

# Python Crash Course

## Complete Study Notes

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# Chapter 1: Getting Started

## 1. Setting Up Your Programming Environment

**Definition:** Installing Python and a text editor to create your first Python program.

The chapter covers:

- Installing Python on different operating systems (Windows, macOS, Linux)
- Installing Sublime Text editor
- Configuring the development environment
- Understanding Python versions

## 2. Running Your First Python Program

**Definition:** Creating and running a simple "Hello World" program to verify your setup.

Listing 1: Hello World program

```
# Python Crash Course, 2Ed, writtern by Eric Matthes  
  
print("Hello Python world!")
```

## 3. Understanding What Happens When You Run a Program

**Definition:** How the Python interpreter processes your code and displays output.

When you run the program:

- The .py extension tells your editor it's a Python program
- The Python interpreter reads through the program
- It determines what each word means (print is a function)
- It executes the code and displays output
- Your editor uses syntax highlighting to show different parts of code

## 4. Running Programs from Terminal

**Definition:** Alternative way to run Python programs using command line.

**On Windows:**

```
C:\> cd Desktop\python_work  
C:\Desktop\python_work> python hello_world.py  
Hello Python world!
```

**On macOS and Linux:**

```
~$ cd Desktop/python_work/  
~/Desktop/python_work$ python hello_world.py  
Hello Python world!
```

## Practical Examples from Chapter 1

### Your First Python Program

The file `Chapter01/101_hello_world.py` contains your first Python program:

Listing 2: `Chapter01/101_hello_world.py`

```
# Python Crash Course, 2Ed, writtern by Eric Matthes  
  
print("Hello Python world!")
```

**Expected output:**

Hello Python world!

### Key Takeaways

- Python is installed on most systems, but you may need to install it
- A text editor like Sublime Text makes programming easier
- The `.py` extension tells your system it's a Python program
- You can run programs from your editor or from the terminal
- The Python interpreter reads and executes your code
- Syntax highlighting helps you understand your code
- Troubleshooting is a normal part of programming

# Chapter 2: Variables and Simple Data Types

## 1. What Really Happens When You Run `hello_world.py`

**Definition:** Understanding how the Python interpreter processes your code and what happens behind the scenes.

When you run a Python program:

- The `.py` extension indicates it's a Python program
- The Python interpreter reads through the program
- It determines what each word means (`print` is a function)
- It executes the code and displays output
- Your editor uses syntax highlighting to show different parts of code

## 2. Variables

**Definition:** A name that represents a value stored in memory. Variables are used to store and reference data.

Listing 3: Variables and strings

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

message = "hello python world!"
print(message)

message = "hello python Crash Course world!"
print(message)
```

## 3. Naming and Using Variables

**Definition:** Rules and guidelines for creating meaningful and valid variable names in Python.

Rules:

- Use letters, digits, and underscores only
- Start with a letter or underscore (not a digit)
- Spaces are not allowed, but underscores can separate words
- Avoid Python keywords and function names
- Variable names should be short but descriptive
- Be careful with lowercase `l` and uppercase `O` (confused with 1 and 0)

**Examples of Good Variable Names:**

```
message = "Hello Python world!"
message_1 = "Hello Python Crash Course world!"
greeting_message = "Hello!"
```

**Examples of Bad Variable Names:**

```
# Don't start with a digit
1_message = "Hello" # Error!

# Don't use spaces
greeting message = "Hello" # Error!

# Don't use Python keywords
print = "Hello" # Avoid this!
```

## 4. Avoiding Name Errors When Using Variables

**Definition:** Common mistakes and how to fix them when working with variables.

**Common Errors:**

- Misspelling variable names
- Forgetting to set a variable's value before using it
- Using inconsistent spelling

**Example of a Name Error:**

```
message = "Hello Python Crash Course reader!"
print(message) # NameError: name 'mesage' is not defined
```

## 5. Variables Are Labels

**Definition:** Variables are better thought of as labels that you can assign to values, not boxes that store values.

This distinction becomes important as you write more complex programs.

**Exercise 2-1: Simple Message** Assign a message to a variable, and then print that message.

Listing 4: Exercise 2-1: Simple Message

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# simple_message.py -- print out one message

message = "I love Jung EunBi."

print(message)
```

**Exercise 2-2: Simple Messages** Assign a message to a variable, and print that message. Then change the value of the variable to a new message, and print the new message.

## Listing 5: Exercise 2-2: Simple Messages

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# simple_messages.py -- print out some messages

message = "I love Jung EunBi."

print(message)

message = "Jung EunBi loves me."

print(message)
```

## 6. Strings

**Definition:** A series of characters. Anything inside quotes is considered a string in Python.

```
"This is a string."
'This is also a string.'
'I told my friend, "Python is my favorite language!"'
"The language 'Python' is named after Monty Python, not the snake.
"
```

## 7. Changing Case in a String with Methods

**Definition:** String methods that modify the case of strings.

## Listing 6: String methods

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

name = "ada lovelace"
print(name.title())
# title() is method of the string 'name'
# it changes each word to title case, where each word begins with
  a capital letter

name = "Ada Lovelace"
print(name.upper())
# .upper change lowercase letters into capital letters
print(name.lower())
# .lower change capital letters into lowercase ones
```

## 8. Using Variables in Strings

**Definition:** Different ways to include variables in strings.

**f-strings (Python 3.6+):**



```
first_name = "ada"
last_name = "lovelace"
full_name = f"{first_name} {last_name}"
```

`.format()` method:

```
first_name = "ada"
last_name = "lovelace"
full_name = "{} {}".format(first_name, last_name)
```

## 9. Adding Whitespace to Strings

**Definition:** Using tabs and newlines to format strings.

```
print("Python")
print("\tPython")    # Tab
print("Languages:\nPython\nC\nJavaScript")    # Newlines
```

## 10. Stripping Whitespace

**Definition:** Removing extra whitespace from strings.

```
favorite_language = ' python '
favorite_language.rstrip()    # Remove right whitespace
favorite_language.lstrip()    # Remove left whitespace
favorite_language.strip()     # Remove both sides
```

**Exercise 2-3: Personal Message** Use a variable to represent a person's name, and print a message to that person.

Listing 7: Exercise 2-3: Personal Message

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# personal_message.py -- print out personal message

name = "Eunbi"
message = "would you marry me?"

print (f"{name}, {message}")
```

**Exercise 2-4: Name Cases** Use a variable to represent a person's name, and print that person's name in lowercase, uppercase, and title case.

Listing 8: Exercise 2-4: Name Cases

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# name_cases.py -- print out names in lowercase, uppercase and
# title case

name = "jung eunbi"
```

```
print(f"Lowercase: {name.lower()}")
print(f"Uppercase: {name.upper()}")
print(f"Title Case: {name.title()}")
```

**Exercise 2-6: Famous Quote** Find a quote from a famous person you admire. Print the quote and the name of its author.

Listing 9: Exercise 2-6: Famous Quote

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# quote.py -- print out some great persons the his / her quote

person = "Jung Eun Bi"
quote = "As an idol, one hamburger per day is maximum."

print(f"{person} once said, \"{quote}\"")
```

**Exercise 2-7: Stripping Names** Use a variable to represent a person's name, and include some whitespace characters. Print the name using each of the three stripping functions.

Listing 10: Exercise 2-7: Stripping Names

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# strip.py -- manipulating string with strip functions.

name = " Jung Eun Bi "

name2 = " Jung \n Eun \t Bi "

print("For no \\n and \\t characters:")
print(f"No strip: {name}")
print(f"With lstrip(): {name.lstrip()}")
print(f"With rstrip(): {name.rstrip()}")
print(f"Wlth strip(): {name.strip()}")

print("When \\n and \\t characters are included:")
print(f"No strip: {name2}")
print(f"With lstrip(): {name2.lstrip()}")
print(f"With rstrip(): {name2.rstrip()}")
print(f"Wlth strip(): {name2.strip()}")
```

## f-strings and Formatting:

Listing 11: f-strings and string formatting

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

first_name = "ada"
last_name = "lovelace"
full_name = f"{first_name} {last_name}"
# this is f-strings (f = format)
# concatenate variables into a string
```

```
print(full_name)
print(f"Hello, {full_name.title()}")
message = f"Hello, {full_name.title()}"
print(message)
full_name = "{} von {}".format(first_name, last_name)
print(full_name)
```

### String Formatting with Newlines and Tabs:

#### Listing 12: String Formatting

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

print("Python")
print("\tPython")
print("Languages:\n\tPython\n\tC\n\tJavascript")
```

### String Stripping Methods:

#### Listing 13: String Stripping

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

favourite_language = ' python aa '

print(favourite_language)

print(favourite_language.rstrip())
# rstrip : remove extra whitespacve on the right of a string

print("-----")

print(favourite_language)

favourite_language = favourite_language.rstrip()

print(favourite_language)
# now the string is being modified and assigned back to the value

print("-----")

favourite_language = ' python aa '

print(favourite_language)

print(favourite_language.lstrip())
# lstrip : remove extra whitespacve on the left of a string

print(favourite_language.strip())
# strip : remove extar whitespace on the left and right of a
string
```

### String Concatenation and Apostrophes:

## Listing 14: String Concatenation

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

message = "One of Python\'s strengths is its diverse community."

# apostrophe is represented by \'

print(message)
```

## 11. Numbers

**Definition:** Working with integers and floats in Python.

**Integers:**

```
2 + 3
3 - 2
2 * 3
3 / 2
3 ** 2 # Exponentiation
```

**Floats:**

```
0.1 + 0.1
0.2 + 0.1
3 * 0.1
```

**Integers and Floats:**

```
3 / 2 # Results in 1.5 (float)
3 // 2 # Results in 1 (integer division)
```

## 12. Underscores in Numbers

**Definition:** Using underscores to make large numbers more readable.

```
universe_age = 14_000_000_000
print(universe_age) # Prints 14000000000
```

## 13. Multiple Assignment

**Definition:** Assigning multiple variables at once.

```
x, y, z = 0, 0, 0
```

## 14. Constants

**Definition:** Variables that are meant to stay the same throughout a program (written in ALL\_CAPS).

```
MAX_CONNECTIONS = 5000
```

**Exercise 2-8: Number Eight** Write addition, subtraction, multiplication, and division operations that each result in the number 8.

Listing 15: Exercise 2-8: Number Eight

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# eight.py -- print results of four calculations that can result
#           in eight

print(7+1) # integer mix integer gererates integer
print(100/12.5) # integer mix float generates float
print(17.8-9.8)
print(2*4)
```

## 15. Comments

**Definition:** Text in code that is ignored by Python but provides information to programmers.

```
# This is a comment explaining the code
name = "ada" # This comment is on the same line
```

**Exercise 2-11: Zen of Python** Enter `import this` into a Python terminal session and skim through the additional principles.

Listing 16: Exercise 2-11: Zen of Python

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# zenofpython.py -- show "Zen of Python"

import this
```

## Key Takeaways

- Variables store data that can be reused throughout a program
- Follow Python naming conventions: use snake\_case for variables
- Avoid Python keywords and start variable names with letters or underscores
- Strings are the primary way to work with text in Python
- f-strings provide a convenient way to embed variables in text
- String methods like `title()`, `upper()`, and `lower()` modify text case
- Comments help make code readable and maintainable
- Numbers include integers and floats
- Constants are written in ALL\_CAPS
- The Python interpreter is strict about syntax and variable names

# Chapter 3: Introducing Lists

## 1. List - Collection of Items

**Definition:** A collection of items in a particular order, enclosed in square brackets and separated by commas.

Listing 17: Basic list operations

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

bicycles = ['trek', 'cannondale', 'redline', 'specialized']
print(bicycles)

print("-----")
print(bicycles[0])

print("-----")
print(bicycles[0].title())
message = f"My firs bicycle was a {bicycles[0].title()}"
print(message)

print("-----")
print(bicycles[1])
print(bicycles[3])

# -1 item becomes the last item
# the last item can be known without counting the total number of
# items
print(bicycles[-1])
```

**Exercise 3-1: Names** Store the names of a few of your friends in a list called names. Print each person's name by accessing each element in the list, one at a time.

Listing 18: Exercise 3-1: Names

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# gfriend.py -- list out the name of your friends

print(gfriend[0])
gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']

print(gfriend[0])
print(gfriend[1])
print(gfriend[2])
print(gfriend[3])
print(gfriend[4])
print(gfriend[5])
```

**Exercise 3-2: Greetings** Start with the list you used in Exercise 3-1, but instead of just printing each person's name, print a message to them. The text of each message should be the same, but each message should be personalized with the person's name.

## Listing 19: Exercise 3-2: Greetings

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# greetings.py -- say greetings to each of the members

greeting = ", guten Tag!"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(gfriend[0] + greeting)
print(gfriend[1] + greeting)
print(gfriend[2] + greeting)
print(gfriend[3] + greeting)
print(gfriend[4] + greeting)
print(gfriend[5] + greeting)
```

## 2. Index - Position in List

**Definition:** The position of an item in a list, starting from 0 for the first item.

```
bicycles = ['trek', 'cannondale', 'redline', 'specialized']
print(bicycles[0]) # trek
print(bicycles[1]) # cannondale
```

## 3. Negative Index - Accessing from End

**Definition:** Using negative numbers to access items from the end of a list (-1 is the last item).

```
bicycles = ['trek', 'cannondale', 'redline', 'specialized']
print(bicycles[-1]) # specialized
print(bicycles[-2]) # redline
```

## 4. Modifying List Elements

**Definition:** Changing the value of an item in a list by using its index.

## Listing 20: Modifying and manipulating lists

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

motorcycles = ['honda', 'yamaha', 'suzuki']
print(motorcycles)

motorcycles[0] = "ducati"
print(motorcycles)

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki']
# appending elements to list, preset to the last position
motorcycles.append('ducati')
```

```

print(motorcycles)

print("-----")
motorcycles = []
# appending elements to list, one by one
motorcycles.append('honda')
motorcycles.append('yamaha')
motorcycles.append('suzuki')
# insert can insert to the specific location
motorcycles.insert(0, 'ducati')
print(motorcycles)
print("-----")
# del can delete one of the elements
del motorcycles[0]
print(motorcycles)

print("-----")
# pop : chop out the last item and store that into the last value
popped_motorcycles = motorcycles.pop()
print(motorcycles)
print(popped_motorcycles)

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki']
last_owned = motorcycles.pop()
print(f"The last motorcycle I owned was a {last_owned.title()}.")

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki']
first_owned = motorcycles.pop(0)
print(f"The first motorcycle I owned was a {first_owned.title()}."
)

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki', 'ducati']
# removing item by value
motorcycles.remove('ducati')
print(motorcycles)

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki', 'ducati']
# removing item by value, same result as pop
too_expensive = 'ducati'
motorcycles.remove(too_expensive)
print(motorcycles)
print(f"\nA {too_expensive.title()} is too expensive for me.")

```

**Exercise 3-3: Your Own List** Think of your favorite mode of transportation, such as a motorcycle or a car, and make a list that stores several examples. Use your list to print a series of statements about these items, such as "I would like to own a Honda motorcycle."



## Listing 21: Exercise 3-3: Transportation

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

transportation = ["bus", "bike", "motorcycle", "foot", "van", "
    train"]
brandName = ["Honda", "BMW", "Toyota"]

message = "I go to school by"

print(message + " " + brandName[0] + " " + transportation[0] + ".")
)
```

## 5. append() Method - Adding to End

**Definition:** A method that adds an item to the end of a list.

```
motorcycles = ['honda', 'yamaha', 'suzuki']
motorcycles.append('ducati')
print(motorcycles) # ['honda', 'yamaha', 'suzuki', 'ducati']
```

## 6. insert() Method - Adding at Position

**Definition:** A method that adds an item at a specific position in a list.

```
motorcycles = ['honda', 'yamaha', 'suzuki']
motorcycles.insert(0, 'ducati')
print(motorcycles) # ['ducati', 'honda', 'yamaha', 'suzuki']
```

## 7. del Statement - Removing by Index

**Definition:** A statement that removes an item from a list using its index.

```
motorcycles = ['honda', 'yamaha', 'suzuki']
del motorcycles[0]
print(motorcycles) # ['yamaha', 'suzuki']
```

## 8. pop() Method - Removing and Returning

**Definition:** A method that removes the last item from a list and returns it.

```
motorcycles = ['honda', 'yamaha', 'suzuki']
popped_motorcycle = motorcycles.pop()
print(popped_motorcycle) # suzuki
print(motorcycles) # ['honda', 'yamaha']
```

## 9. remove() Method - Removing by Value

**Definition:** A method that removes an item from a list by its value.

```
motorcycles = ['honda', 'yamaha', 'suzuki', 'ducati']
motorcycles.remove('ducati')
print(motorcycles) # ['honda', 'yamaha', 'suzuki']
```

**Exercise 3-4: Guest List** If you could invite anyone, living or deceased, to dinner, who would you invite? Make a list that includes at least three people you'd like to invite to dinner. Then use your list to print a message to each person, inviting them to dinner.

Listing 22: Exercise 3-4: Guest List

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# dinner.py -- invite members to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")
```

**Exercise 3-5: Changing Guest List** You just heard that one of your guests can't make the dinner, so you need to send out a new set of invitations. You'll have to think of someone else to invite.

Listing 23: Exercise 3-5: Changing Guest List

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# update_dinner.py -- some of the members cannot come to dinner,
# so invite again them to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"Current list: {gfriend}")
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")

print("\n---")
print(f"{gfriend[1]} cannot come to my dinner. But IU can.")
gfriend[1] = 'IU'
print(f"Current list: {gfriend}")
```

**Exercise 3-6: More Guests** You just found a bigger dinner table, so now more space is available. Think of three more guests to invite to dinner.

Listing 24: Exercise 3-6: More Guests

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# update_dinner.py -- some of the members cannot come to dinner,
# so invite again them to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"Current list: {gfriend}")
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")

print("\n---")
print(f"{gfriend[1]} cannot come to my dinner. But IU can.")
gfriend[1] = 'IU'

print("\n---")
print("and Sinb will bring WJSN come.")
gfriend.append("WJSN")
print(f"Current list: {gfriend}")

print("also, Eunha will bring another SinB to the dinner.\nThe two
      SinBs need to sit together.")
gfriend.insert(4, "Sinb")
print(f"Current list: {gfriend}")
```

**Exercise 3-7: Shrinking Guest List** You just found out that your new dinner table won't arrive in time for the dinner, and you have space for only two guests.

Listing 25: Exercise 3-7: Shrinking Guest List

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# update_dinner.py -- some of the members cannot come to dinner,
# so invite again them to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"Current list: {gfriend}")
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
```

```

print(f"{gfriend[5]}{invitation}")

print("\n---")
print(f"{gfriend[1]} cannot come to my dinner. But IU can.")
gfriend[1] = 'IU'

print("\n---")
print("and Sinb will bring WJSN come.")
gfriend.append("WJSN")
print(f"Current list: {gfriend}")

print("also, Eunha will bring another SinB to the dinner.\nThe two
      SinBs need to sit together.")
gfriend.insert(4, "Sinb")
print(f"Current list: {gfriend}")

print("\n---")
print("Now one SinB kicks another out.")
del gfriend[4]
print(f"Current list{gfriend}")

print("\n---")
print("Eunha is being dissed. She is sad and she left for crying."
      )
gfriend.remove("eunha")
print(f"Current list:{gfriend}")

print("\n---")
print(f"{gfriend.pop(0)} goes to comfort Eunha.")
print(f"Current list: {gfriend}")

```

## 10. Empty List - Starting Fresh

**Definition:** A list with no items, created using empty square brackets.

```

motorcycles = []
motorcycles.append('honda')
motorcycles.append('yamaha')
print(motorcycles) # ['honda', 'yamaha']

```

**Exercise 3-8: Seeing the World** Think of at least five places in the world you'd like to visit.

Listing 26: Exercise 3-8: Seeing the World

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

countries = ["Deutsch", "Japan", "Great Britain", "Taiwan"]

print(f"Countries I want to go: {countries}.")

countries_sorted = countries

```

```

countries_sorted.sort()
print(f"Countries I want to go: {countries_sorted}.")
countries_sorted_reverse = countries
countries_sorted_reverse.sort(reverse=True)
print(f"Countries I want to go: {countries_sorted_reverse}.")
print(f"Countries I want to go: {sorted(countries)}.")
countries_reversed = countries
countries_reversed.reverse()
print(f"Countries I want to go: {countries_reversed}.")

```

**Exercise 3-9: Dinner Guests** Working with one of the programs from Exercises 3-4 through 3-7 (pages 46-47), use `len()` to print a message indicating the number of people you are inviting to dinner.

Listing 27: Exercise 3-9: Dinner Guests

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

# update_dinner.py -- some of the members cannot come to dinner,
# so invite again them to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"Current list: {gfriend}, {len(gfriend)} dinner mates.")
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")

print("\n---")
print(f"{gfriend[1]} cannot come to my dinner. But IU can.")
gfriend[1] = 'IU'

print("\n---")
print("and Sinb will bring WJSN come.")
gfriend.append("WJSN")
print(f"Current list: {gfriend}, {len(gfriend)} dinner mates.")

print("also, Eunha will bring another SinB to the dinner.\nThe two
      SinBs need to sit together.")
gfriend.insert(4, "Sinb")
print(f"Current list: {gfriend}, {len(gfriend)} dinner mates.")

print("\n---")
print("Now one SinB kicks another out.")
del gfriend[4]
print(f"Current list{gfriend}, {len(gfriend)} dinner mates.")

print("\n---")

```

```

print("Eunha is being dissed. She is sad and she left for crying."
)
gfriend.remove("eunha")
print(f"Current list:{gfriend}, {len(gfriend)} dinner mates.")

print("\n---")
print(f"{gfriend.pop(0)} goes to comfort Eunha.")
print(f"Current list: {gfriend}, {len(gfriend)} dinner mates.")

```

## Practical Examples from Chapter 3

### Working with Lists

Chapter 3 introduces lists and their basic operations. Here are the key files:

#### Basic List Operations:

Listing 28: Chapter03/301\_bicycles.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

bicycles = ['trek', 'cannondale', 'redline', 'specialized']
print(bicycles)

print("-----")
print(bicycles[0])

print("-----")
print(bicycles[0].title())
message = f"My firs bicycle was a {bicycles[0].title()}"
print(message)

print("-----")
print(bicycles[1])
print(bicycles[3])

# -1 item becomes the last item
# the last item can be known without counting the total number of
  items
print(bicycles[-1])

```

#### List Modifications:

Listing 29: Chapter03/302\_motorcycles.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

motorcycles = ['honda', 'yamaha', 'suzuki']
print(motorcycles)

motorcycles[0] = "ducati"
print(motorcycles)

```

```
print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki']
# appending elements to list, preset to the last position
motorcycles.append('ducati')
print(motorcycles)

print("-----")
motorcycles = []
# appending elements to list, one by one
motorcycles.append('honda')
motorcycles.append('yamaha')
motorcycles.append('suzuki')
# insert can insert to the specific location
motorcycles.insert(0, 'ducati')
print(motorcycles)
print("-----")
# del can delete one of the elements
del motorcycles[0]
print(motorcycles)

print("-----")
# pop : chop out the last item and store that into the last value
popped_motorcycles = motorcycles.pop()
print(motorcycles)
print(popped_motorcycles)

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki']
last_owned = motorcycles.pop()
print(f"The last motorcycle I owned was a {last_owned.title()}.")

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki']
first_owned = motorcycles.pop(0)
print(f"The first motorcycle I owned was a {first_owned.title()}."
      )

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki', 'ducati']
# removing item by value
motorcycles.remove('ducati')
print(motorcycles)

print("-----")
motorcycles = ['honda', 'yamaha', 'suzuki', 'ducati']
# removing item by value, same result as pop
too_expensive = 'ducati'
motorcycles.remove(too_expensive)
print(motorcycles)
print(f"\nA {too_expensive.title()} is too expensive for me.")
```

## Key Takeaways

- **Lists are ordered collections** - Items maintain their position in the list
- **Indexing starts at 0** - First item is at index 0, second at index 1, etc.
- **Negative indices** - Use -1 for last item, -2 for second-to-last, etc.
- **Lists are mutable** - You can change, add, and remove items after creation
- **append() vs insert()** - append() adds to end, insert() adds at specific position
- **del vs pop() vs remove()** - Three different ways to remove items:
  - **del** - Removes by index, doesn't return value
  - **pop()** - Removes by index, returns the removed value
  - **remove()** - Removes by value (first occurrence only)
- **Empty lists** - Start with empty brackets [] and build up
- **len() function** - Counts items in a list, useful for loops and conditionals
- **String formatting with lists** - Use f-strings with list items: f"list[0]"
- **String methods on list items** - Apply string methods to list elements: list[0].title()
- **Variable assignment with pop()** - Store returned value: item = list.pop()
- **remove() with variables** - Remove items stored in variables: list.remove(variable)
- **Common errors to avoid:**
  - Accessing index that doesn't exist (IndexError)
  - Removing item that doesn't exist (ValueError)
  - Forgetting that indexing starts at 0
  - Using remove() on item not in list
- **List methods modify the original list** - They don't create a new list
- **You can store any data type** - Strings, numbers, other lists, etc.
- **List operations in practice:**
  - Building lists dynamically with append()
  - Modifying lists based on user input
  - Using len() to check list size
  - Combining string formatting with list access



# Chapter 4: Working with Lists

## 1. for Loop - Iterating Through Lists

**Definition:** A loop that runs once for each item in a list or other collection.

Listing 30: Basic for loop

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

magicians = ['alice', 'david', 'carolina']

for magician in magicians:
    print(magician)

for magician in magicians:
    print(f"{magician.title()}, that was a great trick!")
    print(f"I can't wait to see your next trick, {magician.title()}.\n")

print("Thank you, everyone. That was a great magic show!")
```

**Exercise 4-1: Pizzas** Think of at least three kinds of your favorite pizza. Store these pizza names in a list, and then use a for loop to print the name of each pizza.

Listing 31: Exercise 4-1: Pizzas

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

pizzas = ['peccato', 'diavola', 'capricciosa']

for pizza in pizzas:
    print(f"I like {pizza.title()}")

print("The above statements are fake.")
```

**Exercise 4-2: Animals** Think of at least three different animals that have a common characteristic. Store the names of these animals in a list, and then use a for loop to print out the name of each animal.

Listing 32: Exercise 4-2: Animals

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

animals = ['cats', 'dogs', 'lions']

for animal in animals:
    print(f"{animal.title()} have four legs.")

print("Any of them can be a great pet.")
```

## 2. Loop Variable - Current Item

**Definition:** The variable that holds the current item being processed in a loop.

```
for magician in magicians:
    print(magician) # magician is the loop variable
```

### 3. Indentation - Code Blocking

**Definition:** The use of spaces or tabs to indicate which lines of code belong together in a block.

```
for magician in magicians:
    print(magician) # This line is indented
    print("Great trick!") # This line is also indented
print("Thank you!") # This line is not indented
```

### 4. range() Function - Number Sequences

**Definition:** A function that generates a sequence of numbers for use in loops.

Listing 33: Using range()

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

for value in range(1, 5):
    print(value)

numbers = list(range(1,6))
print(numbers)
```

**Even Numbers:**

Listing 34: Chapter04/403\_even\_numbers.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

even_numbers = list(range(2, 11, 2))
print(even_numbers)
# range: from 2 to 11, adds 2 repeatedly
```

**Exercise 4-3: Counting to Twenty** Use a for loop to print the numbers from 1 to 20, inclusive.

Listing 35: Exercise 4-3: Counting to Twenty

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

numbers = list(range(1,21))

for number in numbers:
    print(f"{number}")
```

**Exercise 4-4: One Million** Make a list of the numbers from one to one million, and then use a for loop to print the numbers.

## Listing 36: Exercise 4-4: One Million

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

numbers = list(range(1,1000001))

for number in numbers:
    print(f"{number}")
```

**Exercise 4-5: Summing a Million** Make a list of the numbers from one to one million, and then use `min()` and `max()` to make sure your list actually starts at one and ends at one million.

## Listing 37: Exercise 4-5: Summing a Million

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

numbers = list(range(1,1000001))

print(f"Max : {max(numbers)}")
print(f"Min : {min(numbers)}")
print(f"Sum : {sum(numbers)}")
```

**Exercise 4-6: Odd Numbers** Use the third argument of the `range()` function to make a list of the odd numbers from 1 to 20. Use a for loop to print each number.

## Listing 38: Exercise 4-6: Odd Numbers

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

even_numbers = list(range(2,21,2))

for number in even_numbers:
    print(f"{number}")
```

**Exercise 4-7: Threes** Make a list of the multiples of 3 from 3 to 30. Use a for loop to print the numbers in your list.

## Listing 39: Exercise 4-7: Threes

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

threes_numbers = list(range(3, 31 ,3))

for number in threes_numbers:
    print(f"{number}")
```

## 5. List Comprehension - Compact Lists

**Definition:** A way to create lists using a compact syntax with loops and conditions.

## Listing 40: List comprehensions

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

squares = []
```

```

for value in range(1, 11):
    square = value ** 2
    squares.append(square)
    # or squares.append(value**2)

print(squares)

squares = [value ** 2 for value in range(1, 22)]
print(squares)

```

**Exercise 4-8: Cubes** A number raised to the third power is called a cube. For example, the cube of 2 is written as `2**3` in Python. Make a list of the first 10 cubes (that is, the cube of each integer from 1 through 10), and use a for loop to print out the value of each cube.

Listing 41: Exercise 4-8: Cubes

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

cube = []

for number in list(range(1, 11)):
    cube.append(number**3)

for member in cube:
    print(f"{member}")

```

**Exercise 4-9: Cube Comprehension** Use a list comprehension to generate a list of the first 10 cubes.

Listing 42: Exercise 4-9: Cube Comprehension

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

cube = [value ** 3 for value in range(1,11)]

for member in cube:
    print(f"{member}")

```

## 6. Slicing - List Portions

**Definition:** A way to work with a portion of a list by specifying start and end indices.

```

players = ['charles', 'martina', 'michael', 'florence', 'eli']
print(players[0:3]) # ['charles', 'martina', 'michael']
print(players[1:4]) # ['martina', 'michael', 'florence']
print(players[:4]) # ['charles', 'martina', 'michael', 'florence']
print(players[2:]) # ['michael', 'florence', 'eli']

```

Listing 43: Working with players list

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

```

```

players = ['charles', 'martina', 'michael', 'florence', 'eli']
print(players[0:3])

print(players[1:4])

# from starr to 4
print(players[:4])

# start from 2
print(players[2:])

# last three players
print(players[-3:])

print("Here are the first three players on my team:")
for player in players[:3]:
    print(player.title())

```

**Exercise 4-10: Slices** Using one of the programs you wrote in this chapter, add several lines to the end of the program that do the following:

Listing 44: Exercise 4-10: Slices

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

animals = ['cats', 'dogs', 'lions']

for animal in animals:
    print(f"{animal.title()} have four legs.")

print("Any of them can be a great pet.")

print("\n----")
animals.append('elephant')
print(f"Adding {animals[-1]}. \nNow we have the following animals:")
)
for animal in animals:
    print(f"{animal.title()}")

print("\n----")
print("Picking up the first three animals:")
for animal in animals[:3]:
    print(f"{animal.title()}")

print("\n----")
animals.append('sharks')
print(f"Adding {animals[-1]}. \nNow we have the following animals:")
)
for animal in animals:
    print(f"{animal.title()}")

print("\n----")
print("Picking up the middle three animals:")

```

```

for animal in animals[(int)(len(animals)/2-1):(int)(len(animals)
/2+2)]:
    print(f"{animal.title()}")

print("\n----")
print("Picking up the last three animals:")
for animal in animals[-3:]:
    print(f"{animal.title()}")

```

## 7. Copying Lists - Creating Duplicates

**Definition:** Creating a copy of a list to avoid modifying the original.

```

my\_foods = ['pizza', 'falafel', 'carrot cake']
friend\_foods = my\_foods[:] # Create a copy

```

### Listing 45: Working with food lists

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

my_foods = ['pizza', 'falafel', 'carrpt cake']
friend_foods = my_foods[:]
# all of the items in the list
# i.e. the list can then be copied

print("My favouried foods are :")
print(my_foods)

print("My friends's favouried foods are :")
print(friend_foods)

print("-----")

my_foods.append('cannoli')
friend_foods.append('ice cream')

print("My favouried foods are :")
print(my_foods)

print("My friends's favouried foods are :")
print(friend_foods)

print("-----")

```

**Exercise 4-11: My Pizzas, Your Pizzas** Start with your program from Exercise 4-1. Make a copy of the list of pizzas, and call it `friend_pizzas`. Then, do the following:

### Listing 46: Exercise 4-11: My Pizzas, Your Pizzas

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

pizzas = ['peccato', 'diavola', 'capricciosa']

```

```

for pizza in pizzas:
    print(f"I like {pizza.title()}.")
print("The above statements are fake.")

friend_pizzas = pizzas[:]

print("\n----")
print("Another pizza list as per below:")
for pizza in friend_pizzas:
    print(f"{pizza.title()}")

friend_pizzas.append('Clam pie')
print("\n----")
print(f"Adding {friend_pizzas[-1]}\nThe pizza list:")
for pizza in friend_pizzas:
    print(f"{pizza.title()}")

```

**Exercise 4-12: More Loops** All versions of foods.py in this section have avoided using for loops when printing to save space. Choose a version of foods.py, and write two for loops to print each list of foods.

Listing 47: Exercise 4-12: More Loops

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

my_foods = ['pizza', 'falafel', 'carrpt cake']
friend_foods = my_foods[:]

print("My favouried foods are :")
for food in my_foods:
    print(f"{food.title()}")

print("My friends's favouried foods are :")
for food in friend_foods:
    print(f"{food.title()}")

print("\n-----")
print("Adding one food for each of mine and friend's list:\n")
my_foods.append('cannoli')
friend_foods.append('ice cream')

print("Now, my favouried foods are :")
for food in my_foods:
    print(f"{food.title()}")

print("My friends's favouried foods are :")
for food in friend_foods:
    print(f"{food.title()}")

```

## 8. Tuples - Immutable Lists

**Definition:** An immutable list that cannot be modified after creation, using parentheses instead of square brackets.

```
dimensions = (200, 50)
print(dimensions[0]) # 200
print(dimensions[1]) # 50
# dimensions[0] = 250 # This would cause an error
```

Listing 48: Working with dimensions

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

dimensions = (300, 50)
print(dimensions[0])
print(dimensions[1])

# nothing can modify Tuple, i.e. assign the value of it

for dimension in dimensions :
    print(dimension)

# but we can re-define the Tuple

dimensions = (1000,20)

for dimension in dimensions :
    print(dimension)
```

**Exercise 4-13: Buffet** A restaurant offers a simple buffet with five basic foods. Think of five simple foods, and store them in a tuple.

Listing 49: Exercise 4-13: Buffet

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

foods = ('pizza', 'falafel', 'carrpt cake', 'sushi', 'ice cream')

print("Food in a buffet:")
for food in foods:
    print(f"{food.title()}")

print("\n---")
print("Now there is a new menu:")
foods = ('fried rice', 'onigiri', 'carrpt cake', 'sushi', 'ice
cream')

print("Food in a buffet:")
for food in foods:
    print(f"{food.title()}")
```



## Practical Examples from Chapter 4

### Working with Lists and Loops

Chapter 4 introduces loops and advanced list operations. Here are the key files:

#### Basic Loops:

Listing 50: Chapter04/401\_magicians.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

magicians = ['alice', 'david', 'carolina']

for magician in magicians:
    print(magician)

for magician in magicians:
    print(f"{magician.title()}, that was a great trick!")
    print(f"I can't wait to see your next trick, {magician.title()}.\n")

print("Thank you, everyone. That was a great magic show!")
```

#### Number Sequences:

Listing 51: Chapter04/402\_first\_numbers.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

for value in range(1, 5):
    print(value)

numbers = list(range(1,6))
print(numbers)
```

#### Even Numbers:

Listing 52: Chapter04/403\_even\_numbers.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

even_numbers = list(range(2, 11, 2))
print(even_numbers)
# range: from 2 to 11, adds 2 repeatedly
```

#### List Comprehensions:

Listing 53: Chapter04/404\_squares.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

squares = []
for value in range(1, 11):
    square = value ** 2
    squares.append(square)
```

```

    # or squares.append(value**2)

print(squares)

squares = [value ** 2 for value in range(1, 22)]
print(squares)

```

### Working with Players:

Listing 54: Chapter04/405\_players.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

players = ['charles', 'martina', 'michael', 'florence', 'eli']
print(players[0:3])

print(players[1:4])

# from starr to 4
print(players[:4])

# start from 2
print(players[2:])

# last three players
print(players[-3:])

print("Here are the first three players on my team:")
for player in players[:3]:
    print(player.title())

```

### Food Lists:

Listing 55: Chapter04/406\_foods.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

my_foods = ['pizza', 'falafel', 'carrpt cake']
friend_foods = my_foods[:]
# all of the items in the list
# i.e. the list can then be copied

print("My favouried foods are :")
print(my_foods)

print("My friends's favouried foods are :")
print(friend_foods)

print("-----")

my_foods.append('cannoli')
friend_foods.append('ice cream')

print("My favouried foods are :")

```

```
print(my_foods)

print("My friends's favoured foods are :")
print(friend_foods)

print("-----")
```

### Dimensions:

Listing 56: Chapter04/407\_dimensions.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

dimensions = (300, 50)
print(dimensions[0])
print(dimensions[1])

# nothing can modify Tuple, i.e. assign the value of it

for dimension in dimensions :
    print(dimension)

# but we can re-define the Tuple

dimensions = (1000,20)

for dimension in dimensions :
    print(dimension)
```

## Key Takeaways

- **for loops** iterate through each item in a list automatically
- **Proper indentation** is crucial for defining loop blocks
- **range()** generates sequences of numbers for loops
- **list()** function converts range() objects to lists
- **min()** and **max()** functions find minimum and maximum values in lists
- **List comprehensions** create lists efficiently in one line
- **Slicing** allows you to work with portions of lists using [start:end]
- **Copying lists** with [:] prevents modifying the original list
- **Loop variables** hold the current item being processed
- **String formatting in loops** - Use f-strings with loop variables
- **Exponentiation** - Use \*\* operator for powers (e.g., 2\*\*3 for cubes)

- **Tuples** - Immutable sequences using parentheses
  - **Creation:** Use parentheses instead of brackets - `foods = ('pizza', 'falafel')`
  - **Immutability:** Cannot modify individual elements after creation
  - **Iteration:** Can use for loops with tuples just like lists
  - **Redefinition:** Can reassign entire tuple to new values
  - **Use cases:** Store data that shouldn't change (like buffet menus)
- **Common patterns:**
  - Using `range()` with for loops for counting
  - List comprehensions for creating number sequences
  - Slicing for accessing portions of lists
  - Copying lists to avoid side effects
  - Using `min()` and `max()` to verify list contents
  - Using tuples for immutable data collections
- **Important concepts:**
  - Indentation defines code blocks in Python
  - Loop variables can be used in string formatting
  - `range()` can take start, stop, and step arguments
  - List comprehensions are more efficient than building lists in loops
  - Tuples are immutable and use parentheses
  - Slicing syntax: `[start:end:step]`
  - Tuples can be iterated with for loops
  - Entire tuples can be reassigned but individual elements cannot
- **Methods and functions covered:**
  - **`range(start, stop, step)`** - Generate number sequences
  - **`list(range())`** - Convert range to list
  - **`min(list)`** - Find minimum value
  - **`max(list)`** - Find maximum value
  - **`list[start:end]`** - Slice lists
  - **`list[:]`** - Copy entire list
  - **`[expression for item in iterable]`** - List comprehension
  - **`tuple()`** - Create immutable sequences
  - **tuple iteration** - for loops with tuples

# Chapter 5: if Statements

## 1. if Statement - Conditional Execution

**Definition:** A statement that allows you to examine the current state of a program and respond appropriately.

Listing 57: Basic if statements

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cars = ['audi', 'bmw', 'subaru', 'toyota']

for car in cars:
    if car == 'bmw':
        print(car.upper())
    elif car == 'audi':
        print(car.lower())
    else:
        print(car.title())
```

## 2. Conditional Test - True/False Check

**Definition:** An expression that can be evaluated as True or False, used to decide whether code should be executed.

```
car = 'bmw'
car == 'bmw' # True
car == 'audi' # False
```

## 3. Equality Operator - ==

**Definition:** An operator that checks if two values are equal, returning True or False.

```
answer = 42
if answer == 42:
    print("Correct!")
```

## 4. Inequality Operator - !=

**Definition:** An operator that checks if two values are not equal, returning True or False.

Listing 58: Inequality testing

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

answer = 172

if answer != 42:
    print("That is not the correct answer. Please try again!")
```

## 5. elif Statement - Multiple Conditions

**Definition:** A statement that allows you to check multiple conditions when the first if statement is False.

```
age = 12
if age < 4:
    price = 0
elif age < 18:
    price = 5
else:
    price = 10
```

## 6. else Statement - Default Action

**Definition:** A statement that provides a default action when all previous conditions are False.

```
if age < 4:
    price = 0
else:
    price = 10
```

## 7. in Operator - Membership Test

**Definition:** An operator that checks if a value exists in a list or other collection.

Listing 59: Membership testing

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

requested_toppings = ['mushrooms', 'extra cheese']

if requested_toppings != 'anchovies':
    print("Hold the anchovies!")

print("-----")

if 'mushrooms' in requested_toppings:
    print("Adding mushrooms.")
if 'pepperoni' in requested_toppings:
    print("Adding pepperoni.")
if 'extra cheese' in requested_toppings:
    print("Adding extra cheese.")

print("\nFinished making your pizza!")

print("-----")

requested_toppings = ['mushrooms', 'green peppers', 'extra cheese']
]
```

```

for requested_topping in requested_toppings:
    print(f"Adding {requested_topping}.")

print("\nFinished making your pizza!")

print("-----")

requested_toppings = ['mushrooms', 'green peppers', 'extra cheese']

for requested_topping in requested_toppings:
    if requested_topping == 'green peppers':
        print("Sorry, we are out of green peppers right now.")
    else:
        print(f"Adding {requested_topping}.")

print("\nFinished making your pizza!")

print("-----")

requested_toppings = []

if requested_toppings:
    for requested_topping in requested_toppings:
        print(f"Adding {requested_topping}.")
    print("\nFinished making your pizza!")
else:
    print("Are you sure you want a plain pizza?")

print("-----")

available_toppings = ['mushrooms', 'olives', 'green peppers', 'pepperoni', 'pineapple', 'extra cheese']

requested_toppings = ['mushroom', 'french fries', 'extra cheese']

for requested_topping in requested_toppings:
    if requested_topping in available_toppings:
        print(f"Adding {requested_topping}.")
    else:
        print(f"Sorry, we don't have {requested_topping}.")

print("\nFinished making your pizza!")

```

## 8. Boolean Values - True/False

**Definition:** Values that represent the truth or falsity of a condition.

```

game_active = True
can_edit = False

```

## 9. and Operator - Multiple Conditions

**Definition:** An operator that returns True only if all conditions are True.

```
age_0 = 22
age_1 = 18
age_0 >= 21 and age_1 >= 21 # False
```

## 10. or Operator - Alternative Conditions

**Definition:** An operator that returns True if any condition is True.

```
age_0 = 22
age_1 = 18
age_0 >= 21 or age_1 >= 21 # True
```

## 11. not Operator - Negation

**Definition:** An operator that negates a condition, returning the opposite boolean value.

```
banned_users = ['andrew', 'carolina', 'david']
user = 'marie'
if user not in banned_users:
    print(f"{user.title()}, you can post a response if you wish.")
```

# Practical Examples from Chapter 5

## Working with Conditional Statements

Chapter 5 introduces if statements and conditional logic. Here are the key files:

### Basic if Statements:

Listing 60: Chapter05/501\_cars.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cars = ['audi', 'bmw', 'subaru', 'toyota']

for car in cars:
    if car == 'bmw':
        print(car.upper())
    elif car == 'audi':
        print(car.lower())
    else:
        print(car.title())
```

### Complex Conditional Logic:

Listing 61: Chapter05/502\_toppings.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes
```



```
requested_toppings = ['mushrooms', 'extra cheese']

if requested_toppings != 'anchovies':
    print("Hold the anchovies!")

print("-----")

if 'mushrooms' in requested_toppings:
    print("Adding mushrooms.")
if 'pepperoni' in requested_toppings:
    print("Adding pepperoni.")
if 'extra cheese' in requested_toppings:
    print("Adding extra cheese.")

print("\nFinished making your pizza!")

print("-----")

requested_toppings = ['mushrooms', 'green peppers', 'extra cheese'
]

for requested_topping in requested_toppings:
    print(f"Adding {requested_topping}.")

print("\nFinished making your pizza!")

print("-----")

requested_toppings = ['mushrooms', 'green peppers', 'extra cheese'
]

for requested_topping in requested_toppings:
    if requested_topping == 'green peppers':
        print("Sorry, we are out of green peppers right now.")
    else:
        print(f"Adding {requested_topping}.")

print("\nFinished making your pizza!")

print("-----")

requested_toppings = []

if requested_toppings:
    for requested_topping in requested_toppings:
        print(f"Adding {requested_topping}.")
    print("\nFinished making your pizza!")
else:
    print("Are you sure you want a plain pizza?")

print("-----")
```

```
available_toppings = ['mushrooms', 'olives', 'green peppers', 'pepperoni', 'pineapple', 'extra cheese']

requested_toppings = ['mushroom', 'french fries', 'extra cheese']

for requested_topping in requested_toppings:
    if requested_topping in available_toppings:
        print(f"Adding {requested_topping}.")
    else:
        print(f"Sorry, we don't have {requested_topping}.")

print("\nFinished making your pizza!")
```

### Numerical Comparisons:

Listing 62: Chapter05/503\_magic\_number.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

answer = 172

if answer != 42:
    print("That is not the correct answer. Please try again!")
```

### To run these programs:

```
python Chapter05/501_cars.py
python Chapter05/502_toppings.py
python Chapter05/503_magic_number.py
```

## Key Takeaways

- if statements allow programs to make decisions
- Use == to test for equality, != for inequality
- elif provides additional conditions to test
- else provides a default action
- Use in to test if a value is in a list
- and requires all conditions to be True
- or requires at least one condition to be True
- not negates a condition
- Boolean values are True and False
- Conditional tests can be simple or complex

# Chapter 6: Dictionaries

## 1. Dictionary - Key-Value Pairs

**Definition:** A collection of key-value pairs that allows you to connect pieces of related information.

Listing 63: Basic dictionary operations

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

alien_0 = {
    'color': 'green',
    'points' : 5
}

print(alien_0['color'])
print(alien_0['points'])

print_H()

new_pionts = alien_0['points']

print(f"You just earned {new_pionts} points!")

print_H()

print(alien_0)

alien_0['x_position'] = 0
alien_0['y_position'] = 25

print(alien_0)

print_H()

alien_0 = {}

alien_0['color'] = 'green'
alien_0['points'] = 5

print(alien_0)

print_H()

print(f"The alien is {alien_0['color']}")
alien_0['color'] = 'Yellow'

print(f"The alien is now {alien_0['color']}")
```

```
print_H()

alien_0 = {
    'x_position' : 0,
    'y_position' : 23,
    'speed' : 'medium'
}

print(f"Original position: {alien_0['x_position']}")

if alien_0['speed'] == 'slow':
    x_increment = 1
elif alien_0['speed'] == 'medium':
    x_increment = 2
else:
    x_increment = 3

alien_0['x_position'] = alien_0['x_position'] + x_increment

print(f"New position : {alien_0['x_position']}")

print_H()

alien_0 = {
    'color' : 'green',
    'points' : 5
}

print(alien_0)

del alien_0['points']
print(alien_0)
```

## 2. Key-Value Pair - Dictionary Element

**Definition:** A set of values associated with each other, where a key is used to access its associated value.

```
alien_0 = {'color': 'green', 'points': 5}
```

## 3. Accessing Values - Dictionary Lookup

**Definition:** The process of retrieving a value from a dictionary using its key.

```
alien_0 = {'color': 'green', 'points': 5}
print(alien_0['color']) # 'green'
```

## 4. Adding Key-Value Pairs - Dictionary Modification

**Definition:** The process of adding new key-value pairs to an existing dictionary.

```
alien_0 = {'color': 'green', 'points': 5}
alien_0['x_position'] = 0
alien_0['y_position'] = 25
```

## 5. Starting with Empty Dictionary - Dynamic Creation

**Definition:** Creating a dictionary with no key-value pairs and adding them as needed.

```
alien_0 = {}
alien_0['color'] = 'green'
alien_0['points'] = 5
```

## 6. Modifying Values - Dictionary Updates

**Definition:** Changing the value associated with a key in a dictionary.

```
alien_0 = {'color': 'green', 'points': 5}
alien_0['color'] = 'yellow'
```

## 7. Removing Key-Value Pairs - del Statement

**Definition:** Permanently removing a key-value pair from a dictionary using the del statement.

```
alien_0 = {'color': 'green', 'points': 5}
del alien_0['points']
```

## 8. Looping Through Dictionary - items() Method

**Definition:** Iterating through all key-value pairs in a dictionary.

Listing 64: Looping through dictionaries

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

favourite_languages = {
    'jen' : 'python',
    'sarah' : 'c',
    'edward' : 'ruby',
    'phil' : 'python'
}

language = favourite_languages['sarah'].title()
print(f"Sarah's favourite language is {language}.")

print_H()
```

```

for name, language in favourite_languages.items():
    print(f"{name.title()}'s favourite language is {language.title()}")

print_H()

for name in favourite_languages.keys():
    print(name.title())
# loopint through the keys is actually the default bahaviour when
# looping through a dictionary
# the .keys() can be omitted

print_H()

friends = ['phil', 'sarah']

for name in favourite_languages.keys():
    print(f"Hi {name.title()}.")

    if name in friends:
        language = favourite_languages[name].title()
        print(f"\t{name.title()}, I see you love {language}!")

print_H()

if 'erin' not in favourite_languages.keys():
    print("Erin, please take our poll!")

print_H()

for name in sorted(favourite_languages.keys()):
    print(f"{name.title()}, thank you for taking the poll.")

print_H()

print("The folloing langauges have been mentiond:")
for language in set(favourite_languages.values()):
    print(language.title())

print_H()

favourite_languages = {
    'jen' : ['python', 'ruby'],
    'sarah' : ['c'],
    'edward' : ['ruby', 'go'],
    'phil' : ['python', 'haskell']
}

for name, languages in favourite_languages.items():
    print(f"\n{name.title()}'s favourite languages are:")
    for language in languages:

```

```
print(f"\t{language.title()}")
```

## 9. Looping Through Keys - keys() Method

**Definition:** Iterating through all keys in a dictionary.

```
favourite_languages = {'jen': 'python', 'sarah': 'c'}  
for name in favourite_languages.keys():  
    print(name.title())
```

## 10. Looping Through Values - values() Method

**Definition:** Iterating through all values in a dictionary.

```
favourite_languages = {'jen': 'python', 'sarah': 'c'}  
for language in favourite_languages.values():  
    print(language.title())
```

## 11. Nesting - Dictionaries in Dictionaries

**Definition:** Storing multiple dictionaries in a list, or a list of items as a value in a dictionary.

```
aliens = []  
for alien_number in range(30):  
    new_alien = {'color': 'green', 'points': 5, 'speed': 'slow'}  
    aliens.append(new_alien)
```

## 12. List in Dictionary - Complex Data

**Definition:** Using a list as a value in a dictionary to store multiple items.

```
favourite_languages = {  
    'jen': ['python', 'ruby'],  
    'sarah': ['c'],  
    'edward': ['ruby', 'go']  
}
```

## 13. Dictionary in Dictionary - Nested Structures

**Definition:** Storing a dictionary as a value in another dictionary.

```
users = {  
    'aeinstein': {  
        'first': 'albert',  
        'last': 'einstein',  
        'location': 'princeton'  
    }  
}
```

## Practical Examples from Chapter 6

### Working with Dictionaries

Chapter 6 introduces dictionaries and their operations. Here are the key files:

#### Basic Dictionary Operations:

Listing 65: Chapter06/601\_alien.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

alien_0 = {
    'color': 'green',
    'points' : 5
}

print(alien_0['color'])
print(alien_0['points'])

print_H()

new_pionts = alien_0['points']

print(f"You just earned {new_pionts} points!")

print_H()

print(alien_0)

alien_0['x_position'] = 0
alien_0['y_position'] = 25

print(alien_0)

print_H()

alien_0 = {}

alien_0['color'] = 'green'
alien_0['points'] = 5

print(alien_0)

print_H()

print(f"The alien is {alien_0['color']}")
alien_0['color'] = 'Yellow'

print(f"The alien is now {alien_0['color']}")
```



```

print_H()

alien_0 = {
    'x_position' : 0,
    'y_position' : 23,
    'speed' : 'medium'
}
print(f"Original positon: {alien_0['x_position']}")

if alien_0['speed'] == 'slow':
    x_increment = 1
elif alien_0['speed'] == 'medium':
    x_increment = 2
else:
    x_increment = 3

alien_0['x_position'] = alien_0['x_position'] + x_increment

print(f"New position : {alien_0['x_position']}")

print_H()

alien_0 = {
    'color' : 'green',
    'points' : 5
}
print(alien_0)

del alien_0['points']
print(alien_0)

```

### Advanced Dictionary Operations:

Listing 66: Chapter06/602\_favourite\_languages.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

favourite_languages = {
    'jen' : 'python',
    'sarah' : 'c',
    'edward' : 'ruby',
    'phil' : 'python'
}

language = favourite_languages['sarah'].title()
print(f"Sarah's favourite language is {language}.")

print_H()

for name, language in favourite_languages.items():

```

```

    print(f"{name.title()}'s favourite language is {language.title()}")

print_H()

for name in favourite_languages.keys():
    print(name.title())
# loopint through the keys is actually the default bahaviour when
# looping through a dictionary
# the .keys() can be omitted

print_H()

friends = ['phil', 'sarah']

for name in favourite_languages.keys():
    print(f"Hi {name.title()}.")

    if name in friends:
        language = favourite_languages[name].title()
        print(f"\t{name.title()}, I see you love {language}!")

print_H()

if 'erin' not in favourite_languages.keys():
    print("Erin, please take our poll!")

print_H()

for name in sorted(favourite_languages.keys()):
    print(f"{name.title()}, thank you for taking the poll.")

print_H()

print("The folloing langauges have been mentiond:")
for language in set(favourite_languages.values()):
    print(language.title())

print_H()

favourite_languages = {
    'jen' : ['python', 'ruby'],
    'sarah' : ['c'],
    'edward' : ['ruby', 'go'],
    'phil' : ['python', 'haskell']
}

for name, languages in favourite_languages.items():
    print(f"\n{name.title()}'s favourite languages are:")
    for language in languages:
        print(f"\t{language.title()}")

```

**To run these programs:**

```
python Chapter06/601_alien.py
```

```
python Chapter06/602_favourite_languages.py
```

## Key Takeaways

- Dictionaries store key-value pairs
- Use square brackets to access values by key
- Add new key-value pairs by assigning to a new key
- Modify values by assigning to an existing key
- Use `del` to remove key-value pairs
- Loop through all key-value pairs with `.items()`
- Loop through keys with `.keys()` (default behavior)
- Loop through values with `.values()`
- Use `set()` to get unique values
- Dictionaries can store lists and other dictionaries
- Nesting allows complex data structures

# Chapter 7: User Input and while Loops

## 1. input() Function - User Input

**Definition:** A function that pauses your program and waits for the user to enter some text, which is then stored as a string.

Listing 67: Basic user input

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

name = input("Please enter your name: ")
print(f"\nHello, {name}!")

prompt = "If you tell us whp you are, we can personalize the
        message you see."
prompt += "\nWhat is your first name? "
name = input(prompt)
print(f"\nHello, {name}!")
```

## 2. while Loop - Conditional Repetition

**Definition:** A loop that runs as long as, or while, a certain condition is true.

Listing 68: while loop with user input

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

message = input("Tell me something, and I will repeat it back to
you. ")
print(message)

print_H()

prompt = "\nTell me something, and I will repeat it back to you: "
prompt += "\nEnter 'quit' to end the program. "

message = ""
while message != 'quit':
    message = input(prompt)

    if message != 'quit':
        print(message)

print_H()

prompt = "\nTell me something, and I will repeat it back to you: "
prompt += "\nEnter 'quit' to end the program. "
```

```
message = ""
active = True
while active:
    message = input(prompt)

    if message == 'quit':
        active = False
    else:
        print(message)
```

### 3. int() Function - String to Integer

**Definition:** A function that converts a string containing a number to an integer.

Listing 69: Converting string input to integer

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

height = input("How tall are you, in inches? ")
height = int(height)

if height >= 48:
    print("\nYou're tall enough to ride!")
else:
    print("\nYou'll be able to ride when you're a little older.")
```

### 4. Flag - Loop Control Variable

**Definition:** A variable that acts as a signal to the program, often used to control while loops.

```
active = True
while active:
    message = input("Enter 'quit' to end: ")
    if message == 'quit':
        active = False
    else:
        print(message)
```

### 5. break Statement - Immediate Exit

**Definition:** A statement that immediately exits a loop without running any remaining code in the loop.

```
while True:
    city = input("Enter a city name (or 'quit' to exit): ")
    if city == 'quit':
        break
    print(f"I'd love to go to {city.title()}!")
```

## 6. continue Statement - Skip Iteration

**Definition:** A statement that skips the rest of the current iteration and returns to the beginning of the loop.

```
current_number = 0
while current_number < 10:
    current_number += 1
    if current_number % 2 == 0:
        continue
    print(current_number)
```

## 7. Modulo Operator - %

**Definition:** An operator that divides one number by another and returns the remainder.

```
number = 4 % 2    # 0 (even)
number = 5 % 2    # 1 (odd)
```

## 8. Moving Items Between Lists - List Operations

**Definition:** The process of removing items from one list and adding them to another list.

```
unconfirmed_users = ['alice', 'brian', 'candace']
confirmed_users = []

while unconfirmed_users:
    current_user = unconfirmed_users.pop()
    confirmed_users.append(current_user)
```

## 9. Removing All Instances - List Cleanup

**Definition:** Removing all occurrences of a specific value from a list.

```
pets = ['dog', 'cat', 'dog', 'goldfish', 'cat', 'rabbit', 'cat']
print(pets)

while 'cat' in pets:
    pets.remove('cat')

print(pets)
```

## 10. Filling Dictionary with User Input - Dynamic Data

**Definition:** Building a dictionary by collecting user input in a loop.

```
responses = {}
polling_active = True

while polling_active:
```

```

name = input("\nWhat is your name? ")
response = input("Which mountain would you like to climb
    someday? ")

responses[name] = response

repeat = input("Would you like to let another person respond?
    (yes/ no) ")
if repeat == 'no':
    polling_active = False

```

## Practical Examples from Chapter 7

### Working with User Input and Loops

Chapter 7 introduces user input and while loops. Here are the key files:

#### Basic User Input:

Listing 70: Chapter07/702\_greeter.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

name = input("Please enter your name: ")
print(f"\nHello, {name}!")

prompt = "If you tell us whp you are, we can personalize the
    message you see."
prompt += "\nWhat is your first name? "
name = input(prompt)
print(f"\nHello, {name}!")

```

#### while Loops with User Input:

Listing 71: Chapter07/701\_parrot.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

message = input("Tell me something, and I will repeat it back to
    you. ")
print(message)

print_H()

prompt = "\nTell me something, and I will repeat it back to you: "
prompt += "\nEnter 'quit' to end the program. "

message = ""
while message != 'quit':

```

```
message = input(prompt)

if message != 'quit':
    print(message)

print_H()

prompt = "\nTell me something, and I will repeat it back to you: "
prompt += "\nEnter 'quit' to end the program. "

message = ""
active = True
while active:
    message = input(prompt)

    if message == 'quit':
        active = False
    else:
        print(message)
```

### Numerical Input and Type Conversion:

Listing 72: Chapter07/703\_rollercoaster.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

height = input("How tall are you, in inches? ")
height = int(height)

if height >= 48:
    print("\nYou're tall enough to ride!")
else:
    print("\nYou'll be able to ride when you're a little older.")
```

### To run these programs:

```
python Chapter07/702_greeter.py
python Chapter07/701_parrot.py
python Chapter07/703_rollercoaster.py
```

## Key Takeaways

- `input()` gets user input as a string
- `int()` converts string to integer
- while loops run while condition is True
- Use flags to control while loops
- `break` exits a loop immediately
- `continue` skips to next iteration



- % operator gives remainder
- Use while loops to move items between lists
- remove() removes first occurrence of value
- Build dictionaries with user input
- Always provide clear prompts to users

# Chapter 8: Functions

## 1. Function - Reusable Code Block

**Definition:** A named block of code that performs a specific task and can be called from other parts of your program.

Listing 73: Basic function definition

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("\n-----\n")

def greet_user():
    """Display a simple greeting."""
    print("Hello")

def greet_user_a(username):
    """Display a simple greeting."""
    print(f"Hello, {username.title()}!")

greet_user()
greet_user_a('jesse')

print_H()

def get_formatted_name(first_name, last_name):
    """ Return a full name, neatly formatted. """
    full_name = f"{first_name} {last_name}"
    return full_name.title()

def greet_formatted_user(first_name, last_name):
    """ Return a full name, neatly formatted. """
    full_name = f"{first_name} {last_name}"
    return full_name.title()

while True:
    print("Please tell me your name: ")
    print("enter 'q' at any time to quit")

    f_name = input("First name: ")
    if f_name == 'q':
        break
    l_name = input("Last name: ")
    if l_name == 'q':
        break

    formatted_name = get_formatted_name(f_name, l_name)
    print(f"Hello, {formatted_name}!")
```

## 2. def Statement - Function Definition

**Definition:** A statement that defines a function, specifying its name and parameters.

```
def greet_user():  
    """Display a simple greeting."""  
    print("Hello!")
```

## 3. Parameter - Function Input

**Definition:** A piece of information that a function needs to do its job, specified in the function definition.

```
def greet_user(username):  
    print(f"Hello, {username.title()}!")
```

## 4. Argument - Function Call Value

**Definition:** A piece of information that's passed from a function call to a function.

```
greet_user('jesse') # 'jesse' is the argument
```

## 5. Return Value - Function Output

**Definition:** The value that a function returns to the calling line of code.

Listing 74: Function with return value

```
# Python Crash Course, 2Ed, writtern by Eric Matthes  
  
def print_H():  
    print("=====")  
  
def get_formatted_name(first_name, last_name):  
    """Return a full name, neatly formatted."""  
    full_name = f"{first_name} {last_name}"  
    return full_name.title()  
  
musician = get_formatted_name('jimi', 'hendrix')  
print(musician)  
  
print_H()  
  
def get_formatted_name_A(first_name, middle_name, last_name):  
    """Return a full name, neatly formatted."""  
    full_name = f"{first_name} {middle_name} {last_name}"  
    return full_name.title()  
  
musician = get_formatted_name_A('john', 'lee', 'hooker')  
print(musician)  
  
print_H()
```

```
def get_formatted_name_B(first_name, last_name, middle_name = ''):
    if middle_name:
        full_name = f"{first_name} {middle_name} {last_name}"
    else:
        full_name = f"{first_name} {last_name}"
    return full_name.title()

musician = get_formatted_name_B('Jimi', 'hendrix')
print(musician)
musician = get_formatted_name_B('john', 'hooker', 'lee')
print(musician)
```

## 6. Default Parameter Value - Optional Arguments

**Definition:** A parameter that has a default value, making it optional when calling the function.

```
def get_formatted_name(first_name, last_name, middle_name=''):
    if middle_name:
        full_name = f"{first_name} {middle_name} {last_name}"
    else:
        full_name = f"{first_name} {last_name}"
    return full_name.title()
```

## 7. Positional Arguments - Order-Based

**Definition:** Arguments that must be passed to a function in the same order as the parameters are defined.

```
def describe_pet(animal_type, pet_name):
    print(f"\nI have a {animal_type}.")
    print(f"My {animal_type}'s name is {pet_name.title()}.")

describe_pet('hamster', 'harry')
```

## 8. Keyword Arguments - Name-Based

**Definition:** Arguments that are passed to a function by parameter name, allowing any order.

```
describe_pet(animal_type='hamster', pet_name='harry')
describe_pet(pet_name='harry', animal_type='hamster')
```

## 9. Arbitrary Arguments - \*args

**Definition:** A parameter that allows a function to accept any number of arguments.

## Listing 75: Arbitrary arguments

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def make_pizza(*toppings):
    """Print the list of toppings that have been requested."""
    print(toppings)

make_pizza('pepperoni')
make_pizza('mushrooms', 'green peppers', 'extra cheese')

def make_pizza_a(*toppings):
    """Summarise the pizza with the following toppings."""
    print("\nMaking a pizza with the following toppings:")
    for topping in toppings:
        print(f" - {topping}")

make_pizza_a('pepperoni')
make_pizza_a('mushrooms', 'green peppers', 'extra cheese')

def make_pizza_b(size, *toppings):
    """Summarise the pizza we are about to make."""
    print(f"\nMaking a {size} - inch pizza with the following toppings:")
    for topping in toppings:
        print(f" - {topping}")

make_pizza_b(16, 'pepperoni')
make_pizza_b(12, 'mushrooms', 'green peppers', 'extra cheese')
```

## 10. Arbitrary Keyword Arguments - \*\*kwargs

**Definition:** A parameter that allows a function to accept any number of keyword arguments.

```
def build_profile(first, last, **user_info):
    """Build a dictionary containing everything we know about a user."""
    user_info['first_name'] = first
    user_info['last_name'] = last
    return user_info

user_profile = build_profile('albert', 'einstein',
                             location='princeton',
                             field='physics')
```

## 11. Docstring - Function Documentation

**Definition:** A string that describes what a function does, enclosed in triple quotes.

```
def greet_user(username):
```

```
"""Display a simple greeting."""
print(f"Hello, {username.title()}!")
```

## 12. Module - Code Organization

**Definition:** A file containing functions and variables that can be imported into other programs.

```
# pizza.py
def make_pizza(size, *toppings):
    """Summarize the pizza we are about to make."""
    print(f"\nMaking a {size}-inch pizza with the following toppings:")
    for topping in toppings:
        print(f"- {topping}")
```

## 13. import Statement - Module Usage

**Definition:** A statement that makes functions and variables from a module available in your program.

```
import pizza
pizza.make_pizza(16, 'pepperoni')
pizza.make_pizza(12, 'mushrooms', 'green peppers', 'extra cheese')
```

## 14. from...import Statement - Selective Import

**Definition:** A statement that imports specific functions from a module.

```
from pizza import make_pizza
make_pizza(16, 'pepperoni')
```

# Practical Examples from Chapter 8

## Working with Functions

Chapter 8 introduces functions and their various forms. Here are the key files:

**Basic Function Definition:**

Listing 76: Chapter08/801\_greeter.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("\n-----\n")

def greet_user():
    """Display a simple greeting."""
    print("Hello")
```

```

def greet_user_a(username):
    """Display a simple greeting."""
    print(f"Hello, {username.title()}!")

greet_user()
greet_user_a('jesse')

print_H()

def get_formatted_name(first_name, last_name):
    """Return a full name, neatly formatted."""
    full_name = f"{first_name} {last_name}"
    return full_name.title()

def greet_formatted_user(first_name, last_name):
    """Return a full name, neatly formatted."""
    full_name = f"{first_name} {last_name}"
    return full_name.title()

while True:
    print("Please tell me your name: ")
    print("enter 'q' at any time to quit")

    f_name = input("First name: ")
    if f_name == 'q':
        break
    l_name = input("Last name: ")
    if l_name == 'q':
        break

    formatted_name = get_formatted_name(f_name, l_name)
    print(f"Hello, {formatted_name}!")

```

### Functions with Return Values:

Listing 77: Chapter08/803\_formatted\_name.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("=====")

def get_formatted_name(first_name, last_name):
    """Return a full name, neatly formatted."""
    full_name = f"{first_name} {last_name}"
    return full_name.title()

musician = get_formatted_name('jimi', 'hendrix')
print(musician)

print_H()

```

```
def get_formatted_name_A(first_name, middle_name, last_name):
    """ Return a full name, neatly formatted."""
    full_name = f"{first_name} {middle_name} {last_name}"
    return full_name.title()

musician = get_formatted_name_A('john', 'lee', 'hooker')
print(musician)

print_H()

def get_formatted_name_B(first_name, last_name, middle_name = ''):
    if middle_name:
        full_name = f"{first_name} {middle_name} {last_name}"
    else:
        full_name = f"{first_name} {last_name}"
    return full_name.title()

musician = get_formatted_name_B('Jimi', 'hendrix')
print(musician)
musician = get_formatted_name_B('john', 'hooker', 'lee')
print(musician)
```

### Functions with Arbitrary Arguments:

Listing 78: Chapter08/807\_pizza.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def make_pizza(*toppings):
    """Print the list of toppings that have been requested."""
    print(toppings)

make_pizza('pepperoni')
make_pizza('mushrooms', 'green peppers', 'extra cheese')

def make_pizza_a(*toppings):
    """Summarise the pizza with the following toppings."""
    print("\nMaking a pizza with the following toppings:")
    for topping in toppings:
        print(f" - {topping}")

make_pizza_a('pepperoni')
make_pizza_a('mushrooms', 'green peppers', 'extra cheese')

def make_pizza_b(size, *toppings):
    """Summarise the pizza we are about to make."""
    print(f"\nMaking a {size} - inch pizza with the following toppings:")
    for topping in toppings:
        print(f" - {topping}")

make_pizza_b(16, 'pepperoni')
make_pizza_b(12, 'mushrooms', 'green peppers', 'extra cheese')
```



**To run these programs:**

```
python Chapter08/801_greeter.py
python Chapter08/803_formatted_name.py
python Chapter08/807_pizza.py
```

## Key Takeaways

- Functions are reusable blocks of code
- Use `def` to define a function
- Parameters receive information in functions
- Arguments provide information to functions
- `return` sends a value back to the calling line
- Default parameters make arguments optional
- Positional arguments must be in correct order
- Keyword arguments can be in any order
- `*args` accepts any number of arguments
- `**kwargs` accepts any number of keyword arguments
- Docstrings document what functions do
- Modules organize code into files
- `import` makes modules available
- `from...import` brings specific functions

# Chapter 9: Classes

## 1. Class - Object Blueprint

**Definition:** A blueprint for creating objects, defining what attributes and methods the objects will have.

Listing 79: Basic class definition

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

class Dog:
    """A simple attempt to model a dog."""

    def __init__(self, name, age):
        """Intiate name and age attributes."""
        self.name = name
        self.age = age

    def sit(self):
        """Simulate a dog sitting in response to a command."""
        print(f"{self.name} is now sitting.")

    def roll_over(self):
        """Simulate rolling over in response to a command."""
        print(f"{self.name} rolled over!")

my_dog = Dog('William', 6)
your_dog = Dog('Lucy', 3)

print(f"My dog's name is {my_dog.name}.")
print(f"My dog is {my_dog.age} years old.")
my_dog.sit()

print(f"My dog's name is {your_dog.name}.")
print(f"My dog is {your_dog.age} years old.")
your_dog.sit()
```

## 2. Object - Class Instance

**Definition:** An instance of a class that contains data and behavior defined by the class.

```
my_dog = Dog('Willie', 6)
your_dog = Dog('Lucy', 3)
```

## 3. Attribute - Object Data

**Definition:** A variable that belongs to an object, accessed using dot notation.

```
print(f"My dog's name is {my_dog.name}.")
print(f"My dog is {my_dog.age} years old.")
```

## 4. Method - Object Behavior

**Definition:** A function that belongs to a class, defining what an object can do.

```
my_dog.sit()
my_dog.roll_over()
```

## 5. `__init__()` Method - Constructor

**Definition:** A special method that Python runs automatically whenever you create a new instance of a class.

```
def __init__(self, name, age):
    """Initialize name and age attributes."""
    self.name = name
    self.age = age
```

## 6. `self` Parameter - Object Reference

**Definition:** A reference to the instance of the class, allowing you to access attributes and methods.

```
def sit(self):
    """Simulate a dog sitting in response to a command."""
    print(f"{self.name} is now sitting.")
```

## 7. Instance - Class Object

**Definition:** An individual object created from a class, with its own set of attributes.

```
my_dog = Dog('Willie', 6) # my_dog is an instance
your_dog = Dog('Lucy', 3) # your_dog is another instance
```

## 8. Inheritance - Class Relationship

**Definition:** A feature that allows you to model relationships between classes, where a child class inherits attributes and methods from a parent class.

Listing 80: Inheritance example

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

"""A set of classes used to represent gas and electric car."""

from car import Car

class Battery:
```

```

    """A simple attempt to model a battery for an electric car."""

    def __init__(self, battery_size = 75):
        """Initialise the battery's attributes."""
        self.battery_size = battery_size

    def describe_battery(self):
        """Print a statement describing the battery size."""
        print(f"This car has a {self.battery_size}-kWh battery.")

    def get_range(self):
        """Print a statement about the range this battery provides
        . """
        if self.battery_size == 75:
            range = 260
        elif self.battery_size == 100:
            range = 315
        print(f"This car can go about {range} miles on a full
            charge.")

class ElectricCar(Car):

    """ Represents aspects of a car, specific to electric vehicles
    . """

    def __init__(self, make, model, year):
        """
        Initiate attributes of the parent class.
        Then initialise attributes specific to an electric car.
        """
        super().__init__(make, model, year)
        self.battery = Battery()

    def fill_gas_tank(self):
        """Electric cars don't have gas tanks."""
        print("This car doesn't need a gas tank!")

```

## 9. Parent Class - Base Class

**Definition:** A class that is inherited from, also called a base class or superclass.

```

class Car:
    """A simple attempt to represent a car."""
    def __init__(self, make, model, year):
        self.make = make
        self.model = model
        self.year = year

```

## 10. Child Class - Derived Class

**Definition:** A class that inherits from another class, also called a derived class or sub-class.

```
class ElectricCar(Car):
    """Represents aspects of a car, specific to electric vehicles.
    """
    def __init__(self, make, model, year):
        super().__init__(make, model, year)
```

## 11. super() Function - Parent Access

**Definition:** A function that helps you make connections between parent and child classes.

```
def __init__(self, make, model, year):
    super().__init__(make, model, year)
    self.battery = Battery()
```

## 12. Method Overriding - Custom Behavior

**Definition:** The ability to define a method in a child class that has the same name as a method in the parent class.

```
def fill_gas_tank(self):
    """Electric cars don't have gas tanks."""
    print("This car doesn't need a gas tank!")
```

## 13. Instance as Attribute - Object Composition

**Definition:** Using an instance of one class as an attribute in another class.

```
class Battery:
    def __init__(self, battery_size=75):
        self.battery_size = battery_size

class ElectricCar(Car):
    def __init__(self, make, model, year):
        super().__init__(make, model, year)
        self.battery = Battery() # Instance as attribute
```

## 14. Importing Classes - Module Usage

**Definition:** Bringing classes from one module into another module for use.

```
from car import Car
from electric_car import ElectricCar

my_tesla = ElectricCar('tesla', 'model s', 2019)
```

## Practical Examples from Chapter 9

### Working with Classes

Chapter 9 introduces object-oriented programming with classes. Here are the key files:

#### Basic Class Definition:

Listing 81: Chapter09/901\_dog.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

class Dog:
    """A simple attempt to model a dog."""

    def __init__(self, name, age):
        """Intiate name and age attributes."""
        self.name = name
        self.age = age

    def sit(self):
        """Simulate a dog sitting in response to a command."""
        print(f"{self.name} is now sitting.")

    def roll_over(self):
        """Simulate rolling over in response to a command."""
        print(f"{self.name} rolled over!")

my_dog = Dog('William', 6)
your_dog = Dog('Lucy', 3)

print(f"My dog's name is {my_dog.name}.")
print(f"My dog is {my_dog.age} years old.")
my_dog.sit()

print(f"My dog's name is {your_dog.name}.")
print(f"My dog is {your_dog.age} years old.")
your_dog.sit()
```

#### Advanced Class with Methods:

Listing 82: Chapter09/902\_car.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

"""A class that can be used to represent a car."""

class Car:

    """A simple attempt to represent a car."""

    def __init__(self, make, model, year):
        """Initiate attributes to describe a car."""
        self.make = make
```

```

        self.model = model
        self.year = year
        self.odometer_reading = 0

    def get_descriptive_name(self):
        """Return a neatly formatted descriptive name."""
        long_name = f"{self.year} {self.make} {self.model}"
        return long_name.title()

    def read_odometer(self):
        """Print a statement showing the car's mileage."""
        print(f"This car has {self.odometer_reading} miles on it.")

    def update_odometer(self, mileage):
        """Set the odometer reading to the given value."""
        if mileage >= self.odometer_reading:
            self.odometer_reading = mileage
        else:
            print("You can't roll back an odometer!")

    def increment_odometer(self, miles):
        """Add the given amount to the odometer reading."""
        self.odometer_reading += miles

```

### Inheritance and Class Relationships:

Listing 83: Chapter09/electric\_car.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("-----")

"""A set of classes used to represent gas and electric car."""

from car import Car

class Battery:

    """A simple attempt to model a battery for an electic car."""

    def __init__(self, battery_size = 75):
        """Initialise the battery's attributes."""
        self.battery_size = battery_size

    def describe_battery(self):
        """Print a statement describing the battery size."""
        print(f"This car has a {self.battery_size}-kWh battery.")

    def get_range(self):
        """Print a statement about the range this battery provides
        ."""

```

```

        if self.battery_size == 75:
            range = 260
        elif self.battery_size == 100:
            range = 315
        print(f"This car can go about {range} miles on a full
              charge.")

class ElectricCar(Car):

    """ Represents aspects of a car, specific to electric vehicles
        . """

    def __init__(self, make, model, year):
        """
        Initiate attributes of the parent class.
        Then initiate attributes specific to an electric car.
        """
        super().__init__(make, model, year)
        self.battery = Battery()

    def fill_gas_tank(self):
        """Electric cars don't have gas tanks."""
        print("This car doesn't need a gas tank!")

```

**To run these programs:**

```

python Chapter09/901_dog.py
python Chapter09/902_car.py
python Chapter09/electric_car.py

```

## Key Takeaways

- Classes are blueprints for creating objects
- Objects are instances of classes
- Attributes store data in objects
- Methods define behavior of objects
- `__init__()` initializes new instances
- `self` refers to the current instance
- Inheritance creates class relationships
- Child classes inherit from parent classes
- `super()` calls parent class methods
- Method overriding customizes behavior
- Objects can contain other objects



- Import classes to use them in other modules
- Classes help organize and structure code

# Chapter 10: Files and Exceptions

## 1. File - Data Storage

**Definition:** A collection of information stored as a unit on a computer, accessible by programs.

```
filename = 'pi_digits.txt'
with open(filename) as file_object:
    contents = file_object.read()
```

## 2. open() Function - File Access

**Definition:** A function that opens a file and returns a file object, which contains methods and attributes for working with the file.

```
with open('pi_digits.txt') as file_object:
    contents = file_object.read()
```

## 3. with Statement - File Context

**Definition:** A statement that ensures a file is properly closed after the block of code using it is finished.

```
with open('pi_digits.txt') as file_object:
    contents = file_object.read()
# File is automatically closed here
```

## 4. read() Method - File Content

**Definition:** A method that reads the entire contents of a file as a string.

Listing 84: Reading file contents

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("=====")

with open('pi_digits.txt') as file_object:
    contents = file_object.read()
print(contents)
print(contents.rstrip())

print_H()

file_path = 'd:/CSS.md'
with open(file_path) as file_object:
    contents = file_object.read()
print(contents)
```

```
print_H()

file_path = 'd:/Pandoc.md'
with open(file_path) as file_object:
    for line in file_object:
        print(line.rstrip())

print_H()

filename = 'd:/Markdown.md'
with open(filename) as file_object:
    lines = file_object.readlines()

for line in lines:
    print(line.rstrip())

print_H()

filename = 'pi_digits.txt'

with open(filename) as file_object:
    lines = file_object.readlines()

pi_string = ''
for line in lines:
    pi_string += line.strip()

print(pi_string)
print(len(pi_string))
```

## 5. readlines() Method - Line List

**Definition:** A method that reads each line from a file and stores them in a list.

```
with open('pi_digits.txt') as file_object:
    lines = file_object.readlines()

for line in lines:
    print(line.rstrip())
```

## 6. write() Method - File Writing

**Definition:** A method that writes a string to a file, overwriting the file's contents.

```
filename = 'programming.txt'
with open(filename, 'w') as file_object:
    file_object.write("I love programming.")
```

## 7. append Mode - 'a' Parameter

**Definition:** A file mode that adds content to the end of a file instead of overwriting it.

```
filename = 'programming.txt'
with open(filename, 'a') as file_object:
    file_object.write("I also love finding meaning in large
        datasets.\n")
```

## 8. Exception - Error Handling

**Definition:** An error that occurs during program execution, which can be caught and handled.

Listing 85: Exception handling

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("=====")

try:
    print(5/0)
except ZeroDivisionError:
    print("You can't divide by zero!")

print_H()

print("Give me two numbers, and I'll divide them.")
print("Enter 'q' to quit.")

while True:
    first_number = input("\n First number: ")
    if first_number == 'q':
        break
    second_number = input("\n Second number: ")
    if second_number == 'q':
        break
    try:
        answer = int(first_number) / int(second_number)
    except ZeroDivisionError:
        print("You can't divide bu 0!")
    else:
        print(answer)
```

## 9. try-except Block - Error Catching

**Definition:** A block of code that tries to run some code and catches any exceptions that occur.

```
try:
    answer = int(first_number) / int(second_number)
```

```
except ZeroDivisionError:
    print("You can't divide by 0!")
```

## 10. else Block - Success Handling

**Definition:** A block of code that runs only if the try block succeeds (no exceptions occur).

```
try:
    answer = int(first_number) / int(second_number)
except ZeroDivisionError:
    print("You can't divide by 0!")
else:
    print(answer)
```

## 11. FileNotFoundError - Missing File

**Definition:** An exception that occurs when trying to open a file that doesn't exist.

Listing 86: Handling missing files

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def count_words(filename):
    """Count the approximate number of words in a file."""
    try:
        with open(filename, encoding='utf-8') as f:
            contents = f.read()
    except FileNotFoundError:
        #print(f"Sorry, the file {filename} does not exist.")
        pass
    else:
        words = contents.split()
        num_words = len(words)
        print(f"The file {filename} has about {num_words} words.")

filename = '1005_alice/alice.txt'
count_words(filename)

print("=====")

filenames = ['1005_alice/alice.txt', '1003_programming/programming
.txt', '1001_pi/pi_digits.txt']
for filename in filenames:
    count_words(filename)
```

## 12. ZeroDivisionError - Division by Zero

**Definition:** An exception that occurs when trying to divide by zero.

```
try:
    print(5/0)
except ZeroDivisionError:
    print("You can't divide by zero!")
```

### 13. ValueError - Invalid Conversion

**Definition:** An exception that occurs when trying to convert a string to a number when the string doesn't contain a valid number.

```
try:
    age = int(input("Enter your age: "))
except ValueError:
    print("Please enter a valid number.")
```

### 14. pass Statement - Silent Failure

**Definition:** A statement that tells Python to do nothing in a block, often used in exception handling.

```
try:
    with open(filename) as f:
        contents = f.read()
except FileNotFoundError:
    pass # Do nothing if file not found
```

### 15. JSON - Data Format

**Definition:** A lightweight data format that's easy for programs to parse and generate.

```
import json

numbers = [2, 3, 5, 7, 11, 13]
filename = 'numbers.json'
with open(filename, 'w') as f:
    json.dump(numbers, f)
```

## Practical Examples from Chapter 10

### Working with Files and Exceptions

Chapter 10 introduces file handling and exception handling. Here are the key files:

#### File Reading Operations:

Listing 87: Chapter10/1001\_pi/file\_reader.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
```

```

    print("=====")

with open('pi_digits.txt') as file_object:
    contents = file_object.read()
print(contents)
print(contents.rstrip())

print_H()

file_path = 'd:/CSS.md'
with open(file_path) as file_object:
    contents = file_object.read()
print(contents)

print_H()

file_path = 'd:/Pandoc.md'
with open(file_path) as file_object:
    for line in file_object:
        print(line.rstrip())

print_H()

filename = 'd:/Markdown.md'
with open(filename) as file_object:
    lines = file_object.readlines()

for line in lines:
    print(line.rstrip())

print_H()

filename = 'pi_digits.txt'

with open(filename) as file_object:
    lines = file_object.readlines()

pi_string = ''
for line in lines:
    pi_string += line.strip()

print(pi_string)
print(len(pi_string))

```

### Exception Handling:

Listing 88: Chapter10/1004\_division\_calculator.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

def print_H():
    print("=====")

```

```

try:
    print(5/0)
except ZeroDivisionError:
    print("You can't divide by zero!")

print_H()

print("Give me two numbers, and I'll divide them.")
print("Enter 'q' to quit.")

while True:
    first_number = input("\n First number: ")
    if first_number == 'q':
        break
    second_number = input("\n Second number: ")
    if second_number == 'q':
        break
    try:
        answer = int(first_number) / int(second_number)
    except ZeroDivisionError:
        print("You can't divide bu 0!")
    else:
        print(answer)

```

### File Error Handling:

Listing 89: Chapter10/1006\_word\_count.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

def count_words(filename):
    """Count the approximate number of words in a file."""
    try:
        with open(filename, encoding='utf-8') as f:
            contents = f.read()
    except FileNotFoundError:
        #print(f"Sorry, the file {filename} does not exist.")
        pass
    else:
        words = contents.split()
        num_words = len(words)
        print(f"The file {filename} has about {num_words} words.")

filename = '1005_alice/alice.txt'
count_words(filename)

print("=====")

filenames = ['1005_alice/alice.txt', '1003_programming/programming
.txt', '1001_pi/pi_digits.txt']
for filename in filenames:
    count_words(filename)

```



**To run these programs:**

```
python Chapter10/1001_pi/file_reader.py
python Chapter10/1004_division_calculator.py
python Chapter10/1006_word_count.py
```

## Key Takeaways

- Files store data persistently
- `open()` creates file objects
- `with` ensures proper file closing
- `read()` gets entire file content
- `readlines()` gets list of lines
- `write()` overwrites file content
- `'a'` mode appends to files
- Exceptions handle errors gracefully
- `try-except` catches exceptions
- `else` runs on successful try
- `FileNotFoundError` for missing files
- `ZeroDivisionError` for division by zero
- `ValueError` for invalid conversions
- `pass` does nothing in a block
- JSON stores structured data

# Chapter 11: Testing Your Code

## 1. Test - Code Verification

**Definition:** A piece of code that verifies that another piece of code works correctly.

```
def test_first_last_name():
    """Do names like 'Janis Joplin' work?"""
    formatted_name = get_formatted_name('janis', 'joplin')
    assert formatted_name == 'Janis Joplin'
```

## 2. Unit Test - Function Testing

**Definition:** A test that verifies that one aspect of a function works correctly.

Listing 90: Unit testing with unittest

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import unittest
from name_function import get_formatted_name

class NamesTestCase(unittest.TestCase):
    """Test for 'name_function.py'."""

    def test_first_last_name(self):
        """Do names like 'Janis Joplin' work?"""
        formatted_name = get_formatted_name('janis', 'joplin')
        self.assertEqual(formatted_name, 'Janis Joplin')

    def test_first_last_middle_name(self):
        """Do names like 'Wolfgang Amadeus Mozart' work?"""
        formatted_name = get_formatted_name('wolfgang', 'mozart',
                                             'amadeus')
        self.assertEqual(formatted_name, 'Wolfgang Amadeus Mozart')

if __name__ == '__main__':
    unittest.main()
```

## 3. Test Case - Test Class

**Definition:** A class that contains a series of unit tests that can be run together.

```
class NamesTestCase(unittest.TestCase):
    """Tests for 'name_function.py'."""

    def test_first_last_name(self):
        """Do names like 'Janis Joplin' work?"""
        formatted_name = get_formatted_name('janis', 'joplin')
        self.assertEqual(formatted_name, 'Janis Joplin')
```

## 4. assertEquals() Method - Value Comparison

**Definition:** A method that verifies that a value you expect matches the value the function returns.

```
formatted_name = get_formatted_name('janis', 'joplin')
self.assertEqual(formatted_name, 'Janis Joplin')
```

## 5. unittest Module - Testing Framework

**Definition:** A Python module that provides tools for testing your code.

```
import unittest
from name_function import get_formatted_name

class NamesTestCase(unittest.TestCase):
    def test_first_last_name(self):
        formatted_name = get_formatted_name('janis', 'joplin')
        self.assertEqual(formatted_name, 'Janis Joplin')
```

## 6. setUp() Method - Test Preparation

**Definition:** A method that runs before each test method, allowing you to create objects once and use them in all your test methods.

```
def setUp(self):
    """Create a survey and a set of responses for use in all test
    methods."""
    question = "What language did you first learn to speak?"
    self.my_survey = AnonymousSurvey(question)
    self.responses = ['English', 'Spanish', 'Mandarin']
```

## 7. Test Function - Individual Test

**Definition:** A function that tests a specific aspect of your code.

Listing 91: Function to be tested

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def get_formatted_name(first, last, middle=''):
    """Generate a neatly formatter full name"""
    if middle:
        full_name = f"{first} {middle} {last}"
    else:
        full_name = f"{first} {last}"
    return full_name.title()
```

## 8. assertIn() Method - Membership Test

**Definition:** A method that verifies that an item is in a list.

```
def test_store_single_response(self):
    """Test that a single response is stored properly."""
    self.my_survey.store_response(self.responses[0])
    self.assertIn(self.responses[0], self.my_survey.responses)
```

## 9. assertNotIn() Method - Non-Membership Test

**Definition:** A method that verifies that an item is not in a list.

```
def test_duplicate_responses(self):
    """Test that duplicate responses are not stored."""
    self.my_survey.store_response(self.responses[0])
    self.my_survey.store_response(self.responses[0])
    self.assertEqual(len(self.my_survey.responses), 1)
```

## 10. Test Runner - Test Execution

**Definition:** A tool that runs your tests and reports the results.

```
if __name__ == '__main__':
    unittest.main()
```

## 11. Failing Test - Bug Detection

**Definition:** A test that fails, indicating that there's a problem with the code being tested.

```
def test_first_last_middle_name(self):
    """Do names like 'Wolfgang Amadeus Mozart' work?"""
    formatted_name = get_formatted_name('wolfgang', 'mozart', '
        amadeus')
    self.assertEqual(formatted_name, 'Wolfgang Amadeus Mozart')
```

## 12. Passing Test - Success Verification

**Definition:** A test that passes, indicating that the code being tested works correctly.

```
def test_first_last_name(self):
    """Do names like 'Janis Joplin' work?"""
    formatted_name = get_formatted_name('janis', 'joplin')
    self.assertEqual(formatted_name, 'Janis Joplin')
```

### 13. Test Coverage - Code Verification

**Definition:** The percentage of your code that's covered by tests.

```
# Test different scenarios
def test_empty_string(self):
    """Test with empty strings."""
    result = get_formatted_name('', '')
    self.assertEqual(result, ' ')

def test_single_name(self):
    """Test with single name."""
    result = get_formatted_name('john', '')
    self.assertEqual(result, 'John ')
```

### 14. Integration Test - System Testing

**Definition:** A test that verifies that multiple parts of your system work together correctly.

Listing 92: Integration testing with user input

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from survey import AnonymousSurvey

# Define a question, and make a survey.
question = "What language did you first learn to speak?"
my_survey = AnonymousSurvey(question)

# Show the question, and store responses to the question.
my_survey.show_question()
print("Enter 'q' at any time to quit.\n")
while True:
    response = input("Language: ")
    if response == 'q':
        break
    my_survey.store_response(response)

# Show the survey results.
print("\nThank you o everyone who participated in the survey!")
my_survey.show_results()
```

## Practical Examples from Chapter 11

### Working with Testing

Chapter 11 introduces testing and test-driven development. Here are the key files:

**Function to be Tested:**

Listing 93: Chapter11/name\_function.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def get_formatted_name(first, last, middle=''):
    """Generate a neatly formatter full name"""
    if middle:
        full_name = f"{first} {middle} {last}"
    else:
        full_name = f"{first} {last}"
    return full_name.title()
```

**Unit Tests:**

Listing 94: Chapter11/test\_name\_function.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import unittest
from name_function import get_formatted_name

class NamesTestCase(unittest.TestCase):
    """Test for 'name_function.py'."""

    def test_first_last_name(self):
        """Do names like 'Janis Joplin' work?"""
        formatted_name = get_formatted_name('janis', 'joplin')
        self.assertEqual(formatted_name, 'Janis Joplin')

    def test_first_last_middle_name(self):
        """Do names like 'Wolfgang Amadeus Mozart' work?"""
        formatted_name = get_formatted_name('wolfgang', 'mozart',
                                             'amadeus')
        self.assertEqual(formatted_name, 'Wolfgang Amadeus Mozart')

if __name__ == '__main__':
    unittest.main()
```

**Integration Testing:**

Listing 95: Chapter11/language\_survey.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from survey import AnonymousSurvey

# Define a question, and make a survey.
question = "What language did you first learn to speak?"
my_survey = AnonymousSurvey(question)

# Show the question, and store responses to the question.
my_survey.show_question()
print("Enter 'q' at any time to quit.\n")
while True:
```

```
response = input("Language: ")
if response == 'q':
    break
my_survey.store_response(response)

# Show the survey results.
print("\nThank you o everyone who participated in the survey!")
my_survey.show_results()
```

To run these tests:

```
python Chapter11/test_name_function.py
```

```
python Chapter11/language_survey.py
```

## Key Takeaways

- Tests verify code works correctly
- Unit tests check individual functions
- Test cases group related tests
- `assertEqual()` compares expected and actual values
- `unittest` provides testing framework
- `setUp()` prepares test data
- `assertIn()` checks list membership
- `assertNotIn()` checks non-membership
- Test runners execute tests
- Failing tests indicate bugs
- Passing tests verify correctness
- Test coverage measures completeness
- Integration tests check system parts
- Write tests before fixing bugs
- Tests help prevent regressions

# Chapters 12-14: Alien Invasion Project

## Project Overview: Alien Invasion Game

Chapters 12-14 focus on building a complete 2D game using Pygame. The project progresses from basic game setup to a fully functional space shooter with scoring, levels, and user interface elements.

### Chapter 12: A Ship that Fires Bullets

#### 1. Pygame - Game Development Library

**Definition:** A set of Python modules designed for writing video games, providing tools for graphics, sound, and input handling.

```
import pygame
pygame.init()
```

#### 2. Game Loop - Core Game Logic

**Definition:** The main loop that runs continuously during gameplay, handling events, updating game state, and rendering graphics.

```
def run_game(self):
    """Start the main loop for the game."""
    while True:
        # Watch for keyboard and mouse events.
        for event in pygame.event.get():
            if event.type == pygame.QUIT:
                sys.exit()

        # Update game objects
        self.ship.update()

        # Redraw the screen
        self.screen.fill(self.settings.bg_color)
        self.ship.blitme()
        pygame.display.flip()
```

#### 3. Surface - Drawing Canvas

**Definition:** A Pygame object that represents a rectangular area where you can draw graphics.

```
self.screen = pygame.display.set_mode((1200, 800))
self.screen.fill((230, 230, 230)) # Fill with background color
```



## 4. Rect - Rectangle Object

**Definition:** A Pygame object that represents a rectangle, used for positioning and collision detection.

```
self.rect = self.image.get_rect()
self.rect.midbottom = self.screen_rect.midbottom
```

## 5. Sprite - Game Object

**Definition:** A 2D object that can be drawn on the screen, typically representing game characters or elements.

```
class Ship:
    """A class to manage the ship."""
    def __init__(self, ai_game):
        self.screen = ai_game.screen
        self.image = pygame.image.load('images/ship.bmp')
        self.rect = self.image.get_rect()
```

## 6. Event Handling - User Input

**Definition:** The process of detecting and responding to user actions like key presses and mouse movements.

```
for event in pygame.event.get():
    if event.type == pygame.QUIT:
        sys.exit()
    elif event.type == pygame.KEYDOWN:
        if event.key == pygame.K_RIGHT:
            self.ship.moving_right = True
    elif event.type == pygame.KEYUP:
        if event.key == pygame.K_RIGHT:
            self.ship.moving_right = False
```

## 7. Movement Flags - State Management

**Definition:** Boolean variables that track whether an object should be moving in a particular direction.

```
# Movement flags
self.moving_right = False
self.moving_left = False

def update(self):
    """Update the ship's position based on movement flags."""
    if self.moving_right and self.rect.right < self.screen_rect.right:
        self.x += self.settings.ship_speed
    if self.moving_left and self.rect.left > 0:
        self.x -= self.settings.ship_speed
```

## 8. Bullet Class - Projectile System

**Definition:** A class that manages bullets fired by the ship, including their movement and collision detection.

```
class Bullet(Sprite):
    """A class to manage bullets fired from the ship."""

    def __init__(self, ai_game):
        super().__init__()
        self.screen = ai_game.screen
        self.settings = ai_game.settings
        self.color = self.settings.bullet_color

        # Create a bullet rect at (0, 0) and then set correct
        # position.
        self.rect = pygame.Rect(0, 0, self.settings.bullet_width,
                                self.settings.bullet_height)
        self.rect.midtop = ai_game.ship.rect.midtop

        # Store the bullet's position as a decimal value.
        self.y = float(self.rect.y)

    def update(self):
        """Move the bullet up the screen."""
        # Update the decimal position of the bullet.
        self.y -= self.settings.bullet_speed
        # Update the rect position.
        self.rect.y = self.y

    def draw_bullet(self):
        """Draw the bullet to the screen."""
        pygame.draw.rect(self.screen, self.color, self.rect)
```

## Chapter 13: Aliens

### 9. Alien Fleet - Enemy Management

**Definition:** A group of alien sprites that move together and represent the enemies in the game.

```
class Alien(Sprite):
    """A class to represent a single alien in the fleet."""

    def __init__(self, ai_game):
        super().__init__()
        self.screen = ai_game.screen
        self.settings = ai_game.settings

        # Load the alien image and set its rect attribute.
        self.image = pygame.image.load('images/alien.bmp')
```

```
self.rect = self.image.get_rect()

# Start each new alien near the top left of the screen.
self.rect.x = self.rect.width
self.rect.y = self.rect.height

# Store the alien's exact horizontal position.
self.x = float(self.rect.x)
```

## 10. Fleet Movement - Coordinated Motion

**Definition:** The synchronized movement of all aliens in the fleet, including direction changes and dropping down.

```
def _check_fleet_edges(self):
    """Respond appropriately if any aliens have reached an edge.
    """
    for alien in self.aliens.sprites():
        if alien.check_edges():
            self._change_fleet_direction()
            break

def _change_fleet_direction(self):
    """Drop the entire fleet and change the fleet's direction."""
    for alien in self.aliens.sprites():
        alien.rect.y += self.settings.fleet_drop_speed
    self.settings.fleet_direction *= -1
```

## 11. Collision Detection - Hit Testing

**Definition:** The process of determining when game objects touch or overlap, used for bullet-alien collisions.

```
def _check_bullet_alien_collisions(self):
    """Respond to bullet-alien collisions."""
    # Remove any bullets and aliens that have collided.
    collisions = pygame.sprite.groupcollide(
        self.bullets, self.aliens, True, True)

    if collisions:
        for aliens in collisions.values():
            self.stats.score += self.settings.alien_points * len(
                aliens)
        self.sb.prep_score()
```

## 12. Sprite Groups - Object Collections

**Definition:** Pygame containers that hold multiple sprites, making it easier to update and draw them together.

```

from pygame.sprite import Group

class AlienInvasion:
    def __init__(self):
        # Create groups to store bullets and aliens
        self.bullets = Group()
        self.aliens = Group()

        self._create_fleet()

    def _create_fleet(self):
        """Create the fleet of aliens."""
        # Create an alien and find the number of aliens in a row.
        alien = Alien(self)
        alien_width, alien_height = alien.rect.size

        available_space_x = self.settings.screen_width - (2 *
            alien_width)
        number.aliens_x = available_space_x // (2 * alien_width)

        # Determine the number of rows of aliens that fit on the
        screen.
        ship_height = self.ship.rect.height
        available_space_y = (self.settings.screen_height -
            (3 * alien_height) - ship_height)
        number_rows = available_space_y // (2 * alien_height)

        # Create the full fleet of aliens.
        for row_number in range(number_rows):
            for alien_number in range(number.aliens_x):
                self._create_alien(alien_number, row_number)

```

## 13. Game Stats - State Tracking

**Definition:** A class that tracks game statistics like score, level, and lives remaining.

```

class GameStats:
    """Track statistics for Alien Invasion."""

    def __init__(self, ai_game):
        """Initialize statistics."""
        self.settings = ai_game.settings
        self.reset_stats()

        # Start game in an inactive state.
        self.game_active = False

        # High score should never be reset.
        self.high_score = 0

```

```
def reset_stats(self):
    """Initialize statistics that can change during the game.
    """
    self.ships_left = self.settings.ship_limit
    self.score = 0
    self.level = 1
```

## Chapter 14: Scoring

### 14. Score Display - UI Elements

**Definition:** Visual elements that show the player's current score, high score, and level.

```
class Scoreboard:
    """A class to report scoring information."""

    def __init__(self, ai_game):
        """Initialize scorekeeping attributes."""
        self.ai_game = ai_game
        self.screen = ai_game.screen
        self.screen_rect = self.screen.get_rect()
        self.settings = ai_game.settings
        self.stats = ai_game.stats

        # Font settings for scoring information.
        self.text_color = (30, 30, 30)
        self.font = pygame.font.SysFont(None, 48)

        # Prepare the initial score images.
        self.prep_score()
        self.prep_high_score()
        self.prep_level()
        self.prep_ships()

    def prep_score(self):
        """Turn the score into a rendered image."""
        rounded_score = round(self.stats.score, -1)
        score_str = "{:,}".format(rounded_score)
        self.score_image = self.font.render(score_str, True,
                                             self.text_color, self.settings.bg_color)

        # Display the score at the top right of the screen.
        self.score_rect = self.score_image.get_rect()
        self.score_rect.right = self.screen_rect.right - 20
        self.score_rect.top = 20
```

### 15. Play Button - User Interface

**Definition:** A clickable button that allows players to start or restart the game.

```
class Button:
    def __init__(self, ai_game, msg):
        """Initialize button attributes."""
        self.screen = ai_game.screen
        self.screen_rect = self.screen.get_rect()

        # Set the dimensions and properties of the button.
        self.width, self.height = 200, 50
        self.button_color = (0, 255, 0)
        self.text_color = (255, 255, 255)
        self.font = pygame.font.SysFont(None, 48)

        # Build the button's rect object and center it.
        self.rect = pygame.Rect(0, 0, self.width, self.height)
        self.rect.center = self.screen_rect.center

        # The button message needs to be prepped only once.
        self._prep_msg(msg)

    def _prep_msg(self, msg):
        """Turn msg into a rendered image and center text on the
        button."""
        self.msg_image = self.font.render(msg, True, self.
            text_color,
            self.button_color)
        self.msg_image_rect = self.msg_image.get_rect()
        self.msg_image_rect.center = self.rect.center

    def draw_button(self):
        """Draw blank button and then draw message."""
        self.screen.fill(self.button_color, self.rect)
        self.screen.blit(self.msg_image, self.msg_image_rect)
```

## 16. Mouse Events - Click Detection

**Definition:** Events that occur when the user moves or clicks the mouse, used for button interactions.

```
def _check_play_button(self, mouse_pos):
    """Start a new game when the player clicks Play."""
    button_clicked = self.play_button.rect.collidepoint(mouse_pos)
    if button_clicked and not self.stats.game_active:
        # Reset the game settings.
        self.settings.initialize_dynamic_settings()

        # Reset the game statistics.
        self.stats.reset_stats()
        self.stats.game_active = True
        self.sb.prep_score()
        self.sb.prep_level()
```

```
self.sb.prep_ships()

# Get rid of any remaining aliens and bullets.
self.aliens.empty()
self.bullets.empty()

# Create a new fleet and center the ship.
self._create_fleet()
self.ship.center_ship()

# Hide the mouse cursor.
pygame.mouse.set_visible(False)
```

## 17. Level Progression - Difficulty Scaling

**Definition:** The system that increases game difficulty as the player advances through levels.

```
def _check.aliens.bottom(self):
    """Check if any aliens have reached the bottom of the screen.
    """
    screen_rect = self.screen.get_rect()
    for alien in self.aliens.sprites():
        if alien.rect.bottom >= screen_rect.bottom:
            # Treat this the same as if the ship got hit.
            self._ship_hit()
            break

def _ship_hit(self):
    """Respond to the ship being hit by an alien."""
    if self.stats.ships_left > 0:
        # Decrement ships_left, and update scoreboard.
        self.stats.ships_left -= 1
        self.sb.prep_ships()

        # Get rid of any remaining aliens and bullets.
        self.aliens.empty()
        self.bullets.empty()

        # Create a new fleet and center the ship.
        self._create_fleet()
        self.ship.center_ship()

        # Pause.
        sleep(0.5)
    else:
        self.stats.game_active = False
        pygame.mouse.set_visible(True)
```

## Practical Examples from the Alien Invasion Project

### Complete Game Structure

The Alien Invasion project demonstrates a complete game development workflow:

#### Main Game File:

Listing 96: Project1/adding\_ship\_image/alien\_invasion.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import sys

import pygame

from settings import Settings
from ship import Ship

class AlienInvasion:
    """Overall class to manage game assets and behavior."""

    def __init__(self):
        """Initialize the game, and create game resources."""
        pygame.init()
        self.settings = Settings()

        self.screen = pygame.display.set_mode(
            (self.settings.screen_width, self.settings.
             screen_height))
        pygame.display.set_caption("Alien Invasion")

        self.ship = Ship(self)

    def run_game(self):
        """Start the main loop for the game."""
        while True:
            # Watch for keyboard and mouse events.
            for event in pygame.event.get():
                if event.type == pygame.QUIT:
                    sys.exit()

            # Redraw the screen during each pass through the loop.
            self.screen.fill(self.settings.bg_color)
            self.ship.blitme()

            # Make the most recently drawn screen visible.
            pygame.display.flip()

if __name__ == '__main__':
    # Make a game instance, and run the game.
    ai = AlienInvasion()
```



```
ai.run_game()
```

### Game Settings:

Listing 97: Project1/adding\_ship\_image/settings.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

class Settings:
    """A class to store all settings for Alien Invasion."""

    def __init__(self):
        """Initialize the game's settings."""
        # Screen settings
        self.screen_width = 1200
        self.screen_height = 800
        self.bg_color = (230, 230, 230)
```

### Ship Class:

Listing 98: Project1/adding\_ship\_image/ship.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import pygame

class Ship:
    """A class to manage the ship."""

    def __init__(self, ai_game):
        """Initialize the ship and set its starting position."""
        self.screen = ai_game.screen
        self.screen_rect = ai_game.screen.get_rect()

        # Load the ship image and get its rect.
        self.image = pygame.image.load('images/ship.bmp')
        self.rect = self.image.get_rect()

        # Start each new ship at the bottom center of the screen.
        self.rect.midbottom = self.screen_rect.midbottom

    def blitme(self):
        """Draw the ship at its current location."""
        self.screen.blit(self.image, self.rect)
```

### To run the game:

```
python Project1/adding_ship_image/alien_invasion.py
```

## Key Takeaways

- Pygame provides tools for 2D game development
- Game loops handle events, updates, and rendering

- Sprites represent game objects with position and graphics
- Event handling captures user input
- Collision detection determines object interactions
- Sprite groups manage collections of game objects
- Game stats track score, lives, and level
- UI elements like buttons enhance user experience
- Mouse events enable interactive elements
- Level progression increases game difficulty
- Proper game state management is crucial
- Code organization improves maintainability
- Real-time graphics require efficient rendering
- User feedback through scoring and visual elements

## Project Progression

1. **Chapter 12:** Basic game setup, ship movement, and bullet firing
2. **Chapter 13:** Alien fleet creation, movement, and collision detection
3. **Chapter 14:** Scoring system, UI elements, and game completion

This three-chapter project demonstrates complete game development from concept to finished product, covering all essential aspects of 2D game programming with Python and Pygame.

# Chapters 15-17: Data Visualization and APIs Project

## Project Overview: Data Visualization and APIs

Chapters 15-17 cover the complete development of data visualization skills and API integration using Python. This project focuses on creating meaningful visualizations and working with real-world data through APIs.

## Chapter 15: Generating Data

**Project Focus:** Creating and visualizing data using Python libraries

**Key Concepts:**

- **Matplotlib:** Primary plotting library for Python
- **Plotly:** Interactive plotting library for web-based visualizations
- **Random Data Generation:** Creating synthetic data for testing
- **Data Visualization:** Converting data into meaningful charts
- **Statistical Analysis:** Understanding data distributions

**Main Projects:**

### Rolling Dice Simulation

**Concept:** Simulating dice rolls and analyzing probability distributions

**Key Components:**

- **Die Class:** Object-oriented approach to dice simulation
- **Probability Analysis:** Understanding random distributions
- **Data Collection:** Gathering results from multiple trials
- **Visualization:** Creating bar charts of results

**Implementation:**

Listing 99: Project2/Dice/die.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from random import randint

class Die:
    # A class representing a single die. #

    def __init__(self, num_sides = 6):
```

```

        # Assume a six-sided die. #
        self.num_sides = num_sides

    def roll(self):
        # Return a random value between 1 and number of sides. #
        return randint(1, self.num_sides)

```

### Visualization Code:

#### Listing 100: Project2/Dice/die\_visual.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

from die import Die
from plotly import offline
from plotly.graph_objs import Bar, Layout

# Create a D6.
die = Die()

# Make some rolls, and store results in a list.
results = []
for roll_num in range(1000):
    result = die.roll()
    results.append(result)

# Analyse the results
frequencies = []
for value in range(1, die.num_sides+1):
    frequency = results.count(value)
    frequencies.append(frequency)

# Visualize the results
x_value = list(range(1, die.num_sides+1))
data = [Bar(x=x_value, y=frequencies)]

x_axis_config = {'title': 'Result'}
y_axis_config = {'title': 'Frequency of Result'}
my_layout = Layout(title='Results of rolling one D6 1000 times',
    xaxis = x_axis_config, yaxis = y_axis_config)
offline.plot({'data': data, 'layout' : my_layout}, filename = 'd6.
    html')

```

## Random Walks

**Concept:** Creating random movement patterns and visualizing paths

### Key Components:

- **RandomWalk Class:** Generating random movement patterns
- **Coordinate Systems:** Working with x,y coordinates
- **Path Visualization:** Plotting movement trails

- **Statistical Patterns:** Understanding random behavior

### Implementation:

Listing 101: Project2/RandomWalk/random\_walk.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from random import choice

class Randomwalk:
    # A class to generate random walks. #

    def __init__(self, num_points = 5000):
        # Initialize attricutes of a walk. #
        self.num_points = num_points

        # All walks start at (0,0)
        self.x_values = [0]
        self.y_values = [0]

        # determine the range possible for each steps
        self.step = [value for value in range(0,9)]

    def get_step(self):
        # Decide which direction to go and how far to go in that
        # direction.
        direction = choice([1, -1])
        distance = choice(self.step)
        step = direction * distance
        return step

    def fill_walk(self):
        # Calculate all the points in the walk #
        # Keep talking steps until the walk reaches the desired
        # length. #
        while len(self.x_values) < self.num_points:

            x_step = self.get_step()
            y_step = self.get_step()

            # Reject moves that go nowhere. #
            if x_step == 0 and y_step == 0:
                continue

            # Calculate the new position. #
            x = self.x_values[-1] + x_step
            y = self.y_values[-1] + y_step

            self.x_values.append(x)
            self.y_values.append(y)
```

## Chapter 16: Downloading Data

**Project Focus:** Working with real-world data from various sources

**Key Concepts:**

- **CSV Files:** Reading and processing comma-separated values
- **Data Cleaning:** Handling missing or invalid data
- **Date/Time Processing:** Working with temporal data
- **Error Handling:** Managing data inconsistencies
- **Data Analysis:** Extracting meaningful insights

**Main Projects:**

### Weather Data Visualization

**Concept:** Analyzing and visualizing weather patterns from real data

**Key Components:**

- **CSV Processing:** Reading weather data files
- **Date Handling:** Converting string dates to datetime objects
- **Data Filtering:** Handling missing or invalid values
- **Comparative Analysis:** Comparing multiple datasets
- **Advanced Plotting:** Creating complex visualizations

**Implementation:**

Listing 102: Project2/Weather/highs\_lows\_2018.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import csv
import matplotlib.pyplot as plt
from datetime import datetime

filename = 'data/sitka_weather_2018_simple.csv'
with open(filename) as f:
    reader = csv.reader(f)
    header_row = next(reader)

    # Get dates, high and low temperatures from this file.
    dates, highs1, lows1 = [], [], []
    for row in reader:
        dates.append(datetime.strptime(row[header_row.index('DATE',
            )], '%Y-%m-%d'))
        highs1.append(int(row[header_row.index('TMAX')]))
        lows1.append(int(row[header_row.index('TMIN')]))
```

```

filename = 'data/death_valley_2018_simple.csv'
with open(filename) as f:
    reader = csv.reader(f)
    header_row = next(reader)

    # Get dates, high and low temperatures from this file.
    dates, highs2, lows2 = [], [], []
    for row in reader:
        current_date = datetime.strptime(row[header_row.index('
            DATE')], '%Y-%m-%d')
        try:
            high = int(row[header_row.index('TMAX')])
            low = int(row[header_row.index('TMIN')])
        except ValueError:
            print(f"Missing data for {current_date}.")
        else:
            dates.append(current_date)
            highs2.append(high)
            lows2.append(low)

# Plot the high and low temperatures
# Shade the temperature range
plt.style.use('seaborn')
fig, ax = plt.subplots()
ax.plot(dates, highs1, c='red', alpha=0.5, label='Sitka High')
ax.plot(dates, lows1, c='blue', alpha=0.5, label='Sitka Low')
ax.fill_between(dates, highs1, lows1, facecolor='blue', alpha=0.1)
ax.legend()
ax.plot(dates, highs2, c='brown', alpha=0.5, label="Death Valley
    High")
ax.plot(dates, lows2, c='green', alpha=0.5, label="Death Valley
    Low")
ax.fill_between(dates, highs2, lows2, facecolor='yellow', alpha
    =0.1)
ax.legend()

# Format plot
ax.set_title("Daily high and low temperatures, 2018", fontsize =
    24)
ax.set_xlabel("", fontsize = 16)
fig.autofmt_xdate()
ax.set_ylabel("Temperature (F)", fontsize = 16)
ax.tick_params(axis='both', which='major', labelsize = 16)

plt.show()

```

## Global Data Mapping

**Concept:** Working with global datasets and creating maps

**Key Components:**

- **JSON Data:** Processing structured data formats
- **Geographic Data:** Working with location-based information
- **Data Aggregation:** Combining multiple data sources
- **Interactive Maps:** Creating web-based visualizations

## Chapter 17: Working with APIs

**Project Focus:** Integrating with web services and external data sources

**Key Concepts:**

- **API (Application Programming Interface):** Interface for accessing external services
- **HTTP Requests:** Making web requests to APIs
- **JSON Processing:** Working with API response data
- **Authentication:** Securing API access
- **Rate Limiting:** Managing API usage limits

**Main Projects:**

### GitHub API Integration

**Concept:** Accessing GitHub's API to analyze repository data

**Key Components:**

- **API Authentication:** Using tokens for secure access
- **Data Extraction:** Parsing API responses
- **Error Handling:** Managing API failures
- **Interactive Visualizations:** Creating web-based charts

**Implementation:**

Listing 103: Project2/Working\_API/python\_repos\_visual.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import requests
from plotly.graph_objs import Bar
from plotly import offline

# Make an API call and store the response.

url = 'https://api.github.com/search/repositories?q=language:python&sort=stars'
```



```

headers = {'Accept': 'applicaiton/vnd.github.v3+json'}
r = requests.get(url, headers = headers)
print(f"Status code: {r.status_code}")

# Process results.
response_dict = r.json()
repo_dicts = response_dict['items']
repo_links, stars, labels = [], [], []
for repo_dict in repo_dicts:
    repo_name = repo_dict['name']
    repo_url = repo_dict['html_url']
    repo_link = f"<a href='{repo_url}'>{repo_name}</a>"
    repo_links.append(repo_link)

    stars.append(repo_dict['stargazers_count'])

    owner = repo_dict['owner']['login']
    description = repo_dict['description']
    label = f"{owner}<br />{description}"
    labels.append(label)

# Make visualization.
data = [{
    'type' : 'bar',
    'x' : repo_links,
    'y' : stars,
    'hovertext' : labels,
    'marker' : {
        'color' : 'rgb(60, 100, 150)',
        'line' : {
            'width' : 1.5,
            'color' : 'rgb(25, 25, 25)'
        }
    },
    'opacity' : 0.6,
}]

my_layout = {
    'title' : 'Most-Starred Python Projects on Github',
    'titlefont' : {
        'size' : 28
    },
    'xaxis' : {
        'title' : 'Repository',
        'titlefont' : {
            'size' : 24
        },
        'tickfont' : {
            'size' : 14
        },
    },
    'yaxis' : {'title' : 'stars'},

```

```
}  
fig = {'data' : data, 'layout' : my_layout}  
offline.plot(fig, filename = 'python_repos.html')
```

## Hacker News API

**Concept:** Working with news data and creating visualizations

**Key Components:**

- **Real-time Data:** Accessing current information
- **Data Filtering:** Selecting relevant information
- **User Interaction:** Creating clickable elements
- **Data Storytelling:** Presenting insights effectively

## Technical Skills Developed

### Data Visualization Libraries

- **Matplotlib:** Static plotting and basic charts
- **Plotly:** Interactive web-based visualizations
- **Seaborn:** Statistical data visualization
- **Pygal:** SVG-based charts for web

### Data Processing

- **Pandas:** Data manipulation and analysis
- **NumPy:** Numerical computing
- **CSV Module:** File I/O operations
- **JSON Module:** Structured data processing

### Web Integration

- **Requests Library:** HTTP client for APIs
- **URL Handling:** Managing web addresses
- **Response Processing:** Handling API data
- **Error Management:** Robust API interactions

## Project Outcomes

### Data Analysis Skills

- **Statistical Understanding:** Probability and distributions
- **Data Cleaning:** Handling real-world data issues
- **Pattern Recognition:** Identifying trends in data
- **Insight Generation:** Drawing conclusions from data

### Visualization Techniques

- **Chart Selection:** Choosing appropriate visualizations
- **Design Principles:** Creating effective charts
- **Interactive Elements:** Engaging user experiences
- **Storytelling:** Communicating data insights

### API Integration

- **Service Integration:** Connecting to external data
- **Authentication:** Secure API access
- **Data Transformation:** Converting API responses
- **Error Handling:** Robust application design

## Real-World Applications

### Business Intelligence

- **Sales Analysis:** Tracking performance metrics
- **Market Research:** Understanding customer behavior
- **Financial Modeling:** Analyzing economic data
- **Operational Metrics:** Monitoring business processes

### Scientific Research

- **Climate Analysis:** Weather pattern studies
- **Statistical Modeling:** Probability distributions
- **Data Mining:** Discovering patterns in large datasets
- **Research Visualization:** Presenting findings effectively

## Web Development

- **Dashboard Creation:** Real-time data displays
- **API Development:** Building data services
- **Interactive Applications:** User-driven visualizations
- **Data-Driven Websites:** Dynamic content generation

## Advanced Concepts

### Data Ethics

- **Privacy Protection:** Handling sensitive information
- **Data Accuracy:** Ensuring reliable information
- **Transparency:** Clear data presentation
- **Responsible Use:** Ethical data practices

### Performance Optimization

- **Memory Management:** Efficient data handling
- **Processing Speed:** Optimizing calculations
- **API Efficiency:** Minimizing request overhead
- **Scalability:** Handling large datasets

## Project Summary

Chapters 15-17 provide comprehensive training in:

1. **Data Generation:** Creating and simulating data
2. **Data Acquisition:** Accessing real-world information
3. **Data Processing:** Cleaning and preparing data
4. **Data Visualization:** Creating meaningful charts
5. **API Integration:** Working with external services
6. **Interactive Applications:** Building engaging experiences

This project develops essential skills for data science, business intelligence, and modern web development, providing a solid foundation for working with real-world data and creating impactful visualizations.

# Chapter End Exercises and Practice Problems

This document contains the chapter end exercises and practice problems from Chapters 1-11 of "Python Crash Course" to reinforce learning and provide hands-on practice.

## Chapter End Exercises Overview

Each chapter includes practical exercises that reinforce the concepts learned. These exercises provide hands-on practice with real Python code and help solidify understanding of programming concepts.

## Chapter 1: Getting Started

**Exercise Focus:** Basic Python setup and first programs

**Key Concepts Practiced:**

- Writing your first Python program
- Using the `print()` function
- Understanding Python syntax
- Running Python programs

**Sample Exercise:**

```
# Exercise: Write a simple message
message = "Hello, Python world!"
print(message)
```

## Chapter 2: Variables and Simple Data Types

**Exercise Focus:** Variables, strings, and basic data types

**Key Concepts Practiced:**

- Creating and using variables
- String manipulation and formatting
- Working with different data types
- Using f-strings for formatting

**Exercise Examples:**

**Exercise 2.1 - Simple Message:**

Listing 104: Chapter02/ex2.1.simple\_message.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# simple_message.py -- print out one message

message = "I love Jung EunBi."

print(message)
```

**Exercise 2.2 - Simple Messages:**

Listing 105: Chapter02/ex2.2.simple\_messages.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# simple_messages.py -- print out some messages

message = "I love Jung EunBi."

print(message)

message = "Jung EunBi loves me."

print(message)
```

**Exercise 2.3 - Personal Message:**

Listing 106: Chapter02/ex2.3.personal\_message.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# personal_message.py -- print out personal message

name = "Eunbi"
message = "would you marry me?"

print (f"{name}, {message}")
```

**Exercise 2.4 - Name Cases:**

Listing 107: Chapter02/ex2.4.name\_cases.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# name_cases.py -- print out names in lowercase, uppercase and
    title case

name = "jung eunbi"

print(f"Lowercase: {name.lower()}")
print(f"Uppercase: {name.upper()}")
print(f"Title Case: {name.title()}")
```

**Exercise 2.6 - Famous Quote:**

Listing 108: Chapter02/ex2.6.quote.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# quote.py -- print out some great persons the his / her quote

person = "Jung Eun Bi"
quote = "As an idol, one hamburger per day is maximum."

print(f"{person} once said, \"{quote}\"")
```

**Exercise 2.7 - Stripping Names:**

Listing 109: Chapter02/ex2.7.strip.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# strip.py -- manipulating string with strip functions.

name = " Jung Eun Bi "

name2 = " Jung \n Eun \t Bi "

print("For no \\n and \\t characters:")
print(f"No strip: {name}")
print(f"With lstrip(): {name.lstrip()}")
print(f"With rstrip(): {name.rstrip()}")
print(f"Wlth strip(): {name.strip()}")

print("When \\n and \\t characters are included:")
print(f"No strip: {name2}")
print(f"With lstrip(): {name2.lstrip()}")
print(f"With rstrip(): {name2.rstrip()}")
print(f"Wlth strip(): {name2.strip()}")
```

## Chapter 3: Introducing Lists

**Exercise Focus:** Working with lists and list operations

**Key Concepts Practiced:**

- Creating and accessing lists
- List indexing and slicing
- Modifying list elements
- List methods and operations

**Exercise Examples:**

**Exercise 3.1 - Names:**

Listing 110: Chapter03/ex3.1.gfriend.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes
```

```
# gfriend.py -- list out the name of your friends

print(gfriend[0])
gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']

print(gfriend[0])
print(gfriend[1])
print(gfriend[2])
print(gfriend[3])
print(gfriend[4])
print(gfriend[5])
```

### Exercise 3.2 - Greetings:

Listing 111: Chapter03/ex3.2.greetings.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# greetings.py -- say greetings to each of the members

greeting = ", guten Tag!"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(gfriend[0] + greeting)
print(gfriend[1] + greeting)
print(gfriend[2] + greeting)
print(gfriend[3] + greeting)
print(gfriend[4] + greeting)
print(gfriend[5] + greeting)
```

### Exercise 3.3 - Your Own List:

Listing 112: Chapter03/ex3.3.transportation.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

transportation = ["bus", "bike", "motorcycle", "foot", "van", "train"]
brandName = ["Honda", "BMW", "Toyota"]

message = "I go to school by"

print(message + " " + brandName[0] + " " + transportation[0] + ".")
)
```

### Exercise 3.4 - Guest List:

Listing 113: Chapter03/ex3.4.dinner.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# dinner.py -- invite members to the my dinner

invitation = ", would you join my dinner tonight?"
```



```
gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")
```

### Exercise 3.5 - Changing Guest List:

Listing 114: Chapter03/ex3.5.update\_dinner.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# update_dinner.py -- some of the members cannot come to dinner,
# so invite again them to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"Current list: {gfriend}")
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")

print("\n---")
print(f"{gfriend[1]} cannot come to my dinner. But IU can.")
gfriend[1] = 'IU'
print(f"Current list: {gfriend}")
```

### Exercise 3.6 - More Guests:

Listing 115: Chapter03/ex3.6.update\_dinner.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# update_dinner.py -- some of the members cannot come to dinner,
# so invite again them to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"Current list: {gfriend}")
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")
```

```

print("\n---")
print(f"{gfriend[1]} cannot come to my dinner. But IU can.")
gfriend[1] = 'IU'

print("\n---")
print("and Sinb will bring WJSN come.")
gfriend.append("WJSN")
print(f"Current list: {gfriend}")

print("also, Eunha will bring another SinB to the dinner.\nThe two
      SinBs need to sit together.")
gfriend.insert(4, "Sinb")
print(f"Current list: {gfriend}")

```

### Exercise 3.7 - Shrinking Guest List:

Listing 116: Chapter03/ex3.7.update\_dinner.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

# update_dinner.py -- some of the members cannot come to dinner,
# so invite again them to the my dinner

invitation = ", would you join my dinner tonight?"

gfriend = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
print(f"Current list: {gfriend}")
print(f"{gfriend[0]}{invitation}")
print(f"{gfriend[1]}{invitation}")
print(f"{gfriend[2]}{invitation}")
print(f"{gfriend[3]}{invitation}")
print(f"{gfriend[4]}{invitation}")
print(f"{gfriend[5]}{invitation}")

print("\n---")
print(f"{gfriend[1]} cannot come to my dinner. But IU can.")
gfriend[1] = 'IU'

print("\n---")
print("and Sinb will bring WJSN come.")
gfriend.append("WJSN")
print(f"Current list: {gfriend}")

print("also, Eunha will bring another SinB to the dinner.\nThe two
      SinBs need to sit together.")
gfriend.insert(4, "Sinb")
print(f"Current list: {gfriend}")

print("\n---")
print("Now one SinB kicks another out.")
del gfriend[4]
print(f"Current list{gfriend}")

```

```
print("\n---")
print("Eunha is being dissed. She is sad and she left for crying."
      )
gfriend.remove("eunha")
print(f"Current list:{gfriend}")

print("\n---")
print(f"{gfriend.pop(0)} goes to comfort Eunha.")
print(f"Current list: {gfriend}")
```

## Chapter 4: Working with Lists

**Exercise Focus:** Loops, list operations, and numerical ranges

**Key Concepts Practiced:**

- Using for loops with lists
- Working with numerical ranges
- List comprehensions
- Slicing and copying lists

**Exercise Examples:**

**Exercise 4.1 - Pizzas:**

Listing 117: Chapter04/ex4.1.pizza.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

pizzas = ['peccato', 'diavola', 'capricciosa']

for pizza in pizzas:
    print(f"I like {pizza.title()}")

print("The above statements are fake.")
```

**Exercise 4.2 - Animals:**

Listing 118: Chapter04/ex4.2.animal.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

animals = ['cats', 'dogs', 'lions']

for animal in animals:
    print(f"{animal.title()} have four legs.")

print("Any of them can be a great pet.")
```

**Exercise 4.3 - Counting to Twenty:**

Listing 119: Chapter04/ex4.3.count.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

numbers = list(range(1,21))

for number in numbers:
    print(f"{number}")
```

**Exercise 4.4 - One Million:**

Listing 120: Chapter04/ex4.4.count.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

numbers = list(range(1,1000001))

for number in numbers:
    print(f"{number}")
```

**Exercise 4.5 - Summing a Million:**

Listing 121: Chapter04/ex4.5.million.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

numbers = list(range(1,1000001))

print(f"Max : {max(numbers)}")
print(f"Min : {min(numbers)}")
print(f"Sum : {sum(numbers)}")
```

**Exercise 4.6 - Odd Numbers:**

Listing 122: Chapter04/ex4.6.count.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

even_numbers = list(range(2,21,2))

for number in even_numbers:
    print(f"{number}")
```

**Exercise 4.7 - Threes:**

Listing 123: Chapter04/ex4.7.count.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

threes_numbers = list(range(3, 31 ,3))

for number in threes_numbers:
    print(f"{number}")
```

**Exercise 4.8 - Cubes:**

Listing 124: Chapter04/ex4.8.cubic.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cube = []

for number in list(range(1, 11)):
    cube.append(number**3)

for member in cube:
    print(f"{member}")
```

### Exercise 4.9 - Cube Comprehension:

Listing 125: Chapter04/ex4.9.cubic.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cube = [value ** 3 for value in range(1,11)]

for member in cube:
    print(f"{member}")
```

### Exercise 4.10 - Slices:

Listing 126: Chapter04/ex4.10.animal.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

animals = ['cats', 'dogs', 'lions']

for animal in animals:
    print(f"{animal.title()} have four legs.")

print("Any of them can be a great pet.")

print("\n----")
animals.append('elephant')
print(f"Adding {animals[-1]}.\nNow we have the following animals:")
)
for animal in animals:
    print(f"{animal.title()}")

print("\n----")
print("Picking up the first three animals:")
for animal in animals[:3]:
    print(f"{animal.title()}")

print("\n----")
animals.append('sharks')
print(f"Adding {animals[-1]}.\nNow we have the following animals:")
)
for animal in animals:
    print(f"{animal.title()}")

print("\n----")
```

```

print("Picking up the middle three animals:")
for animal in animals[(int)(len(animals)/2-1):(int)(len(animals)
/2+2)]:
    print(f"{animal.title()}")

print("\n----")
print("Picking up the last three animals:")
for animal in animals[-3:]:
    print(f"{animal.title()}")

```

### Exercise 4.11 - My Pizzas, Your Pizzas:

Listing 127: Chapter04/ex4.11.pizza.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

pizzas = ['peccato', 'diavola', 'capricciosa']

for pizza in pizzas:
    print(f"I like {pizza.title()}")
print("The above statements are fake.")

friend_pizzas = pizzas[:]

print("\n----")
print("Another pizza list as per below:")
for pizza in friend_pizzas:
    print(f"{pizza.title()}")

friend_pizzas.append('Clam pie')
print("\n----")
print(f"Adding {friend_pizzas[-1]}\nThe pizza list:")
for pizza in friend_pizzas:
    print(f"{pizza.title()}")

```

### Exercise 4.12 - More Loops:

Listing 128: Chapter04/ex4.12.foods.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

my_foods = ['pizza', 'falafel', 'carrpt cake']
friend_foods = my_foods[:]

print("My favouried foods are :")
for food in my_foods:
    print(f"{food.title()}")

print("My friends's favouried foods are :")
for food in friend_foods:
    print(f"{food.title()}")

print("\n-----")
print("Adding one food for each of mine and friend's list:\n")

```

```
my_foods.append('cannoli')
friend_foods.append('ice cream')

print("Now, my favouried foods are :")
for food in my_foods:
    print(f"{food.title()}")

print("My friends's favouried foods are :")
for food in friend_foods:
    print(f"{food.title()}")
```

### Exercise 4.13 - Buffet:

Listing 129: Chapter04/ex4.13.buffet.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

foods = ('pizza', 'falafel', 'carrpt cake', 'sushi', 'ice cream')

print("Food in a buffet:")
for food in foods:
    print(f"{food.title()}")

print("\n---")
print("Now there is a new menu:")
foods = ('fried rice', 'onigiri', 'carrpt cake', 'sushi', 'ice
cream')

print("Food in a buffet:")
for food in foods:
    print(f"{food.title()}")
```

## Chapter 5: if Statements

**Exercise Focus:** Conditional logic and decision making

**Key Concepts Practiced:**

- Writing if statements
- Using conditional tests
- Boolean logic and operators
- Complex conditional logic

**Exercise Examples:**

**Exercise 5.1 - Conditional Tests:**

Listing 130: Chapter05/ex5.1.cars.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

car = 'subaru'
```

```
print("Is car == 'subaru'? I predict it is True.")
print(car == 'subaru')

print("Is car == 'audi'? I predict it is False.")
print(car == 'audi')
```

### Exercise 5.2 - More Conditional Tests:

Listing 131: Chapter05/ex5.2.guessing\_number.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

# guessing_number.py
# system randomly define a number between 1 and 100
# let user guess the number
# if user's guess is out of range, warning will be issued (only
#   three out-of-range guess allowed)
# if user's guess is in the range but not matching the answer,
#   user need to guess again
# if the guess is correct, exit the program

import random

number = random.randint(1, 100)
out_of_range_chance = 3
guessRange = list(range(1, 101))

while True:
    guess = int(input(f"Input an integer between {guessRange[0]}
        and {guessRange[-1]}: "))
    if (guess > guessRange[-1]) or (guess < guessRange[0]):
        out_of_range_chance = out_of_range_chance - 1
        if out_of_range_chance > 0:
            print("Your guess is out of the range of available
                gueese. Try again!")
            continue
        else:
            print("There are too many out of range guesses. Get
                out of the game!")
            break
    elif guess == number:
        print("Congradulations! You have got a correct guess.")
        break
    else:
        if guess > number:
            print("Your guess is too large. Please try again.")
            guessRange = guessRange[:guessRange.index(guess)]
            continue
        else:
            print("Your guess is too small. Please try again.")
            guessRange = guessRange[guessRange.index(guess+1):]
```



**Exercise 5.3 - Alien Colors:**

Listing 132: Chapter05/ex5.3.alien\_car.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

alien_car = ['green', 'yellow', 'red']

points = 0

print(f"Now you have {points} points.\n")

guess = input("Guess the car's color (green / yellow / red): ").
lower()

if guess in alien_car:
    print("Congratulations: Your guess is correct. You get five
        points!\n")
    points += 5
    print(f"Now you have {points} points.")
else:
    print("Wrong guess.")
```

**Exercise 5.4 - Alien Colors 2:**

Listing 133: Chapter05/ex5.4.alien\_car.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

alien_car = ['green', 'yellow', 'red']
awards = [5, 10, 10]

points = 0

print(f"Now you have {points} points.\n")

guess = input("Guess the car's color (green / yellow / red): ").
lower()

if guess in alien_car:
    print("Congratulations: Your guess is correct.\n")
    award = awards[alien_car.index(guess)]
    print(f"You get {award} points!\n")
    points += award
    print(f"Now you have {points} points.")
else:
    print("Wrong guess.")
```

**Exercise 5.5 - Alien Colors 3:**

Listing 134: Chapter05/ex5.5.alien\_car.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

alien_car = ['green', 'yellow', 'red']
```

```
awards = [5, 10, 15]

points = 0

print(f"Now you have {points} points.\n")

guess = input("Guess the car's color (green / yellow / red): ").lower()

if guess in alien_car:
    print("Congratulations: Your guess is correct.\n")
    award = awards[alien_car.index(guess)]
    print(f"You get {award} points!\n")
    points += award
    print(f"Now you have {points} points.")
else:
    print("Wrong guess.")
```

### Exercise 5.6 - Stages of Life:

Listing 135: Chapter05/ex5.6.stages\_of\_life.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

age = input("Input your age: ")

if age < 2:
    print("Baby")
elif age < 4:
    print("Toddler")
elif age < 13:
    print("Kid")
elif age < 20:
    print("Teenager")
elif age < 65:
    print("Adult")
else:
    print("Elder")
```

### Exercise 5.7 - Favorite Fruit:

Listing 136: Chapter05/ex5.7.fruits.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

fruits = ['banana', 'orange', 'fdf', 'apple']

fruit = 'banana'

if fruit in fruits:
    print("I like bananas")
else:
    print(f"{fruit.title()}")
```

### Exercise 5.8 - Hello Admin:

Listing 137: Chapter05/ex5.8.users.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

admin = ['sowon', 'yerin', 'eunha']
users = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']

for user in users:
    if user in admin:
        print(f"Hello admin {user}, would you like to see a status
              report?")
    else:
        print(f"Hello {user}, thank you for logging in again.")
```

**Exercise 5.9 - No Users:**

Listing 138: Chapter05/ex5.9.users.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

admin = ['sowon', 'yerin', 'eunha']
users = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']

if users:
    for user in users:
        if user in admin:
            print(f"Hello admin {user}, would you like to see a
                  status report?")
        else:
            print(f"Hello {user}, thank you for logging in again.")
else:
    print("There is no user.")
```

**Exercise 5.10 - Checking Usernames:**

Listing 139: Chapter05/ex5.10.users.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

admin = ['sowon', 'yerin', 'eunha']
users = ['sowon', 'yerin', 'eunha', 'yuju', 'sinb', 'umji']
walk_in_users = ['eunso', 'yeorum', 'IU', 'sana', 'eunha', 'sinb']
walk_in_users_updated = []

for walk_in_user in walk_in_users:
    walk_in_users_updated.append(walk_in_user.lower())

if users:
    for walk_in_user in walk_in_users_updated:
        if walk_in_user in users:
            print(f"{walk_in_user.title()} name is already in user
                  list. Please use another name.")
        else:
            users.append(walk_in_user)
```

```
        print(f"{walk_in_user.title()} has been newly  
            registered.")  
else:  
    print("There is no registered user.")
```

### Exercise 5.11 - Ordinal Numbers:

Listing 140: Chapter05/ex5.11.ordinary.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes  
  
numbers = list(range(1,10))  
  
for number in numbers:  
    if number == 1:  
        print(f"{number}st")  
    elif number == 2:  
        print(f"{number}nd")  
    elif number == 3:  
        print(f"{number}rd")  
    else:  
        print(f"{number}th")
```

## Chapter 6: Dictionaries

**Exercise Focus:** Working with key-value pairs and dictionary operations

### Key Concepts Practiced:

- Creating and accessing dictionaries
- Modifying dictionary contents
- Looping through dictionaries
- Nesting data structures

### Exercise Examples:

#### Exercise 6.1 - Person:

Listing 141: Chapter06/ex6.1.person.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes  
  
person = {  
    'first_name' : 'eunbi',  
    'last_name' : 'jung',  
    'age' : 26,  
    'city' : 'seoul'  
}  
  
print(f"I am going to talk about my wife:\nHer name is {person['  
last_name'].title()} + ' ' + person['first_name'].title()}\nShe  
is {person['age']} years old.\nShe is living in {person['city'  
'].title()}." )
```

**Exercise 6.2 - Favorite Numbers:**

Listing 142: Chapter06/ex6.2.favourite\_number.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

favourite_number = {
    'sowon' : 1,
    'yerin' : 2,
    'eunha' : 3,
    'yuju' : 4,
    'sinb' : 5,
    'umji' : 6
}

print(f"Sowon's favourite number is {favourite_number['sowon']}")
print(f"Yerin's favourite number is {favourite_number['yerin']}")
print(f"Eunha's favourite number is {favourite_number['eunha']}")
print(f"Yuju's favourite number is {favourite_number['yuju']}")
print(f"Sinb's favourite number is {favourite_number['sinb']}")
print(f"Umji's favourite number is {favourite_number['umji']}")
```

**Exercise 6.3 - Glossary:**

Listing 143: Chapter06/ex6.3.glossary.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

glossary = {
    'die Adresse' : "address",
    'die Webseite' : "website"
}

print(f"'die Adresse' means {glossary['die Adresse'].title()}")
print(f"'die Webseite' means {glossary['die Webseite'].title()}")
```

**Exercise 6.4 - Glossary 2:**

Listing 144: Chapter06/ex6.4.glossary.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

glossary = {
    'die Adresse' : "address",
    'die Webseite' : "website",
    'können' : "can",
    'Velen Dank' : "Very thnks"
}

for word, meaning in glossary.items():
    print(f"{word.title()} means {meaning.title()}")
```

**Exercise 6.5 - Rivers:**

Listing 145: Chapter06/ex6.5.river.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

rivers = {
    'nile' : "egypt",
    'eunha' : "Jung Eun Bi",
    'komogawa' : "japan"
}
countRiver = 0
countCountry = 0

for river, country in rivers.items():
    print(f"The {river.title()} runs through {country.title()}.")

for river in rivers.keys():
    countRiver += 1
    print(f"River {countRiver}: {river.title()}")

for country in rivers.values():
    countCountry += 1
    print(f"Country {countCountry}: {country.title()}")
```

### Exercise 6.6 - Polling:

Listing 146: Chapter06/ex6.6.favourite\_languages.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

favourite_languages = {
    'jen' : 'python',
    'sarah' : 'c',
    'edward' : 'ruby',
    'phil' : 'python'
}

for name, language in favourite_languages.items():
    print(f"{name.title()}s favourite language is {language.title()}")

print("\n-----\n")

people = ['david', 'stefan', 'modric', 'sarah', 'phil']

for person in people:
    if person in favourite_languages:
        print(f"{person.title()}, thank you for the poll.\nYour favourite language is {favourite_languages.get(person).title()}")
    else:
        print(f"{person.title()}, please take the poll.")
```

### Exercise 6.7 - People:

Listing 147: Chapter06/ex6.7.person.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

members = []

countMember = 0

for count in range(6):
    person = {
        'nick_name' : 'eunha',
        'first_name' : 'eunbi',
        'last_name' : 'jung',
        'age' : 26,
        'city' : 'seoul'
    }
    members.append(person)

members[0]['first_name'] = 'sojung'
members[0]['last_name'] = 'kim'
members[0]['age'] = 27
members[0]['nick_name'] = 'sowon'

members[1]['first_name'] = 'yerin'
members[1]['last_name'] = 'jung'
members[1]['nick_name'] = 'yerin'

members[3]['first_name'] = 'yuna'
members[3]['last_name'] = 'choi'
members[3]['age'] = 25
members[3]['nick_name'] = 'yuju'

members[4]['last_name'] = 'hwang'
members[4]['age'] = 24
members[4]['nick_name'] = 'sinb'

members[5]['first_name'] = 'yewon'
members[5]['last_name'] = 'kim'
members[5]['age'] = 24
members[5]['nick_name'] = 'umji'

for member in members:
    countMember += 1
    print(f"I am going to talk about my wife no. {countMember}:\n
        nHer name is {member['last_name'].title() + ' ' + member['first_name'].title()}\n
        nShe is {member['age']} years old.\n
        nShe is living in {member['city'].title()}." )
    print("...\n")

```

### Exercise 6.8 - Pets:

Listing 148: Chapter06/ex6.8.pets.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

```

```
pets = []

pet= {
    'type' : 'cat',
    'name' : 'david',
    'owner' : 'lawrence',
    'weight' : 44,
    'food' : "meat"
}
pets.append(pet)

pet= {
    'type' : 'dog',
    'name' : 'alan',
    'owner' : 'steve',
    'weight' : 29,
    'food' : "sausage"
}
pets.append(pet)

pet= {
    'type' : 'parrot',
    'name' : 'baga',
    'owner' : 'sarah',
    'weight' : 3,
    'food' : "peanuts"
}
pets.append(pet)
for pet in pets:
    print(f"{pet['type'].title()}’s names is {pet['name']}, owner
          is {pet['owner'].title()}.")
    print(f"Weight is {pet['weight']}, and it eats {pet['food']}."
```

### Exercise 6.9 - Favorite Places:

Listing 149: Chapter06/ex6.9.favourite\_places.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

favourite_places = {
    "steven" : ['tokyo', 'pusan', 'yokohama'],
    "apple" : ['new york', 'london'],
    "baka" : ['rome', 'frankfurt', 'seoul', 'taipei']
}

for name, places in favourite_places.items():
    print(f"{name.title()}’s favourite place are:")
    for place in places:
        print(f"{place.title()}")
```

### Exercise 6.10 - Favorite Numbers:



Listing 150: Chapter06/ex6.10.favourite\_numbers.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

favourite_numbers = {
    'sowon' : [1, 3, 4, 8],
    'yerin' : [2, 6, 9],
    'eunha' : [3, 7, 11],
    'yuju' : [4, 112, 1100],
    'sinb' : [5, 6, 7],
    'umji' : [1, 6]
}

for person, numbers in favourite_numbers.items():
    print(f"{person.title()}'s favourite numbers are:")
    for number in numbers:
        print(number)
```

**Exercise 6.11 - Cities:**

Listing 151: Chapter06/ex6.11.cities.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cities = {
    'tokyo' : {
        'country' : 'japan',
        'population' : 1_000_000,
        'food' : 'sushi'},
    'new york' : {
        'country' : 'the unided states',
        'population' : 2_000_000,
        'food' : 'hamburger'
    },
    'hongkong' : {
        'country' : 'hongkong',
        'population' : 6_000_000,
        'food' : 'noodles'
    }
}

for city, information in cities.items():
    print(f"Information of {city.title()}:")
    # for country, population, food in information.items():
    print(f"Country: {information['country'].title()}\nPopulation:
        {information['population']}\nFamous food :{information['
        food'].title()}\n")
```

## Chapter 7: User Input and while Loops

**Exercise Focus:** Getting user input and controlling program flow**Key Concepts Practiced:**

- Getting user input with `input()`
- Using while loops
- Controlling loop execution
- Data type conversion

**Exercise Examples:****Exercise 7.1 - Rental Car:**

Listing 152: Chapter07/ex7.1.rental\_car.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

car = input("Which tell me what kind of rental car you would like
to have: ")
print(f"Let me see if I can find you a {car.title()}.\\n")
```

**Exercise 7.2 - Restaurant Seating:**

Listing 153: Chapter07/ex7.2.restaurant.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

no_of_ppl = int(input("Please tell me how many of people in your
dinner group: "))

if no_of_ppl > 8:
    print("Sorry, please wait for a while.\\n")
else:
    print("Your table is ready.\\n")
```

**Exercise 7.3 - 10s:**

Listing 154: Chapter07/ex7.3.multiple.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

number = int(input("Enter a number: "))

if number % 10 == 0:
    print(f"{number} is divisible by 10.\\n")
else:
    print(f"{number} is not divisible by 10.\\n")
```

**Exercise 7.4 - Pizza Toppings:**

Listing 155: Chapter07/ex7.4.pizza\_toppings.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

pizza_toppings = []

active = True
while active == True:
```

```

pizza_topping = input("Enter one pizza topping (or type \'quit
\' to exit): ").lower()
if pizza_topping == 'quit':
    active = False
else :
    pizza_toppings.append(pizza_topping

if len(pizza_toppings) == 0:
    print("You will get a bare pizza.\n")
else:
    print(f"There are {len(pizza_toppings)} of pizza toppings:")
    for pizza_topping in pizza_toppings:
        print(pizza_topping.title())

```

### Exercise 7.5 - Movie Tickets:

Listing 156: Chapter07/ex7.5.movie\_tickets.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

customers = []
group = {
    'baby' : 0,
    'child' : 0,
    'adult' : 0
}
unit_price = {
    'baby' : 0,
    'child' : 10,
    'adult' : 15
}
total_customers = 0
total_cost = 0
active = True

# input the ages

while active:
    customer = int(input("Please enter customer's age (input \'0\'
to quit): "))
    if customer == 0:
        active = False
    else:
        customers.append(customer)

# divide the customers into groups

if len(customers) == 0:
    print("There is no one watching the movie.")
else:
    for customer in customers:
        if customer < 3:
            group['baby'] += 1

```

```

        elif (customer >= 3) and (customer < 12):
            group['child'] += 1
        else:
            group['adult'] += 1

# calculate the cost
print("\nNumber of customers: ")
for item, value in group.items():
    total_customers += value
    cost = value * unit_price[item]
    total_cost += cost
    print(f"{item.title()}\t:\t{value} customers\t\tSubtotal:
          ${cost}")
print(f"-----\nTotal\t:\t{total_customers} customers\t\
tGrand Total: ${total_cost}")

```

**Exercise 7.8 - Deli:**

Listing 157: Chapter07/ex7.8.deli.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

sandwich_orders = ['hamburger', 'club sandwich', 'doner sandwich',
                   'chicken breast sandwich', 'porilainen']
finished_orders = []

def make_sandwich(sandwich):
    print(f"I make your {sandwich.title()}.")

def finished_sandwich(sandwich):
    print(f"{sandwich.title()} has been finished.")

print("Sandwich orders:")
for sandwich in sandwich_orders:
    print(f"{sandwich.title()}")
print("\n-----\n")

while len(sandwich_orders) != 0:
    processing = sandwich_orders.pop(0)
    make_sandwich(processing)
    finished_orders.append(processing)
    finished_sandwich(processing)

print("\n-----\nFinished sandwich orders:")
for sandwich in finished_orders:
    print(f"{sandwich.title()}")

```

**Exercise 7.9 - No Pastrami:**

Listing 158: Chapter07/ex7.9.deli.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

```

```
sandwich_orders = ['hamburger', 'club sandwich', 'doner sandwich',
                  'chicken breast sandwich', 'porilainen', 'pastrami a', '
                  pastrami b', 'pastrami c']
finished_orders = []

def make_sandwich(sandwich):
    print(f"I make your {sandwich.title()}.")

def finished_sandwich(sandwich):
    print(f"{sandwich.title()} has been finished.")

def no_pastrami(sandwich):
    print(f"Sorry, there is no pastrami, so {sandwich.title()}
          will be skipped.")

print("Sorry, there is no pastrami available now.\n")
print("Sandwich orders:")
for sandwich in sandwich_orders:
    print(f"{sandwich.title()}")
print("\n-----\n")

while len(sandwich_orders) != 0:
    processing = sandwich_orders.pop(0)
    make_sandwich(processing)
    if 'pastrami' in processing:
        no_pastrami(processing)
        continue
    finished_orders.append(processing)
    finished_sandwich(processing)

print("\n-----\nFinished sandwich orders:")
for sandwich in finished_orders:
    print(f"{sandwich.title()}")
```

## Chapter 8: Functions

**Exercise Focus:** Creating and using functions

**Key Concepts Practiced:**

- Defining functions with def
- Passing arguments to functions
- Returning values from functions
- Using default parameters

**Exercise Examples:**

**Exercise 8.1 - Message:**

Listing 159: Chapter08/ex8.1.message.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def display_message():
    print("I am going to learn this chapter.")

display_message()
```

**Exercise 8.2 - Favorite Book:**

Listing 160: Chapter08/ex8.2.favourite\_book.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def favourite_book(title):
    print(f"One of my favourite books is {title.title()}.")

books = ['Alice in the Wonderland', 'The Wealth of Nations', '1984',
        '']

for book in books:
    favourite_book(book)
```

**Exercise 8.3 - T-Shirt:**

Listing 161: Chapter08/ex8.3.t-shirt.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def make_shirt(size = 'M', message = 'Wie heißen Sie?'):
    print(f"We will make {size} T-shirt with a slogen of \"{message}\".\n")

make_shirt()

make_shirt('S')

# make_shirt(, 'Ich heiße hihi.')
# cannot empty the first argument.

make_shirt(message = 'Und Sie?', size = 'L')

make_shirt('XL', 'Ich heiße Stefan.')
```

**Exercise 8.5 - Cities:**

Listing 162: Chapter08/ex8.5.cities.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cities = []

def describe_city(city, country):
    print(f"{city.title()} is in {country.title()}.\n")
```

```
cityInsert = {
    'city_name' : 'osaka',
    'country' : 'japan'
}

cities.append(cityInsert)

cityInsert = {
    'city_name' : 'munich',
    'country' : 'germany'
}

cities.append(cityInsert)

cityInsert = {
    'city_name' : 'london',
    'country' : 'britain'
}

cities.append(cityInsert)

for city in cities:
    describe_city(city['city_name'], city['country'])
```

### Exercise 8.6 - City Names:

Listing 163: Chapter08/ex8.6.cities.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cities = []

def describe_city(city, country):
    print(f"{city.title()}, {country.title()}")

def city_country(city, country):
    city_insert = {}
    city_insert['city_name'] = city.lower()
    city_insert['country'] = country.lower()
    cities.append(city_insert)

city_country('OsAka', 'japan')
city_country('berlin', 'germAny')
city_country('paris', 'France')

for city in cities:
    describe_city(city['city_name'], city['country'])
```

### Exercise 8.7 - Album:

Listing 164: Chapter08/ex8.7.albums.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes
```

```

albums = []

def make_album (album_name, artist):
    album = {}
    album['album_name'] = album_name
    album['artist'] = artist
    album['no_of_songs'] = None
    return album

def print_album(albums):
    for album in albums:
        if album['no_of_songs'] != None:
            print(f"{album['album_name']} of {album['artist']} has
                number of songs: {album['no_of_songs']}")
        else:
            print(f"{album['album_name']} of {album['artist']} has
                no songs.")

albums.append(make_album('Beam of Prism', 'VIVIZ'))
albums.append(make_album('Summer Vibe', 'VIVIZ'))
albums.append(make_album('VarioUS', 'VVIZ'))

albums[0]['no_of_songs'] = 7

print_album(albums)

```

### Exercise 8.8 - User Albums:

Listing 165: Chapter08/ex8.8.albums.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

albums = []

def make_album (album_name, artist):
    album = {}
    album['album_name'] = album_name
    album['artist'] = artist
    album['no_of_songs'] = None
    return album

def print_album(albums):
    for album in albums:
        if album['no_of_songs'] != None:
            print(f"\{album['album_name']}\ of {album['artist']}
                has number of songs: {album['no_of_songs']}")
        else:
            print(f"\{album['album_name']}\ of {album['artist']}
                has no songs.")

albums.append(make_album('Beam of Prism', 'VIVIZ'))
albums.append(make_album('Summer Vibe', 'VIVIZ'))

```



```

albums.append(make_album('VarioUS', 'VVIZ'))
albums[0]['no_of_songs'] = 7

while True:
    print("Enter detail of an album.")
    print("(enter \'q\' at any time to quit)")

    album_name = input("Album Name: ")
    if album_name == 'q':
        break

    artist = input("Artist Name: ")
    if artist == 'q':
        break

    no_of_songs = input("No. of Albums: ")
    if no_of_songs == 'q':
        break
    elif no_of_songs == '0':
        no_of_songs = None

    albums.append(make_album(album_name, artist))
    if no_of_songs != None:
        albums[-1]['no_of_songs'] = int(no_of_songs)

print("\n")
print_album(albums)

```

### Exercise 8.9 - Messages:

Listing 166: Chapter08/ex8.9.messages.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

messages = [
    "A: Puh. Wie es hier aussieht!\nWo ist das Telefon?\nVielleicht in  
der Küche?",
    "B: Nein. Hier ist kein Telefon!\nAber hier ist eine Uhr!",
    "A: Oh, das ist die Uhr von Stefan, oder?",
    "B: Stimmt! Ich schreibe Stefan.\nEr sucht die Uhr bestimmt...",
    "A: Hmm, wo sind die Schlüssel?",
    "B: Vielleicht im Wohnzimmer?",
    "A: Nein, hier sind keine Schlüssel.",
    "B: Ah, hier.",
    "A: Super, danke.",
    "A: Ah, es ist Stefans Uhr.\nAhm, Julia: Ist hier auch ein  
Rucksack?",
    "B: Stefans Rucksack?\nNein. Tut mir leid.\nHier ist kein Rucksack  
."
]

def print_message(messages):
    for message in messages:

```

```

        print(f"{message}\n")

print_message(messages)

```

### Exercise 8.10 - Sending Messages:

Listing 167: Chapter08/ex8.10.messages.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

from time import sleep

messages = [
    "A: Puh. Wie es hier aussieht!\nWo ist das Telefon?\nVielleicht in  
der Küche?",
    "B: Nein. Hier ist kein Telefon!\nAber hier ist eine Uhr!",
    "A: Oh, das ist die Uhr von Stefan, oder?",
    "B: Stimmt! Ich schreibe Stefan.\nEr sucht die Uhr bestimmt...",
    "A: Hmm, wo sind die Schlüssel?",
    "B: Vielleicht im Wohnzimmer?",
    "A: Nein, hier sind keine Schlüssel.",
    "B: Ah, hier.",
    "A: Super, danke.",
    "A: Ah, es ist Stefans Uhr.\nAhm, Julia: Ist hier auch ein  
Rucksack?",
    "B: Stefans Rucksack?\nNein. Tut mir leid.\nHier ist kein Rucksack  
."
]

def print_message(messages):
    for message in messages:
        print(f"{message}\n")

sent_messages = []

def send_message(messages, sent_messages):
    while messages:
        current_message = messages.pop(0)
        print(f"Sending below message:\n...\n{current_message}\n...")
        sent_messages.append(current_message)
        sleep(1)
        print("Message sent!\n")

print("Current mesages are:\n-----\n")
print_message(messages)
send_message(messages[:], sent_messages)
print("-----\nNow the messages are:\n-----\n")
print_message(sent_messages)

```

### Exercise 8.12 - Sandwiches:

Listing 168: Chapter08/ex8.12.sandwiches.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def order_sandwich(*ingridents):
    print("Your order is:")
    for ingrident in ingridents:
        print(f"{ingrident.title()}")

order_sandwich('subway series', 'classic sandwiches')
order_sandwich('wraps', 'fresh melts')
order_sandwich('breakfast')
```

### Exercise 8.13 - User Profile:

Listing 169: Chapter08/ex8.13.user\_profile.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

def build_profile(first, last, **user_info):
    """Build a dictionary containing everything we know about a
    user."""
    user_info['first_name'] = first
    user_info['last_name'] = last
    return user_info

user_profile = build_profile('albert', 'einstein', location='
    princeton', field='physics')
print(user_profile)

my_profile = build_profile('baga', 'shit', location='shit', food='
    rabbits')
print(my_profile)
```

### Exercise 8.14 - Cars:

Listing 170: Chapter08/ex8.14.cars.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

cars = []

def make_car(manufacturer, model, **car):
    car['manufacturer'] = manufacturer
    car['model'] = model
    return car

car = make_car('subaru', 'outback', color = 'blue', tow_package =
    True)
cars.append(car)

for car in cars:
    print(car)
```

### Exercise 8.15 - Printing Models:

Listing 171: Chapter08/ex8.15.printing\_models.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from ex8_15_printing_functions import *

unprinted_designs = ['phone case', 'robot pendant', 'dodecahedron',
]
completed_models = []

print_models(unprinted_designs, completed_models)
show_completed_models(completed_models)
```

## Chapter 9: Classes

**Exercise Focus:** Object-oriented programming with classes

**Key Concepts Practiced:**

- Creating classes and objects
- Defining methods and attributes
- Using inheritance
- Working with instances

**Exercise Examples:**

**Exercise 9.1 - Restaurant:**

Listing 172: Chapter09/ex9.1.restaurant.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

class Restaurant:
    def __init__(self, restaurant_name, cuisine_type):
        self.restaurant_name = restaurant_name
        self.cuisine_type = cuisine_type

    def describe_restaurant(self):
        print(f"Restaurant Name: {self.restaurant_name.title()}")
        print(f"Cuisine Type: {self.cuisine_type.title()}")

    def open_restaurant(self):
        print(f"{self.restaurant_name.title()} is open now.")

sukiya = Restaurant('sukiya', 'japanese beef rice')
sukiya.describe_restaurant()
sukiya.open_restaurant()
```

**Exercise 9.2 - Three Restaurants:**

Listing 173: Chapter09/ex9.2.restaurants.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes
```

```

class Restaurant:
    def __init__(self, restaurant_name, cuisine_type):
        self.restaurant_name = restaurant_name
        self.cuisine_type = cuisine_type

    def describe_restaurant(self):
        print(f"Restaurant Name: {self.restaurant_name.title()}")
        print(f"Cuisine Type: {self.cuisine_type.title()}")

    def open_restaurant(self):
        print(f"{self.restaurant_name.title()} is open now.")

sukiya = Restaurant('sukiya', 'japanese beef rice')
sukiya.describe_restaurant()
sukiya.open_restaurant()

hardees = Restaurant('hardees', 'hamburger')
hardees.describe_restaurant()

abc = Restaurant('abc', 'western food')
abc.describe_restaurant()

```

### Exercise 9.3 - Users:

Listing 174: Chapter09/ex9.3.users.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

class users:
    def __init__(self, first_name, last_name, gender, staff_no):
        self.first_name = first_name
        self.last_name = last_name
        self.title = 'staff'
        self.gender = gender
        self.staff_no = staff_no

    def describe_user(self):
        print("Staff Profile:\n-----")
        print(f"Name: {self.first_name.title()} {self.last_name.title()}")
        print(f"Staff ID: {self.staff_no}")
        if self.gender == 'M':
            print("Gender: Male")
        elif self.gender == 'F':
            print("Gender: Female")
        elif self.gender == 'O':
            print("Gender: Other")
        print(f"Title: {self.title.title()}")

    def greet_user(self):
        print(f"Hello, {self.first_name.title()} {self.last_name.title()} !!!")

```

```
sowon = users('sowon', 'kim', 'F', '1234567')
sowon.describe_user()
sowon.greet_user()

pyo = users('pyo', 'pyo', 'O', '23456')
pyo.describe_user()
pyo.greet_user()

daniel = users('daniel', 'kang', 'M', '2134123')
daniel.describe_user()
daniel.greet_user()
```

### Exercise 9.4 - Number Served:

Listing 175: Chapter09/ex9.4.restaurants.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

class Restaurant:
    """ Description of the class """
    # attributes
    # restaurant_name : name of the restaurant
    # cuisine_type : what sort of food can be eaten from that
    # restuarant
    # number_served : number of customers that the restaurant has
    # served; default 0
    """ End of description """

    """ Methods """

    # __init__ : initialize the class
    def __init__(self, restaurant_name, cuisine_type):
        self.restaurant_name = restaurant_name
        self.cuisine_type = cuisine_type
        self.number_served = 0

    # describe_restaurant : print the information of restaurant
    def describe_restaurant(self):
        print(f"Restaurant Name: {self.restaurant_name.title()}")
        print(f"Cuisine Type: {self.cuisine_type.title()}")
        print(f"Number of Customers Served: {self.number_served}")

    # open_restaurant : print an message for siumating the opeing
    # of that restaurant
    def open_restaurant(self):
        print(f"{self.restaurant_name.title()} is open now.")

    # set_number_served : set the number of customers that have
    # been served
    def set_number_served(self, numbers):
        self.number_served = numbers
        print(f"The new number of customers served becomes {self.
```

```

        number_served}).")

    # increment_numbers_served : increase the number of customers
    # who've been served
    def increment_numbers_served(self, increment):
        self.number_served += increment
        print(f"Addind {increment} customers, the number of
              customers served is {self.number_served}.")

### End of Methods ###

sukiya = Restaurant('sukiya', 'japanese beef rice')
sukiya.describe_restaurant()

print('\n')
hardees = Restaurant('hardees', 'hamburger')
hardees.describe_restaurant()

print('\n')
abc = Restaurant('abc', 'western food')
abc.open_restaurant()
abc.describe_restaurant()

print("-----")

print(f"\nSet the number of customers of {sukiya.restaurant_name.
      title()} -")
sukiya.set_number_served(100)

print(f"\nSet the number of customers of {hardees.restaurant_name.
      title()} -")
hardees.set_number_served(10000)

new_customer = 1
print(f"\nThere are {new_customer} customers coming in {abc.
      restaurant_name.title()} -")
abc.increment_numbers_served(new_customer)

print("-----")

print("\nShow restaurants' information again:")
sukiya.describe_restaurant()
print('\n')
hardees.describe_restaurant()
print('\n')
abc.describe_restaurant()

```

### Exercise 9.5 - Login Attempts:

Listing 176: Chapter09/ex9.5.users.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes
```

```
class users:
    """ Description of the class """
    # attributes
    # first_name : first name of the user
    # last_name : last name of the user
    # gender : gender of the user ; 'M' is male, 'F' is female, 'O' is
        others / transgender
    # staff_no : staff ID
    # login_attempts : number of trials for login
    """ End of description """

    """ Methods """

    # __init__ : initialize the class
    def __init__(self, first_name, last_name, gender, staff_no):
        self.first_name = first_name
        self.last_name = last_name
        self.title = 'staff'
        self.gender = gender
        self.staff_no = staff_no
        self.login_attempts = 0

    # describe_user : show descriptions of the user
    def describe_user(self):
        print("Staff Profile:\n-----")
        print(f"Name: {self.first_name.title()} {self.last_name.
            title()}")
        print(f"Staff ID: {self.staff_no}")
        if self.gender == 'M':
            print("Gender: Male")
        elif self.gender == 'F':
            print("Gender: Female")
        elif self.gender == 'O':
            print("Gender: Other")
        print(f"Title: {self.title.title()}")

    # greet_user : greet to user after login success
    def greet_user(self):
        print(f"Hello, {self.first_name.title()} {self.last_name.
            title()} !!!")

    # increment_login_attempts : increase number of attempts by 1
        for each failed login trials
    def increment_login_attempts(self):
        self.login_attempts += 1
        print(f"Now {self.staff_no}'s login attempt number is {
            self.login_attempts}.")

    # reset_login_attempts : set the login attempts to zero
    def reset_login_attempts(self):
        self.login_attempts = 0
```



```

        print(f"Now {self.staff_no}'s login attempt number is {
            self.login_attempts}.")

### End of Methods ###

sowon = users('sowon', 'kim', 'F', '1234567')
sowon.describe_user()
sowon.greet_user()

print('\n')

pyo = users('pyo', 'pyo', 'O', '23456')
pyo.describe_user()
pyo.greet_user()
for value in range(0,3):
    print(f"{pyo.staff_no} login failed:")
    pyo.increment_login_attempts()
print("Finally login succeeded:")
pyo.reset_login_attempts()

print('\n')
daniel = users('daniel', 'kang', 'M', '2134123')
daniel.describe_user()
daniel.greet_user()

```

### Exercise 9.6 - Ice Cream Stand:

Listing 177: Chapter09/ex9.6.restaurants.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

class Restaurant:
    ### Description of the class ###
    # attributes
    # restaurant_name : name of the restaurant
    # cuisine_type : what sort of food can be eaten from that
    # restuarant
    # number_served : number of customers that the restaurant has
    # served; default 0
    ### End of description ###

    ### Methods ###

    # __init__ : initialize the class
    def __init__(self, restaurant_name, cuisine_type):
        self.restaurant_name = restaurant_name
        self.cuisine_type = cuisine_type
        self.number_served = 0

    # describe_restaurant : print the information of restaurant
    def describe_restaurant(self):
        print(f"Restaurant Name: {self.restaurant_name.title()}")
        print(f"Cuisine Type: {self.cuisine_type.title()}")

```

```

        print(f"Number of Customers Served: {self.number_served}")

# open_restaurant : print an message for siumating the opeing
# of that restaurant
def open_restaurant(self):
    print(f"{self.restaurant_name.title()} is open now.")

# set_number_served : set the number of customers that have
# been served
def set_number_served(self, numbers):
    self.number_served = numbers
    print(f"The new number of customers served becomes {self.
        number_served}.")

# increment_numbers_served : increase the number of customers
# who've been served
def increment_numbers_served(self, increment):
    self.number_served += increment
    print(f"Addind {increment} customers, the number of
        customers served is {self.number_served}.")

### End of Methods ###

class IceCreamStand(Restaurant):
    ### Description of the class ###
    # child class of Restaurant
    # flavors : a List of ice-crean flavors
    ### End of description ###

    ### Methods ###

    # __init__ : initialize the clsss
    def __init__(self, restaurant_name, cuisine_type, flavors):
        super().__init__(restaurant_name, cuisine_type)
        self.flavors = flavors[:]

    # describe_restaurant : add ice-cream flavors available
    def describe_restaurant(self):
        super().describe_restaurant()
        print("Ice-Cream flavors available:")
        for flavor in self.flavors:
            print(f"{flavor.title()}")

### End of Methods ###

sukiya = Restaurant('sukiya', 'japanese beef rice')
sukiya.describe_restaurant()

print('\n')
hardees = Restaurant('hardees', 'hamburger')
hardees.describe_restaurant()

```

```

print('\n')
abc = Restaurant('abc', 'western food')
abc.open_restaurant()
abc.describe_restaurant()

print("-----")

print(f"\nSet the number of customers of {sukiya.restaurant_name.
      title()} -")
sukiya.set_number_served(100)

print(f"\nSet the number of customers of {hardees.restaurant_name.
      title()} -")
hardees.set_number_served(10000)

new_customer = 1
print(f"\nThere are {new_customer} customers coming in {abc.
      restaurant_name.title()} -")
abc.increment_numbers_served(new_customer)

print("-----")

print("\nShow restaurants' information again:")
sukiya.describe_restaurant()
print('\n')
hardees.describe_restaurant()
print('\n')
abc.describe_restaurant()

print("-----")

appolo = IceCreamStand('appolo', 'ice cream stand', ['chocolate',
      'vanilla'])
appolo.describe_restaurant()

```

**Exercise 9.7 - Admin:**

Listing 178: Chapter09/ex9.7.users.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

#### CLASS SETUP ####

### User Class :
# attributes
# first_name : first name of the user
# last_name : last name of the user
# gender : gender of the user ; 'M' is male, 'F' is female, 'O' is
           others / transgender
# staff_no : staff ID
# login_attempts : number of trials for login

```

```

class users:

    # __init__ : initialize the class
    def __init__(self, first_name, last_name, gender, staff_no):
        self.first_name = first_name
        self.last_name = last_name
        self.title = 'staff'
        self.gender = gender
        self.staff_no = staff_no
        self.login_attempts = 0

    # describe_user : show descriptions of the user
    def describe_user(self):
        print("Staff Profile:\n-----")
        print(f"Name: {self.first_name.title()} {self.last_name.title()}")
        print(f"Staff ID: {self.staff_no}")
        if self.gender == 'M':
            print("Gender: Male")
        elif self.gender == 'F':
            print("Gender: Female")
        elif self.gender == 'O':
            print("Gender: Other")
        print(f"Title: {self.title.title()}\n-----")

    # greet_user : greet to user after login success
    def greet_user(self):
        print(f"Hello, {self.first_name.title()} {self.last_name.title()} !!!")

    # increment_login_attempts : increase number of attempts by 1
    # for each failed login trials
    def increment_login_attempts(self):
        self.login_attempts += 1
        print(f"Now {self.staff_no}'s login attempt number is {self.login_attempts}.")

    # reset_login_attempts : set the login attempts to zero
    def reset_login_attempts(self):
        self.login_attempts = 0
        print(f"Now {self.staff_no}'s login attempt number is {self.login_attempts}.")

### Admin class

### Admin Class :
# inheritance of user class
# privileges : the abilities of an admin

class admin(users):

```

```

# __init__ : initialize the class
def __init__(self, first_name, last_name, gender, staff_no):
    super().__init__(first_name, last_name, gender, staff_no)
    self.privileges = ['can add post', 'can delete post', 'can
        ban user']

# show_privileges : show admin's privileges
def show_privileges(self):
    for privilege in self.privileges:
        print(f"{privilege.title()}")

### END OF CLASS SETUP ###

sowon = users('sowon', 'kim', 'F', '1234567')
sowon.describe_user()
sowon.greet_user()

print('\n')

pyo = users('pyo', 'pyo', 'O', '23456')
pyo.describe_user()
pyo.greet_user()
for value in range(0,3):
    print(f"\n{pyo.staff_no} login failed:")
    pyo.increment_login_attempts()
print("Finally login succeeded:")
pyo.reset_login_attempts()

print('\n')
daniel = users('daniel', 'kang', 'M', '2134123')
daniel.describe_user()
daniel.greet_user()

yerin = admin('yerin', 'jung', 'F', '23141234')
yerin.describe_user()
yerin.greet_user()
yerin.show_privileges()

```

### Exercise 9.8 - Privileges:

Listing 179: Chapter09/ex9.8.users.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

#### CLASS SETUP ####

### User Class :
# attributes
# first_name : first name of the user
# last_name : last name of the user
# gender : gender of the user ; 'M' is male, 'F' is female, 'O' is
    others / transgender
# staff_no : staff ID

```

```

# login_attempts : number of trials for login

class users:

    # __init__ : initialize the class
    def __init__(self, first_name, last_name, gender, staff_no):
        self.first_name = first_name
        self.last_name = last_name
        self.title = 'staff'
        self.gender = gender
        self.staff_no = staff_no
        self.login_attempts = 0

    # describe_user : show descriptions of the user
    def describe_user(self):
        print("Staff Profile:\n-----")
        print(f"Name: {self.first_name.title()} {self.last_name.title()}")
        print(f"Staff ID: {self.staff_no}")
        if self.gender == 'M':
            print("Gender: Male")
        elif self.gender == 'F':
            print("Gender: Female")
        elif self.gender == 'O':
            print("Gender: Other")
        print(f"Title: {self.title.title()}\n-----")

    # greet_user : greet to user after login success
    def greet_user(self):
        print(f"Hello, {self.first_name.title()} {self.last_name.title()} !!!")

    # increment_login_attempts : increase number of attempts by 1
    # for each failed login trials
    def increment_login_attempts(self):
        self.login_attempts += 1
        print(f"Now {self.staff_no}'s login attempt number is {self.login_attempts}.")

    # reset_login_attempts : set the login attempts to zero
    def reset_login_attempts(self):
        self.login_attempts = 0
        print(f"Now {self.staff_no}'s login attempt number is {self.login_attempts}.")

### Admin Class :
# inheritance of user class
# privileges : the abilities of an admin

class admin(users):

```

```

# __init__ : initialize the class
def __init__(self, first_name, last_name, gender, staff_no):
    super().__init__(first_name, last_name, gender, staff_no)
    self.privileges = privileges()

# show_privileges : show admin's privileges
def show_privileges(self):
    self.privileges.show_privileges()

### Privileges Class :
# privileges : stor the abilities

class privileges():

    # __init__ : initialize the class
    def __init__(self):
        self.privileges = ['can add post', 'can delete post', 'can
            ban user']

    # show_privileges : show admin's privileges
    def show_privileges(self):
        for privilege in self.privileges:
            print(f"{privilege.title()}")

### END OF CLASS SETUP ###

sowon = users('sowon', 'kim', 'F', '1234567')
sowon.describe_user()
sowon.greet_user()

print('\n')

pyo = users('pyo', 'pyo', 'O', '23456')
pyo.describe_user()
pyo.greet_user()
for value in range(0,3):
    print(f"\n{pyo.staff_no} login failed:")
    pyo.increment_login_attempts()
print("Finally login succeeded:")
pyo.reset_login_attempts()

print('\n')
daniel = users('daniel', 'kang', 'M', '2134123')
daniel.describe_user()
daniel.greet_user()

yerin = admin('yerin', 'jung', 'F', '23141234')
yerin.describe_user()
yerin.greet_user()
yerin.show_privileges()

```

**Exercise 9.13 - Dice:**

Listing 180: Chapter09/ex9.13.dice.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from random import randint

class Dice():
    """ attributes """
    # sides : no. of sides of the dice

    # _init_ : initialize the dice class
    def __init__(self, sides = 6):
        self.sides = sides

    # draw_dice : draw a dice, and then give out an result (
        integer)
    def roll_dice(self):
        return randint(1, self.sides)

    # show_dice : tell user how many sides this dice has
    def show_dice(self):
        print(f"This dice has {self.sides} sides.\n")

""" End of class """

dice1 = Dice();
dice1.show_dice();
for i in range(1,11):
    print(f"Draw # {i} : {dice1.roll_dice()}")

print("\n---\n")
dice2 = Dice(10)
dice2.show_dice();
for i in range(1,11):
    print(f"Draw # {i} : {dice2.roll_dice()}")

print("\n---\n")
dice3 = Dice(20)
dice3.show_dice();
for i in range(1,11):
    print(f"Draw # {i} : {dice3.roll_dice()}")
```

## Chapter 10: Files and Exceptions

**Exercise Focus:** File handling and error management**Key Concepts Practiced:**

- Reading and writing files
- Handling exceptions



- Working with different file formats
- Error handling strategies

**Exercise Examples:****Exercise 10.1 - Learning Python:**

Listing 181: Chapter10/ex10.1.learning\_python/learning\_python.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

filename = 'learning_python.txt'

# first time : print the contents once by reading in the entire
# file.

with open(filename) as file_object:
    contents = file_object.read()

print(contents)

# second time : print the contents by looping over the file object

with open(filename) as file_object:
    for line in file_object:
        print(line.rstrip())

# third time : print the contents by storing the lines in a list
# and the working with them outside the with block

with open(filename) as file_object:
    lines = file_object.readlines()

for line in lines:
    print(line.rstrip())
```

**Exercise 10.3 - Guest:**

Listing 182: Chapter10/ex10.3.guest/guest.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

filename = 'guest.txt'

with open(filename, 'w') as file_object:
    name = input("Input your name >> ")
    file_object.write(name)
```

**Exercise 10.4 - Guest Book:**

Listing 183: Chapter10/ex10.4.guest\_book/guest\_book.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

filename = 'guest_book.txt'
```

```

with open(filename, 'w') as file_object:
    while True:
        name = input("Input your name >> ")
        if (name[:].lower() == 'q') :
            break
        else :
            file_object.write(f"{name}\n")

```

### Exercise 10.5 - Programming Poll:

Listing 184: Chapter10/ex10.5.programming\_poll/programming\_poll.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

filename = 'programming_poll.txt'

with open(filename, 'w') as file_object:
    while True:
        name = input("Input your name >> ")
        if (name[:].lower() == 'q') :
            break
        else :
            reason = input(f"{name}, why do you like programming?
                            >> ")
            file_object.write(f"{name} : {reason}\n")

```

### Exercise 10.6 - Addition:

Listing 185: Chapter10/ex10.6.addition.py

```

# Python Crash Course, 2Ed, writtern by Eric Matthes

def addition (num1 , num2):
    return num1 + num2

def get_input():
    num = input("Enter the number >> ")
    try:
        int(num)
    except ValueError:
        print("The input is not digit.\nPlease try again.")
        return None
    else:
        return int(num)

print("The first number:")
x = get_input()
print("The second number:")
y = get_input()

if (x and y) != False :
    print(f"{x} + {y} = {x + y}")

```

### Exercise 10.7 - Addition Calculator:

Listing 186: Chapter10/ex10.7.addition.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

while True:
    x = input("Enter the first number (or enter \'q\' to quit) >>")
    if x.lower() == 'q':
        break
    y = input("Enter the second number (or enter\'q\' to quit) >>")
    if y.lower() == 'q':
        break

    try:
        int(x)
        int(y)
    except ValueError:
        print("One of the numbers are not integers.\nTry again.")
    else:
        print(f"{int(x)} + {int(y)} = {int(x) + int(y)}")
```

**Exercise 10.8 - Cats and Dogs:**

Listing 187: Chapter10/ex10.8.pets/pets.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

pet_files = ['cats.txt', 'dogs.txt', 'mice.txt']

def print_pet(filename):
    try:
        with open(filename) as f:
            pet_names = f.read()
    except:
        print(f"There is no {filename}.")
        return None
    else:
        return pet_names

for pet_file in pet_files:
    message = print_pet(pet_file)
    if message != None:
        print(message)
```

**Exercise 10.11 - Favorite Number:**

Listing 188: Chapter10/ex10.11.favourite\_number/input.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import json

filename = 'data.json'
```

```
while True:
    str = input("Input your favourite number >> ")
    try:
        fav_num = int(str)
    except ValueError:
        print("You have not input integer.\nPlease enter again.")
        continue;
    else:
        print("Your favourite number has been recorded.")
        break

with open(filename, 'w') as f:
    json.dump(fav_num, f)
```

### Exercise 10.12 - Favorite Number Remembered:

Listing 189: Chapter10/ex10.12.favourite\_number/favourite\_number.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from read_data import get_fav_num
from write_data import record_fav_num

fav_num = get_fav_num()
if fav_num != None:
    print(f"I know your favourite number! it's {fav_num}.")
else:
    record_fav_num()
```

### Exercise 10.13 - Verify User:

Listing 190: Chapter10/ex10.13.remember\_me/remember\_me.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import json
import os

def get_stored_username():

    """Get stored username if available."""

    filename = 'username.json'
    if os.path.getsize(filename) > 0:
        try:
            with open(filename) as f:
                username = json.load(f)
        except FileNotFoundError:
            return None
        else:
            return username
    else:
        return None
```

```

def greet_user():

    """ Greet the user by name. """

    username = get_stored_username()
    if username:
        confirmation = input(f"Are you {username}?\n(Input \'Y\' or \'y\' if yes, other input will be cosidered as no.)\n>> ").lower()
        if confirmation == 'y':
            print(f"Welcome back, {username}!")
        else:
            username = get_new_username()
            print(f"We'll remember you whe you come back, {username}!")
    else:
        username = get_new_username()
        print(f"We'll remember you whe you come back, {username}!")

def get_new_username():

    """Prompt for a new username."""

    username = input("What is your name? ")
    filename = 'username.json'
    with open(filename, 'w') as f:
        json.dump(username, f)
    return username

greet_user()

```

## Chapter 11: Testing Your Code

**Exercise Focus:** Writing tests and test-driven development

**Key Concepts Practiced:**

- Writing unit tests
- Using the unittest framework
- Testing different scenarios
- Test-driven development

**Exercise Examples:**

**Exercise 11.1 - City, Country:**

Listing 191: Chapter11/name\_function.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes
```

```
def get_formatted_name(first, last, middle=''):
    """Generate a neatly formatted full name"""
    if middle:
        full_name = f"{first} {middle} {last}"
    else:
        full_name = f"{first} {last}"
    return full_name.title()
```

### Exercise 11.2 - Population:

Listing 192: Chapter11/test\_name\_function.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

import unittest
from name_function import get_formatted_name

class NamesTestCase(unittest.TestCase):
    """Test for 'name_function.py'."""

    def test_first_last_name(self):
        """Do names like 'Janis Joplin' work?"""
        formatted_name = get_formatted_name('janis', 'joplin')
        self.assertEqual(formatted_name, 'Janis Joplin')

    def test_first_last_middle_name(self):
        """Do names like 'Wolfgang Amadeus Mozart' work?"""
        formatted_name = get_formatted_name('wolfgang', 'mozart',
                                             'amadeus')
        self.assertEqual(formatted_name, 'Wolfgang Amadeus Mozart')

if __name__ == '__main__':
    unittest.main()
```

### Exercise 11.3 - Employee:

Listing 193: Chapter11/language\_survey.py

```
# Python Crash Course, 2Ed, writtern by Eric Matthes

from survey import AnonymousSurvey

# Define a question, and make a survey.
question = "What language did you first learn to speak?"
my_survey = AnonymousSurvey(question)

# Show the question, and store responses to the question.
my_survey.show_question()
print("Enter 'q' at any time to quit.\n")
while True:
    response = input("Language: ")
    if response == 'q':
        break
```

```
my_survey.store_response(response)

# Show the survey results.
print("\nThank you o everyone who participated in the survey!")
my_survey.show_results()
```

## Summary of Exercises

The exercises provide comprehensive practice covering:

- **85+ exercise files** across all chapters
- **Progressive difficulty** from basic to advanced concepts
- **Real-world applications** and practical examples
- **Hands-on coding practice** with immediate feedback
- **Concept reinforcement** through varied problem types

## Exercise Categories

1. **Basic Syntax:** Variables, print statements, data types
2. **Data Structures:** Lists, dictionaries, tuples
3. **Control Flow:** if statements, loops, functions
4. **Object-Oriented Programming:** Classes, inheritance, methods
5. **File Operations:** Reading, writing, exception handling
6. **Testing:** Unit tests, test cases, test-driven development

## How to Use These Exercises

1. **Complete exercises sequentially** within each chapter
2. **Modify and experiment** with the code examples
3. **Create your own variations** of the exercises
4. **Test your understanding** by explaining the code
5. **Build upon concepts** from previous chapters

These exercises provide essential practice for mastering Python programming concepts and building confidence in writing real Python code.