**1. List Comprehension**

**Exercise 1: Generate a list of squares of even numbers from 1 to 20 using list comprehension.**

squares = [x\*\*2 for x in range(1, 21) if x % 2 == 0]

print(squares)

**Exercise 2: Create a list of vowels present in a given string.**

sentence = "Hello World, Python is amazing!"

vowels = [char for char in sentence if char.lower() in "aeiou"]

print(vowels)

**2. Dictionary Comprehension**

**Exercise 3: Create a dictionary where keys are numbers from 1 to 10, and values are their cubes.**

cubes = {x: x\*\*3 for x in range(1, 11)}

print(cubes)

**Exercise 4: Convert a dictionary of Celsius temperatures to Fahrenheit using dictionary comprehension.**

celsius = {'NY': 10, 'LA': 15, 'Chicago': 8}

fahrenheit = {city: (temp \* 9/5) + 32 for city, temp in celsius.items()}

print(fahrenheit)

**3. Regex**

**Exercise 5: Extract all valid email addresses from a given string.**

import re

text = "Contact us at support@email.com or sales@company.org"

emails = re.findall(r"[a-zA-Z0-9.\_%+-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}", text)

print(emails)

**Exercise 6: Validate if a given string is a strong password (at least 8 characters, 1 uppercase, 1 digit).**

def is\_strong\_password(password):

pattern = r"^(?=.\*[A-Z])(?=.\*\d).{8,}$"

return bool(re.match(pattern, password))

print(is\_strong\_password("StrongPass1")) # True

print(is\_strong\_password("weakpass")) # False

**4. Format Operators**

**Exercise 7: Format a string using the % operator.**

name = "Alice"

age = 25

print("My name is %s and I am %d years old." % (name, age))

**Exercise 8: Format a floating-point number to two decimal places.**

price = 49.99999

print("The final price is: %.2f" % price)

**5. Hashing**

**Exercise 9: Generate a SHA256 hash of a given string.**

import hashlib

text = "securepassword"

hashed\_text = hashlib.sha256(text.encode()).hexdigest()

print(hashed\_text)

**Exercise 10: Create a dictionary where keys are names and values are their hashed values.**

names = ["Alice", "Bob", "Charlie"]

hashed\_names = {name: hashlib.md5(name.encode()).hexdigest() for name in names}

print(hashed\_names)

**6. Map, Filter, Reduce**

**Exercise 11: Use map to calculate the square of each element in a list.**

numbers = [1, 2, 3, 4, 5]

squared\_numbers = list(map(lambda x: x\*\*2, numbers))

print(squared\_numbers)

**Exercise 12: Use filter to extract only odd numbers from a list.**

numbers = [1, 2, 3, 4, 5, 6, 7, 8, 9]

odd\_numbers = list(filter(lambda x: x % 2 != 0, numbers))

print(odd\_numbers)

**Exercise 13: Use reduce to find the product of all numbers in a list.**

from functools import reduce

numbers = [1, 2, 3, 4, 5]

product = reduce(lambda x, y: x \* y, numbers)

print(product)

**7. Modules and Submodules**

**Exercise 14: Use the math module to calculate the factorial of a number.**

import math

num = 5

print(math.factorial(num))

**Exercise 15: Use the os module to list all files in the current directory.**

import os

print(os.listdir('.'))

**Exercise 16: Use the datetime module to get the current date and time.**

from datetime import datetime

now = datetime.now()

print(now.strftime("%Y-%m-%d %H:%M:%S"))

**8. Installing External Modules**

**Exercise 17: Install and use the requests module to fetch data from a URL.**

# Run this in terminal: pip install requests

import requests

response = requests.get("https://api.github.com")

print(response.json())

**Exercise 18: Install and use numpy to create an array and find the mean.**

# Run this in terminal: pip install numpy

import numpy as np

arr = np.array([1, 2, 3, 4, 5])

print("Mean:", np.mean(arr))

**9. Creating Custom Modules**

**Exercise 19: Create a custom module mymath.py with an add function and use it.**

**mymath.py**

def add(a, b):

return a + b

**main.py**

import mymath

print(mymath.add(5, 3))

**Exercise 20: Create a module that returns random greetings.**

**greetings.py**

import random

def get\_greeting():

greetings = ["Hello!", "Hi!", "Hey!", "Greetings!", "Howdy!"]

return random.choice(greetings)

**main.py**

import greetings

print(greetings.get\_greeting())