Subject Name Solutions

1323203 – Winter 2023

Semester 1 Study Material

Detailed Solutions and Explanations

Question 1(a) [3 marks]

Write a pseudocode to check the given number is positive or negative.

Solution

```
BEGIN
    Input number
    IF number > 0 THEN
        Display "Number is positive"
    ELSE IF number < 0 THEN
        Display "Number is negative"
    ELSE
        Display "Number is zero"
    END IF
END
```

Mnemonic

"Compare Zero"

Question 1(b) [4 marks]

Define Algorithm and Design it for Finding maximum from given three Numbers.

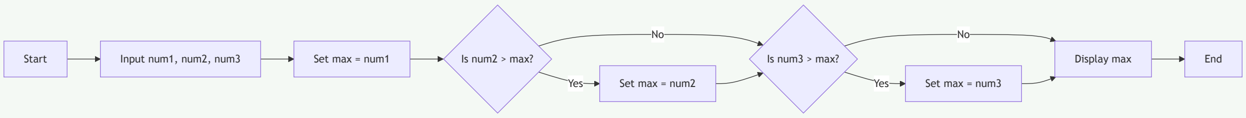
Solution

Algorithm Definition: An algorithm is a step-by-step procedure or set of rules designed to solve a specific problem or perform a computation.

Algorithm for Finding Maximum of Three Numbers:

```
BEGIN
    Input num1, num2, num3
    Set max = num1
    IF num2 > max THEN
        Set max = num2
    END IF
    IF num3 > max THEN
        Set max = num3
    END IF
    Display max
END
```

Diagram:



Mnemonic

"Compare and Replace"

Question 1(c) [7 marks]

Develop a Python code to convert Temperature parameter from Celsius to Fahrenheit.

Solution

```python
# Program to convert Celsius to Fahrenheit

# Get the Celsius temperature from user
celsius = float(input("Enter temperature in Celsius: "))

# Convert to Fahrenheit using the formula: F = (C * 9/5) + 32
fahrenheit = (celsius * 9/5) + 32

# Display the result
print(f"{celsius}^\circC is equal to {fahrenheit}^\circF")
```

Table 1: Temperature Conversion

Component	Description
Input	Temperature in Celsius
Formula	$F = (C \times 9/5) + 32$
Output	Temperature in Fahrenheit

Mnemonic

“Multiply by 9, divide by 5, add 32”

Question 1(c OR) [7 marks]

List out all comparison operators and explain each by giving python code example.

Solution

Table 2: Python Comparison Operators

Operator	Description	Example	Result
==	Equal to	`5 == 5`	`True`
!=	Not equal to	`5 != 6`	`True`
>	Greater than	`6 > 3`	`True`
<	Less than	`3 < 6`	`True`
>=	Greater than or equal to	`5 >= 5`	`True`
<=	Less than or equal to	`5 <= 5`	`True`

Code Example:

```
# Python comparison operators example
a = 10
b = 5

# Equal to
print(f"{a} == {b}: {a == b}")  # False

# Not equal to
print(f"{a} != {b}: {a != b}")  # True

# Greater than
print(f"{a} > {b}: {a > b}")    # True

# Less than
print(f"{a} < {b}: {a < b}")    # False

# Greater than or equal to
print(f"{a} >= {b}: {a >= b}")  # True

# Less than or equal to
print(f"{a} <= {b}: {a <= b}")  # False
```

Mnemonic

“CLEAN” (Compare, Less than, Equal to, Above, Not equal)

Question 2(a) [3 marks]

Describe data types in python with its examples.

Solution

Table 3: Python Data Types

Data Type	Description	Example
int	Integer values	`x = 10`
float	Decimal point values	`y = 10.5`
str	Text or character values	`name = "Python"`
bool	Logical values (True/False)	`is\_valid = True`
list	Ordered, mutable collection	`nums = [1, 2, 3]`
tuple	Ordered, immutable collection	`point = (5, 10)`
dict	Key-value pairs	`student = \{"name": "John"\}`

Mnemonic

“NIFTY SLD” (Numbers, Integers, Floats, Text, Yes/No, Sequences, Lists, Dictionaries)

Question 2(b) [4 marks]

Explain Nested if in python with python code example.

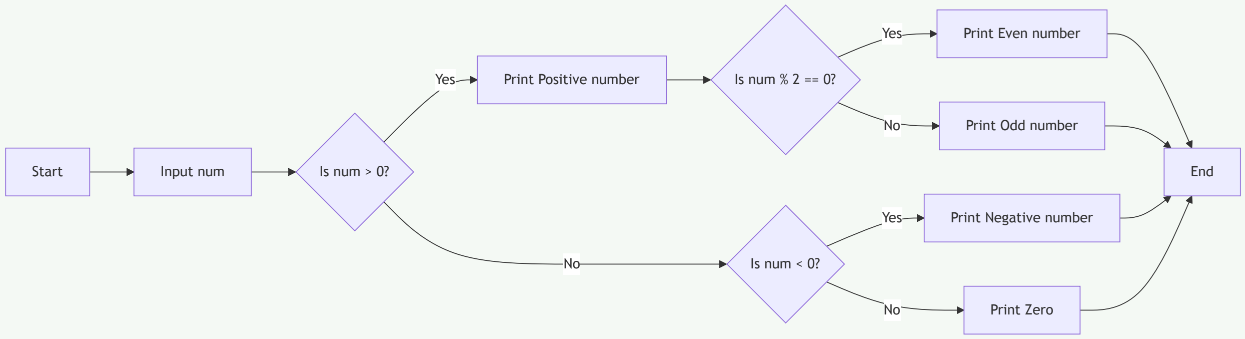
Solution

Nested if: A conditional statement inside another conditional statement is called a nested if. It allows checking for multiple conditions in sequence.

```
# Nested if example to check if a number is positive, negative, or zero
# And if positive, check if it's even or odd

num = int(input("Enter a number: "))
```

```python

if num > 0:
    print("Positive number")
    # Nested if to check if the positive number is even or odd
    if num % 2 == 0:
        print("Even number")
    else:
        print("Odd number")
elif num < 0:
    print("Negative number")
else:
    print("Zero")
```

Diagram:



Mnemonic

"Check Inside Check"

Question 2(c) [7 marks]

Write use of different types of selection / decision making flow of control structures with example.

Solution

Table 4: Selection Control Structures in Python

Structure	Purpose	Use Case
if	Execute code when condition is true	Simple condition check
if-else	Execute one code for true condition, another for false	Binary decision making
if-elif-else	Multiple condition checking	Multiple possible outcomes
Nested if	Condition checking inside another condition	Complex hierarchical decisions
Ternary operator	One-line if-else	Simple conditional assignment

Code Example:

```python
# Example of different selection structures
score = int(input("Enter your score: "))

# Simple if
if score >= 90:
    print("Excellent!")

# if-else
if score >= 60:
    print("You passed.")
else:
    print("You failed.")

# if-elif-else
if score >= 90:
    grade = "A"
elif score >= 80:
    grade = "B"
elif score >= 70:
    grade = "C"
elif score >= 60:
    grade = "D"
else:
    grade = "F"
print(f"Your grade is {grade}")

# Ternary operator
result = "Pass" if score >= 60 else "Fail"
print(result)
```

Mnemonic

"SCENE" (Simple if, Conditions with else, Elif for multiple, Nested for complex, Express with ternary)

Question 2(a) [3 marks] - OR Option

List out rules for defining variables in python.

Solution

Table 5: Rules for Defining Variables in Python

Rule	Description	Example
Start with letter or underscore	First character must be a letter or underscore	`name = "John"`, `\_count = 10`
No special characters	Only letters, numbers, and underscores allowed	`user\_name` (valid), `user-name` (invalid)
Case sensitive	Uppercase and lowercase are different	`age` and `Age` are different variables
No reserved keywords	Cannot use Python keywords as variable names	Cannot use `if`, `for`, `while`, etc.
No spaces	Use underscores instead of spaces	`first\_name` instead of `first name`

Mnemonic

"SILKS" (Start properly, Ignore special chars, Look at case, Keywords avoided, Spaces not allowed)

Question 2(b) [4 marks] - OR Option

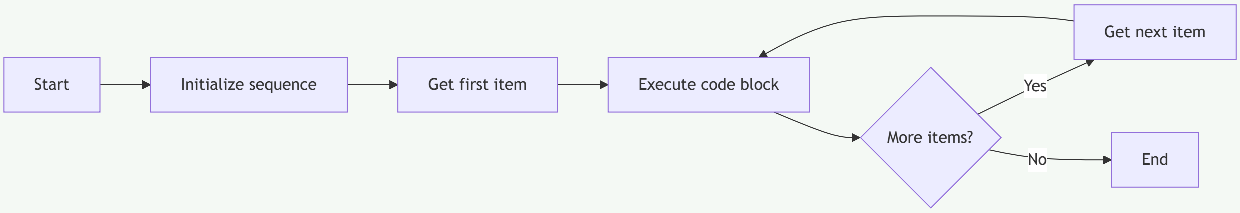
Explain For loop in python with necessary python code example.

Solution

For Loop in Python: A for loop is used to iterate over a sequence (list, tuple, string) or other iterable objects. It executes a block of code for each item in the sequence.

```python
# Example of for loop in Python
# Printing each element in a list
fruits = ["apple", "banana", "cherry"]
for fruit in fruits:
    print(fruit)

# Using range function with for loop
print("Numbers from 1 to 5:")
for i in range(1, 6):
    print(i)

# Using for loop with string
name = "Python"
for char in name:
    print(char)
```

Diagram:



Mnemonic

"ITEM" (Iterate Through Each Member)

Question 2(c) [7 marks] - OR Option

Describe Break and continue statement in python in brief.

Solution

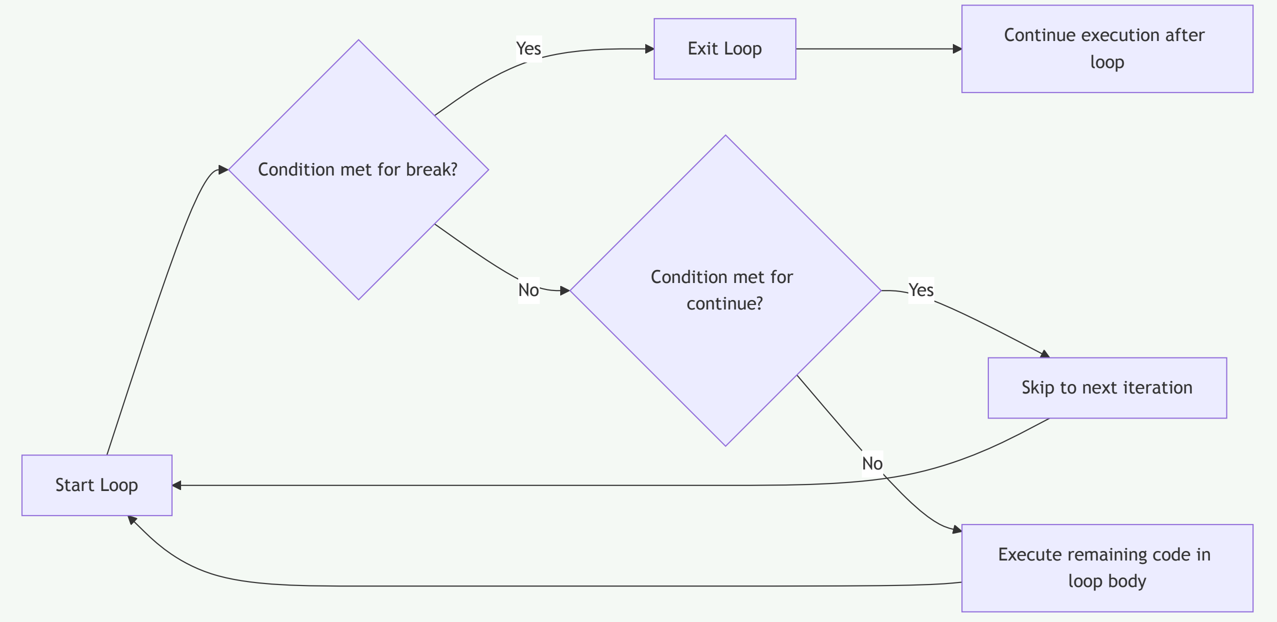
Table 6: Break and Continue Statements

Statement	Purpose	Effect
break	Exit the loop immediately	Terminates the current loop and transfers control to the statement following the loop
continue	Skip the current iteration	Jumps to the next iteration of the loop, skipping any code after the continue statement

Code Example:

```python
# Break statement example
print("Break example:")
for i in range(1, 11):
if

i == 6:

        print("Breaking the loop at i =", i)
        break
    print(i, end=" ")
print("\nLoop ended")

# Continue statement example
print("\nContinue example:")
for i in range(1, 11):
    if i % 2 == 0:
        continue
    print(i, end=" ")
print("\nOnly odd numbers were printed")
```

Diagram:


Yes
Exit Loop
Continue execution after loop
Condition met for break?
No
Condition met for continue?
Yes
Skip to next iteration
No
Start Loop
Execute remaining code in loop body

Mnemonic

“EXIT SKIP” (EXIT with break, SKIP with continue)

Question 3(a) [3 marks]

Develop a python program to print 1 to 10 numbers using loops.

Solution

```python
# Using for loop to print numbers from 1 to 10
print("Using for loop:")
for i in range(1, 11):
    print(i, end=" ")

print("\n\nUsing while loop:")
# Using while loop to print numbers from 1 to 10
counter = 1
while counter <= 10:
    print(counter, end=" ")
    counter += 1
```

Table 7: Loop Approaches

Approach	Advantage
For loop with range	Simple, concise, automatically manages counter
While loop	More flexible for complex conditions

Mnemonic

"COUNT UP" (Counter Updates in each iteration)

Question 3(b) [4 marks]

Develop a python program to print following pattern using loop.

```
*
**
***
****
*****
```

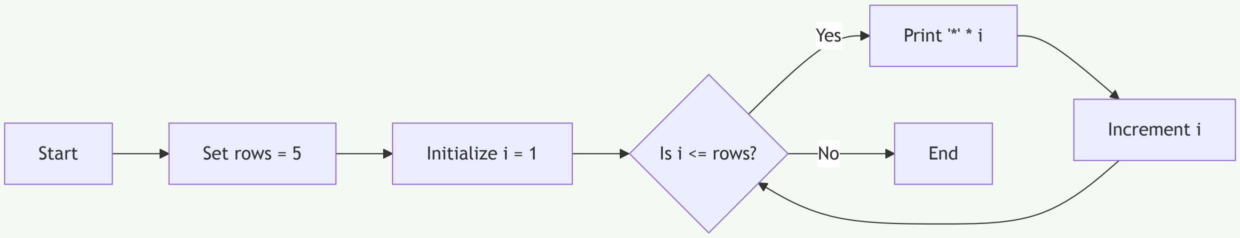
Solution

```python
# Print star pattern using for loop
rows = 5

for i in range(1, rows + 1):
    # Print i stars in each row
    print("*" * i)
```

Alternative solution with nested loops:

```python
# Print star pattern using nested loops
rows = 5

for i in range(1, rows + 1):
    for j in range(1, i + 1):
        print("*", end="")
    print()  # New line after each row
```

Diagram:



Mnemonic

"RISE UP" (Row Increases, Stars Expand Upward Progressively)

Question 3(c) [7 marks]

Create a user define function to find factorial of the given number.

Solution

```python
# Function to find factorial of a given number
def factorial(n):
    # Check if input is valid
    if not isinstance(n, int) or n < 0:
        return "Invalid input. Please enter a non-negative integer."

    # Base case: factorial of 0 or 1 is 1
if

n == 0 or

n == 1:

        return 1

    # Calculate factorial using iteration
    result = 1
    for i in range(2, n + 1):
        result *= i

    return result

# Test the function
number = int(input("Enter a number to find its factorial: "))
print(f"Factorial of {number} is {factorial(number)}")
```

Diagram:

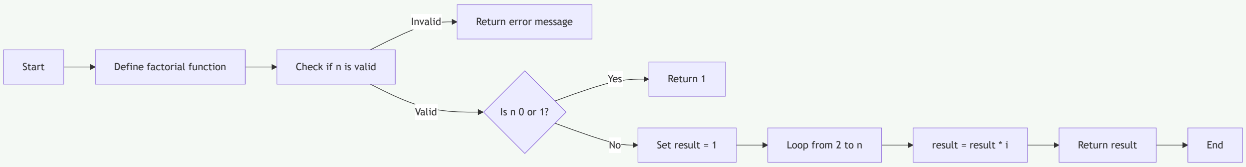


Table 8: Factorial Examples

Number	Calculation	Factorial
0	$0! = 1$	1
1	$1! = 1$	1
3	$3! = 3 \times 2 \times 1$	6
5	$5! = 5 \times 4 \times 3 \times 2 \times 1$	120

Mnemonic

"Multiply Down To One" (Multiply all integers down to 1)

Question 3(a) [3 marks] - OR Option

Develop a python code to find odd and even numbers from 1 to N using loops.

Solution

```python
# Program to find odd and even numbers from 1 to N

# Get input from user
N = int(input("Enter the value of N: "))

print("Even numbers from 1 to", N, "are:")
for i in range(1, N + 1):
    if i % 2 == 0:
        print(i, end=" ")

print("\nOdd numbers from 1 to", N, "are:")
```

```python
for i in range(1, N + 1):
    if i % 2 != 0:
        print(i, end=" ")
```

Table 9: Even and Odd Check

Number	Check	Type
Even numbers	number \% 2 == 0	2, 4, 6, ...
Odd numbers	number \% 2 != 0	1, 3, 5, ...

Mnemonic

"MOD-2" (Modulo 2 determines odd or even)

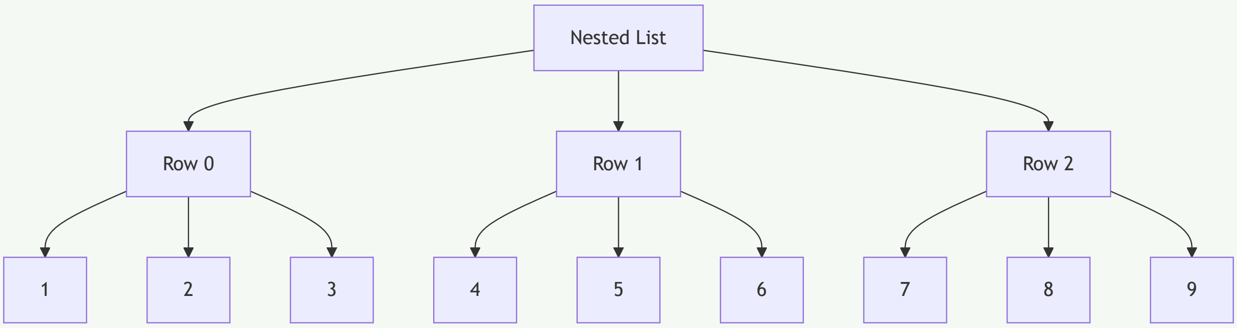
Question 3(b) [4 marks] - OR Option

Develop a code to create nested list and display elements.

Solution

```python
# Program to create and display nested list

# Create a nested list
nested_list = [
    [1, 2, 3],
    [4, 5, 6],
    [7, 8, 9]
]

# Display the nested list
print("Nested List:", nested_list)

# Display each element using nested loops
print("\nElements of the nested list:")
for i in range(len(nested_list)):
    for j in range(len(nested_list[i])):
        print(f"nested_list[{i}][{j}] = {nested_list[i][j]}")

# Alternative way to display using enumerate
print("\nUsing enumerate:")
for i, inner_list in enumerate(nested_list):
    for j, value in enumerate(inner_list):
        print(f"Position ({i}, {j}): {value}")
```

Diagram:



Mnemonic

"ROWS COLS" (Rows and Columns form the structure)

Question 3(c) [7 marks] - OR Option

Explain local and global variables using examples.

Solution

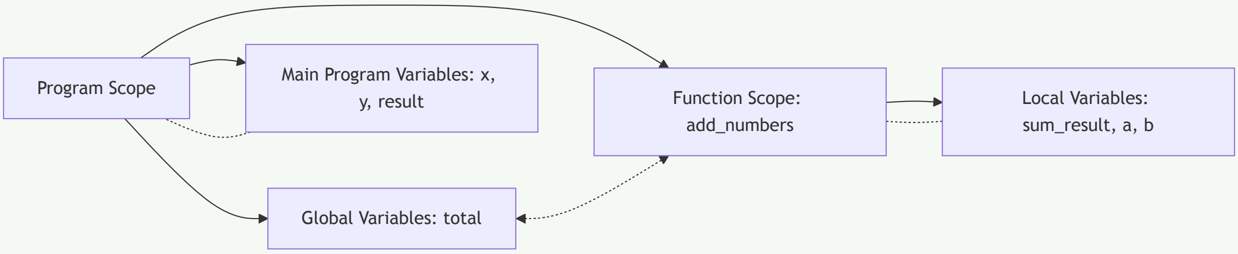
Table 10: Local vs Global Variables

Type	Scope	Accessibility	Declaration
Local Variables	Only within the function where declared	Only inside declaring function	Inside a function
Global Variables	Throughout the program	All functions can access	Outside any function

Code Example:

```python
# Global variable
total = 0

def add_numbers(a, b):
    # Local variables
    sum_result = a + b
    print(f"Local variable sum_result: {sum_result}")

    # Accessing global variable
    print(f"Global variable total before modification: {total}")

    # To modify global variable within function
    global total
    total = sum_result
    print(f"Global variable total after modification: {total}")

    return sum_result

# Main program
x = 5  # Local to main program
y = 10  # Local to main program

result = add_numbers(x, y)
print(f"Result: {result}")
print(f"Updated global total: {total}")

# This would cause an error because sum_result is local to add_numbers
# print(sum_result)  # NameError: name 'sum_result' is not defined
```

Diagram:


Program Scope
Main Program Variables: x, y, result
Function Scope: add_numbers
Local Variables: sum_result, a, b
Global Variables: total

Mnemonic

"GLOBAL SEES ALL" (Global variables are visible everywhere)

Question 4(a) [3 marks]

List out Python standard library mathematical functions.

Solution

Table 11: Python Math Module Functions

Function	Description	Example
abs()	Returns absolute value	`abs(-5)` → 5
pow()	Returns x to power y	`pow(2, 3)` → 8
max()	Returns largest value	`max(5, 10, 15)` → 15
min()	Returns smallest value	`min(5, 10, 15)` → 5
round()	Rounds to nearest integer	`round(4.6)` → 5
math.sqrt()	Square root	`math.sqrt(16)` → 4.0
math.sin()	Sine function	`math.sin(math.pi/2)` → 1.0

Mnemonic

"PEARS Math" (Power, Exponents, Arithmetic, Roots, Sine functions in Math)

Question 4(b) [4 marks]

Explain Module in python with example python code of it.

Solution

Module: A module in Python is a file containing Python definitions and statements. The file name is the module name with the suffix .py added.

```python
# Example of using math module
import math

# Using mathematical functions from math module
radius = 5
area = math.pi * math.pow(radius, 2)
print(f"Area of circle with radius {radius} is {area:.2f}")

# Using different import techniques
from math import sqrt, sin
angle = math.pi / 4
print(f"Square root of 25 is {sqrt(25)}")
print(f"Sine of {angle} radians is {sin(angle):.4f}")

# Importing with alias
import random as rnd
random_number = rnd.randint(1, 100)
print(f"Random number between 1 and 100: {random_number}")
```

Table 12: Module Import Techniques

Method	Syntax	Example
Import entire module	`import module\_name`	`import math`
Import specific items	`from module\_name import item1 , item2`	`from math import sqrt, sin`
Import with alias	`import module\_name as alias`	`import random as rnd`

Mnemonic

"CODE-LIB" (Code Libraries for reuse)

Question 4(c) [7 marks]

Write a Program that determines whether a given number is an 'Armstrong number' or a palindrome using a user-defined function.

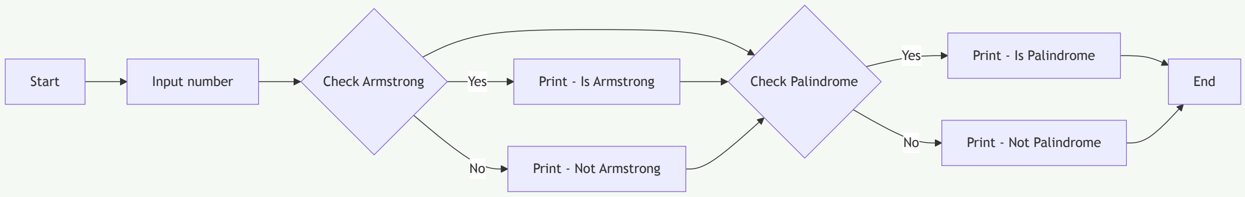
Solution

```python
# Function to check if a number is an Armstrong number
def is_armstrong(num):
    # Convert number to string to count digits
    num_str = str(num)
    n = len(num_str)

    # Calculate sum of each digit raised to power of number of digits
    armstrong_sum = 0
    for digit in num_str:
        armstrong_sum += int(digit) ** n

    # Check if sum equals the original number
    return armstrong_sum == num

# Function to check if a number is a palindrome
def is_palindrome(num):
    # Convert number to string and check if it reads the same forwards and backwards
    num_str = str(num)
    return num_str == num_str[::-1]

# Main program
number = int(input("Enter a number: "))

# Check if the number is an Armstrong number
if is_armstrong(number):
    print(f"{number} is an Armstrong number")
else:
    print(f"{number} is not an Armstrong number")

# Check if the number is a palindrome
if is_palindrome(number):
    print(f"{number} is a palindrome")
else:
    print(f"{number} is not a palindrome")
```

Table 13: Examples

Number	Armstrong Check	Palindrome Check
153	$1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153$	$153 \neq 351$
121	$1^3 + 2^3 + 1^3 = 1 + 8 + 1 = 10 \neq 121$	$121 = 121$
1634	$1^4 + 6^4 + 3^4 + 4^4 = 1 + 1296 + 81 + 256 = 1634$	$1634 \neq 4361$

Diagram:



Mnemonic

"SAME SUM" (SAME forwards and backwards for palindrome, SUM of powered digits for Armstrong)

Question 4(a) [3 marks] - OR Option

Explain built in functions in python.

Solution

Built-in Functions: These are functions that are part of Python's standard library and available without importing any module.

Table 14: Common Python Built-in Functions

Function	Purpose	Example
print()	Display output	`print("Hello")`
input()	Get user input	`name = input("Name: ")`
len()	Return object length	`len([1, 2, 3])` → `3`
type()	Return object type	`type(5)` → `<class 'int'>`
int(), float(), str()	Convert to specific type	`int("5")` → `5`
range()	Generate sequence	`list(range(3))` → `[0, 1, 2]`
sum()	Calculate sum	`sum([1, 2, 3])` → `6`

Mnemonic

"PITS LCR" (Print, Input, Type, Sum, Len, Convert, Range)

Question 4(b) [4 marks] - OR Option

Describe python math module by giving one python code example.

Solution

Python Math Module: The math module provides access to mathematical functions defined by the C standard.

```python
# Example using math module
import math

# Basic constants
print(f"Value of pi: {math.pi}")
print(f"Value of e: {math.e}")

# Trigonometric functions (argument in radians)
angle = math.pi / 3  # 60 degrees
print(f"Sine of {angle:.2f} radians: {math.sin(angle):.4f}")
print(f"Cosine of {angle:.2f} radians: {math.cos(angle):.4f}")
print(f"Tangent of {angle:.2f} radians: {math.tan(angle):.4f}")

# Logarithmic and exponential functions
x = 10
print(f"Natural logarithm of {x}: {math.log(x):.4f}")
print(f"Logarithm base 10 of {x}: {math.log10(x):.4f}")
print(f"e raised to power {x}: {math.exp(x):.4f}")

# Other functions
print(f"Square root of 25: {math.sqrt(25)}")
print(f"Ceiling of 4.3: {math.ceil(4.3)}")
print(f"Floor of 4.7: {math.floor(4.7)}")
```

Table 15: Math Module Categories

Category	Functions
Constants	`math.pi`, `math.e`
Trigonometric	`sin()`, `cos()`, `tan()`
Logarithmic	`log()`, `log10()`, `exp()`
Numeric	`sqrt()`, `ceil()`, `floor()`

Mnemonic

"PENT" (Pi/constants, Exponents, Numbers, Trigonometry)

Question 4(c) [7 marks] - OR Option

Explain concept of scope of variable in Python and Apply global and local variable concepts in python program.

Solution

Scope of Variables in Python: The scope of a variable determines where in the program a variable is accessible or visible.

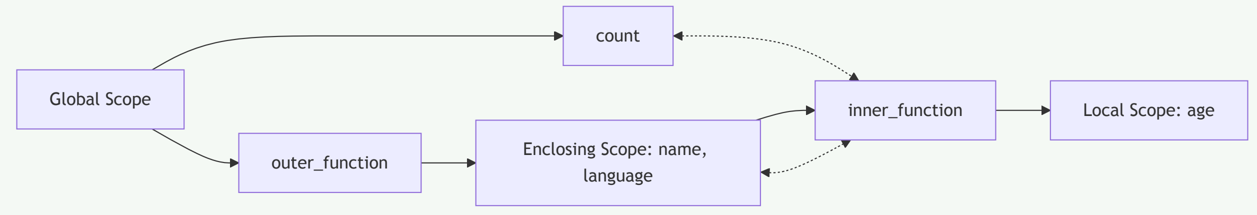
Table 16: Variable Scope Types

Scope	Description	Access
Local	Variables defined inside a function	Only within the function
Global	Variables defined at the top level	Throughout the program
Enclosing	Variables in outer function of nested functions	In the outer and inner function
Built-in	Pre-defined variables in Python	Throughout the program

Code Example:

```python
# Variable scope demonstration

# Global variable
count = 0

def outer_function():
    # Enclosing scope variable
    name = "Python"

    def inner_function():
        # Local variable
        age = 30
        # Accessing global variable
        global count
        count += 1
        # Accessing enclosing variable
        print(f"Inside inner_function: name is {name}")
        print(f"Inside inner_function: age is {age}")
        print(f"Inside inner_function: count is {count}")

    # Local variable to outer_function
    language = "Programming"
    print(f"Inside outer_function: name is {name}")
    print(f"Inside outer_function: language is {language}")
    print(f"Inside outer_function: count is {count}")

    # Call inner function
    inner_function()

    # This would cause an error - age is local to inner_function
    # print(age)

# Main program
print(f"Global scope: count is {count}")
outer_function()
print(f"Global scope after function call: count is {count}")

# These would cause errors - they are local to functions
# print(name)
# print(language)
```

Diagram:



Mnemonic

"LEGB" (Local, Enclosing, Global, Built-in - order of scope lookup)

Question 5(a) [3 marks]

Develop a python program to swap two elements in given list

Solution

```python
# Program to swap two elements in a list

# Create a list
my_list = [10, 20, 30, 40, 50]
print("Original list:", my_list)

# Get positions to swap
pos1 = int(input("Enter first position (index starts from 0): "))
pos2 = int(input("Enter second position (index starts from 0): "))

# Swap elements using a temporary variable
if 0 <= pos1 < len(my_list) and 0 <= pos2 < len(my_list):
    # Swapping
    temp = my_list[pos1]
    my_list[pos1] = my_list[pos2]
    my_list[pos2] = temp

    print(f"List after swapping elements at positions {pos1} and {pos2}:", my_list)
else:
    print("Invalid positions! Positions should be within list range.")
```

Alternative method:

```python
# Swap using Python's tuple unpacking (more pythonic)
if 0 <= pos1 < len(my_list) and 0 <= pos2 < len(my_list):
    my_list[pos1], my_list[pos2] = my_list[pos2], my_list[pos1]
    print(f"List after swapping elements at positions {pos1} and {pos2}:", my_list)
```

Table 17: Swapping Methods

Method	Code
Using temp variable	`temp = a; a = b; b = temp`
Python tuple unpacking	`a, b = b, a`

Mnemonic

"TEMP SWAP" (Temporary variable helps safe swapping)

Question 5(b) [4 marks]

Explain nested list by giving example.

Solution

Nested List: A nested list is a list that contains other lists as its elements, creating a multi-dimensional data structure.

```python
# Creating a nested list (3x3 matrix)
matrix = [
    [1, 2, 3],
    [4, 5, 6],
    [7, 8, 9]
]

# Accessing elements
print("Complete matrix:", matrix)
print("First row:", matrix[0])
print("Element at row 1, column 2:", matrix[0][1])  # Output: 2

# Modifying elements
matrix[1][1] = 50
print("Matrix after modification:", matrix)

# Iterating through a nested list
print("\nPrinting the matrix:")
for row in matrix:
    for element in row:
        print(element, end=" ")
    print()  # New line after each row
```

Diagram:

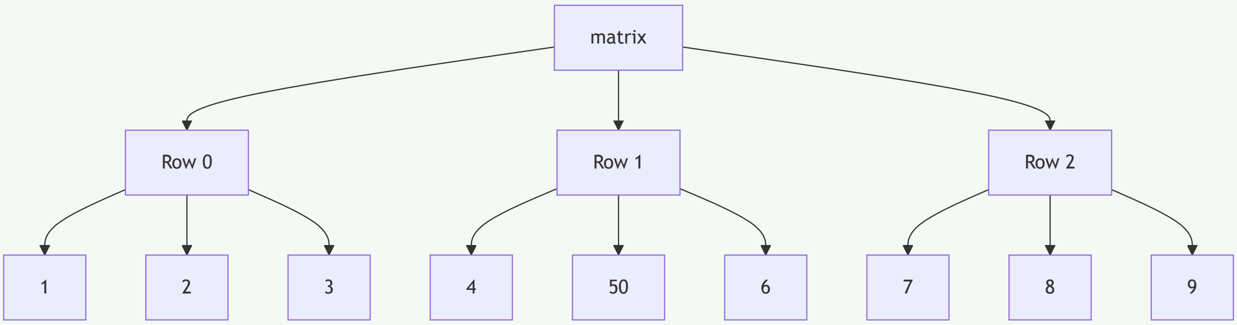


Table 18: Nested List Operations

Operation	Syntax	Example
Access element	`list[row][col]`	`matrix[0][1]`
Modify element	`list[row][col] = new\_value`	`matrix[1][1] = 50`
Add new row	`list.append([...])`	`matrix.append([10, 11, 12])`

Mnemonic

"MARS" (Matrix Access with Row and column Structure)

Question 5(c) [7 marks]

Explain string operations with examples.

Solution

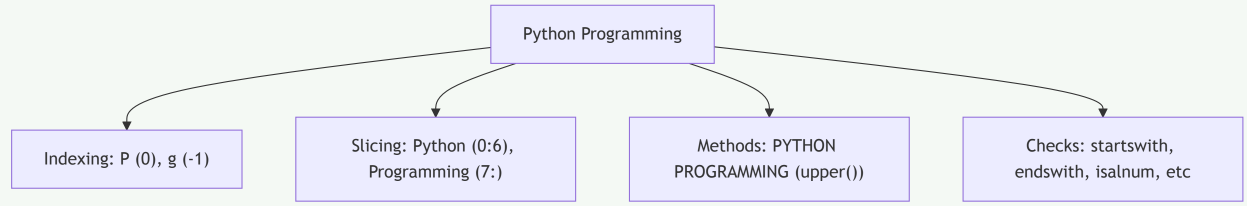
Table 19: String Operations in Python

Operation	Description	Example
Concatenation	Joining strings	`"Hello" + " World"` → `"Hello World"`
Repetition	Repeating strings	`"Python" * 3` → `"PythonPythonPython"`
Slicing	Extract substring	`"Python"[1:4]` → `"yth"`
Indexing	Access character	`"Python"[0]` → `"P"`
Length	Count characters	`len("Python")` → `6`
Membership	Check if present	`"P" in "Python"` → `True`
Comparison	Compare strings	`"apple" < "banana"` → `True`

Code Example:

```python
# String operations demonstration
text = "Python Programming"

# Indexing
print("First character:", text[0])
print("Last character:", text[-1])

# Slicing
print("First word:", text[:6])
print("Second word:", text[7:])
print("Middle characters:", text[3:10])
print("Reverse:", text[::-1])

# String methods
print("Uppercase:", text.upper())
print("Lowercase:", text.lower())
print("Replace 'P' with 'J':", text.replace("P", "J"))
print("Split by space:", text.split())
print("Count 'm':", text.count('m'))
print("Find 'gram':", text.find("gram"))

# Check operations
print("Is alphanumeric?", text.isalnum())
print("Starts with 'Py'?", text.startswith("Py"))
print("Ends with 'ing'?", text.endswith("ing"))
```

Diagram:


Python Programming
Indexing: P (0), g (-1)
Slicing: Python (0:6), Programming (7:)
Methods: PYTHON PROGRAMMING (upper())
Checks: startswith, endswith, isalnum, etc

Mnemonic

“SCREAM” (Slice, Concat, Replace, Extract, Access, Methods)

Question 5(a) [3 marks] - OR Option

Develop a python program to find sum of all elements in given list

Solution

```python
# Program to find sum of all elements in a list

# Method 1: Using built-in sum() function
def sum_list_builtin(numbers):
    return sum(numbers)

# Method 2: Using a loop
def sum_list_loop(numbers):
    total = 0
    for num in numbers:
        total += num
    return total

# Create a sample list
my_list = [10, 20, 30, 40, 50]
print("List:", my_list)

```

```python
# Calculate sum using built-in function
print("Sum using built-in function:", sum_list_builtin(my_list))

# Calculate sum using loop
print("Sum using loop:", sum_list_loop(my_list))
```

Table 20: Sum Methods Comparison

Method	Advantage
Built-in sum()	Simple, efficient, fast
Loop approach	Works for custom summing logic

Mnemonic

"ADD ALL" (Add All elements in sequence)

Question 5(b) [4 marks] - OR Option

Explain indexing and slicing operations in python list

Solution

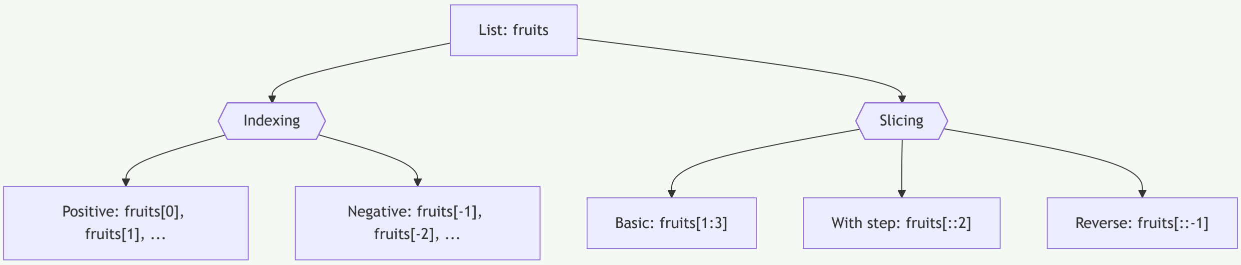
Table 21: Indexing and Slicing Operations

Operation	Syntax	Description	Example
Positive Indexing	`list[i]`	Access item at position i (0-based)	`fruits[0]` $\rightarrow firstitem$
Negative Indexing	`list[-i]`	Access item from end (-1 is last)	`fruits[-1]` $\rightarrow lastitem$
Basic Slicing	`list[start:end]`	Items from start to end-1	`fruits[1:3]` $\rightarrow itemsat1,2$
Slice with Step	`list[start:end:step]`	Items with interval of step	`nums[1:6:2]` $\rightarrow itemsat1,3,5$
Omitting Indices	`list[:end]`, `list[start:]`	From beginning or to end	`fruits[:3]` $\rightarrow first3items$
Negative Slicing	`list[-start:-end]`	Slice from end	`fruits[-3:-1]` $\rightarrow 3rdand2ndlast$
Reverse	`list[::-1]`	Reverse the list	`fruits[::-1]` $\rightarrow listinreverse$

Code Example:

```python
# Indexing and slicing demonstration
fruits = ["apple", "banana", "cherry", "date", "elderberry", "fig"]
print("Original list:", fruits)

# Indexing
print("\nIndexing examples:")
print("First item:", fruits[0])  # apple
print("Last item:", fruits[-1])  # fig
print("Third item:", fruits[2])  # cherry

# Slicing
print("\nSlicing examples:")
print("First three items:", fruits[:3])  # ['apple', 'banana', 'cherry']
print("Last three items:", fruits[-3:])  # ['date', 'elderberry', 'fig']
print("Middle items:", fruits[2:4])  # ['cherry', 'date']
print("Every second item:", fruits[::2])  # ['apple', 'cherry', 'elderberry']
print("Reversed list:", fruits[::-1])  # ['fig', 'elderberry', 'date', 'cherry', 'banana', 'apple']
```

Diagram:



Mnemonic

"START-END-STEP" (Slicing syntax: [start:end:step])

Question 5(c) [7 marks] - OR Option

Explain tuple in brief with necessary example.

Solution

Tuple: A tuple is an ordered, immutable collection of elements. Once created, the elements cannot be changed.

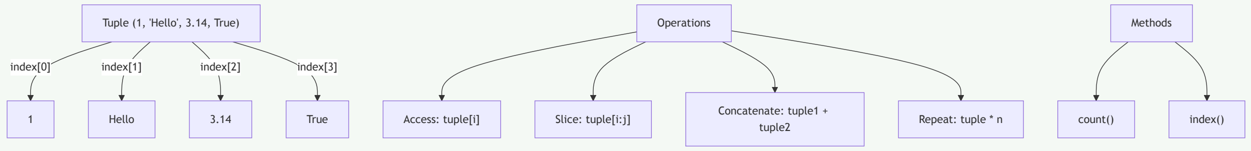
Table 22: Tuple vs List

Feature	Tuple	List
Syntax	`(item1, item2)`	`[item1, item2]`
Mutability	Immutable (cannot change)	Mutable (can change)
Performance	Faster	Slower
Use Case	Fixed data, dictionary keys	Data that needs modification
Methods	Few methods	Many methods

Code Example:

```python
# Creating tuples
empty_tuple = ()
single_item_tuple = (1,)  # Comma is necessary for single item
mixed_tuple = (1, "Hello", 3.14, True)
nested_tuple = (1, 2, (3, 4), 5)

# Accessing tuple elements
print("First item:", mixed_tuple[0])  # 1
print("Last item:", mixed_tuple[-1])  # True
print("Nested tuple element:", nested_tuple[2][0])  # 3

# Slicing tuple
print("First two items:", mixed_tuple[:2])  # (1, "Hello")

# Tuple unpacking
a, b, c, d = mixed_tuple
print("Unpacked values:", a, b, c, d)

# Tuple methods
print("Count of 1:", mixed_tuple.count(1))  # 1
print("Index of 'Hello':", mixed_tuple.index("Hello"))  # 1

# Tuple operations
combined_tuple = mixed_tuple + nested_tuple
repeated_tuple = mixed_tuple * 2
print("Combined tuple:", combined_tuple)
print("Repeated tuple:", repeated_tuple)

# This will cause error as tuples are immutable
# mixed_tuple[0] = 100  # TypeError: 'tuple' object does not support item assignment
```

Diagram:



Mnemonic

“IPAC” (Immutable, Parentheses, Access only, Cannot modify)