >= 60:
    print("Wear jeans and light jacket")
elif temp >= 40:
    print("Wear warm coat and layers")
elif temp >= 20:
    print("Wear heavy winter coat")
else:
    print("Extreme cold! Stay inside if possible!")
    print("If you must go out, dress in layers")
```

Logical Operators

Python Logical Operators

https://www.w3schools.com/python/python_operators.asp

- Scroll to "Python Logical Operators" section
- Understanding and, or, not operators
- Truth tables and operator precedence

Logical Operators Truth Table

A	B	A and B	A or B	not A
True	True	True	True	False
True	False	False	True	False
False	True	False	True	True
False	False	False	False	True

Logical Operator Examples

```
# Using 'and' - both conditions must be True
age = 25
has_license = True

if age >= 16 and has_license:
    print("You can drive!")
else:
    print("You cannot drive")

# Using 'or' - at least one condition must be True
is_weekend = True
is_holiday = False

if is_weekend or is_holiday:
    print("You don't have to work today!")
else:
    print("It's a work day")

# Using 'not' - reverses True/False
login_successful = False

if not login_successful:
    print("Access denied")
    print("Please try again")
```

```
else:
    print("Access granted")

# Complex combinations
income = 45000
credit_score = 680
has_cosigner = True

# Loan approval logic
if (income >= 50000 and credit_score >= 650) or has_cosigner:
    if income >= 100000:
        print("Approved for premium rate!")
    else:
        print("Loan approved!")
else:
    print("Loan denied")

# Event admission checker
age = 20
has_ticket = True
is_vip = False

if age >= 18 and has_ticket:
    if is_vip or age >= 21:
        print("Welcome to VIP section!")
    else:
        print("General admission")
elif age >= 18:
    print("You need a ticket")
else:
    print("Must be 18 or older")
```

Nested Conditionals

Nested If Statements

https://www.geeksforgeeks.org/nested-if-statement-in-python/

- When to use nested if statements
- Alternative approaches using logical operators
- Avoiding overly complex nesting

Nested Conditional Examples

```python
# Movie ticket pricing with nested logic
age = int(input("Enter age: "))
is_student = input("Are you a student? (yes/no): ").lower() == "yes"

if age < 18:
    price = 8
    print("Child ticket: $8")
elif age >= 65:
    price = 10
    print("Senior ticket: $10")
else:
    if is_student:
        price = 12
        print("Student discount: $12")
    else:
        price = 15
        print("Regular adult ticket: $15")

print(f"Total: ${price}")

# Discount calculator with nested conditions
purchase_amount = 75
is_member = True
is_first_time = False

if purchase_amount >= 50:
    print("Qualifies for discount!")

    if is_member:
        if purchase_amount >= 100:
            discount = 0.25  # 25% off for members on large purchases
            print("Premium member discount: 25%")
        else:
            discount = 0.15  # 15% off for members
            print("Member discount: 15%")
    else:
        if is_first_time:
            discount = 0.10  # 10% off for first-time customers
            print("First-time customer discount: 10%")
        else:
            discount = 0.05  # 5% off for regular customers
            print("Regular discount: 5%")
else:
    discount = 0
```

```
    print("No discount available")

final_price = purchase_amount * (1 - discount)
print(f"Final price: ${final_price:.2f}")
```

Python Indentation Rules - CRITICAL!

Unlike many programming languages that use braces {}, Python uses indentation (spaces) to group code blocks. This is not optional - it's how Python knows which code belongs together.

> **Indentation Requirements:**
>
> - **Use 4 spaces** for each level of indentation (not tabs)
> - **Be consistent** - all lines at the same level must have the same indentation
> - **Colon required** - every if, elif, and else must end with a colon (:)
> - **Empty lines allowed** within code blocks for readability

Correct Indentation Examples

```
# Correct indentation
if age >= 18:
    print("You are an adult")  # 4 spaces
    print("You can vote")      # 4 spaces

    if has_license:            # 4 spaces
        print("You can drive") # 8 spaces (nested)
    else:                      # 4 spaces
        print("Get a license") # 8 spaces (nested)

print("This always runs")     # 0 spaces (not in if block)

# More complex nesting
if weather == "sunny":
    print("Great day!")

    if temperature > 75:
        print("Perfect for the beach!")
        print("Don't forget sunscreen")
    else:
```

```
        print("Nice for a walk")

elif weather == "rainy":
    print("Stay inside")
else:
    print("Check the forecast")
```

Common Indentation Errors

```
# ERROR: Missing colon
if age >= 18
    print("Adult")

# ERROR: No indentation
if age >= 18:
print("Adult")

# ERROR: Inconsistent indentation
if age >= 18:
    print("Adult")      # 4 spaces
  print("Can vote")     # 2 spaces - ERROR!

# ERROR: Mixed tabs and spaces (looks correct but isn't)
if age >= 18:
→   print("Adult")      # Tab character
    print("Can vote")   # 4 spaces - ERROR!

# CORRECT: Consistent 4-space indentation
if age >= 18:
    print("Adult")      # 4 spaces
    print("Can vote")   # 4 spaces
```

Common Patterns and Best Practices

Pattern 1: Input Validation

```
age = int(input("Enter age: "))

if age < 0 or age > 120:
```

```
    print("Invalid age entered")
else:
    print(f"Age {age} is valid")
```

Pattern 2: Range Checking

```
score = int(input("Enter test score: "))

if 0 <= score <= 100:
    print("Valid score")
else:
    print("Score must be between 0 and 100")
```

Pattern 3: Email Format Checking

```
# Check if email looks valid
email = input("Enter email: ")

if "@" in email and "." in email:
    if len(email) >= 5:
        print("Email format looks valid")
    else:
        print("Email is too short")
else:
    print("Email must contain @ and .")
```

Quick Reference

Conditional Statement Syntax

```
# Basic if
if condition:
```

```
    # code block

# If-else
if condition:
    # code if True
else:
    # code if False

# If-elif-else
if condition1:
    # code for condition1
elif condition2:
    # code for condition2
elif condition3:
    # code for condition3
else:
    # code if all conditions False

# Nested conditionals
if condition1:
    if condition2:
        # nested code
    else:
        # nested else
else:
    # outer else
```

Logical Operators

```
# and - both must be True
if age >= 18 and has_license:
    print("Can drive")

# or - at least one must be True
if is_weekend or is_holiday:
    print("No work today")

# not - reverses True/False
if not login_successful:
    print("Try again")

# Combining with parentheses
if (age >= 21 or has_permission) and has_id:
    print("Entry allowed")
```

Common Comparison Patterns

```
# Range checking
if 18 <= age <= 65:
    print("Working age")

# String comparisons (case-sensitive)
if user_input.lower() == "yes":
    print("User agreed")

# Multiple possibilities with elif
if grade == "A":
    print("Excellent")
elif grade == "B":
    print("Good")
elif grade == "C":
    print("Average")

# Checking for empty strings
if username != "":
    print("Username provided")
# or
if len(username) > 0:
    print("Username provided")
```