

CHAPTER -8

Strings

2MARK QUESTIONS

1Q: Define a string in the context of computer science.

Answer:

A string is a sequence of characters, typically represented as a series of characters enclosed within quotation marks in programming languages.

2Q: Explain the difference between a character and a string.

Answer:

A character is a single symbol, while a string is a sequence of characters. In programming, a character is often enclosed in single quotes (' '), whereas a string is enclosed in double quotes (" ").

3Q: Discuss the concept of an immutable string.

Answer:

An immutable string cannot be modified after its creation. Once a string is assigned, any operation that seems to modify it creates a new string rather than altering the existing one.

4Q: How is string concatenation performed in programming languages?

Answer:

String concatenation is the process of combining two strings. In many programming languages, this is achieved using the "+" operator. For example, str1 + str2 concatenates str1 and str2.

5Q: What is the significance of the escape character in strings?

Answer:

The escape character, often denoted by a backslash (\), is used to include special characters within a string and represents characters that are difficult to type directly (e.g., newline, tab, quotation marks).

6Q: Differentiate between string length and string indexing.

Answer:

String length refers to the total number of characters in a string, while string indexing involves accessing individual characters in a string using their position or index.

7Q: Explain the concept of substring in strings.

Answer:

A substring is a part of a string. It is obtained by extracting a portion of characters from the original string, typically defined by a starting index and a length.

8Q: Discuss the importance of string manipulation in text processing.

Answer:

String manipulation involves various operations on strings, such as concatenation, substring extraction, and searching. It is crucial in text processing tasks like data cleaning, parsing, and pattern matching.

9Q: What is the role of the strlen() function in C programming?

Answer:

The strlen() function in C is used to determine the length of a string, i.e., the number of characters before the null terminator ('\0').

10Q: Describe the term "palindrome" in the context of strings.

Answer:

A palindrome is a string that reads the same forwards and backward. In other words, when the characters of the string are reversed, it remains unchanged.

4MARK QUESTIONS

1Q: Explain the concept of character encoding and its relevance in string representation.

Answer:

Character encoding is the mapping of characters to numerical codes. It is crucial in string representation because computers interpret and store characters using these codes, such as ASCII or Unicode. This mapping ensures consistency in representing characters across different systems and languages.

2Q: Discuss the advantages and disadvantages of using immutable strings in programming.

Answer:

Immutable strings offer advantages such as simplicity and thread safety, but they have drawbacks like increased memory usage due to creating new strings during operations. Their immutability ensures data integrity but may lead to performance concerns in certain scenarios.

3Q: Compare and contrast string manipulation in Python and C. Provide examples for each.

Answer:

Python provides built-in string manipulation methods like `join()`, while C relies on library functions such as `strcat()` and manual character array manipulation. For instance, concatenating strings in Python: `str1 = "Hello"; str2 = "World"; result = str1 + str2`. In C: `char str1[10] = "Hello"; char str2[10] = "World"; strcat(str1, str2);`

4Q: Elaborate on the significance of regular expressions in string processing.

Answer:

Regular expressions are powerful tools for pattern matching and searching within strings. They provide a concise and flexible way to define patterns, making tasks such as validation and extraction of specific information from strings more efficient.

5Q: Write a C program to determine if a given string is a palindrome or not.

Answer:

```
#include <stdio.h>
#include <string.h>

int isPalindrome(char str[]) {
    int len = strlen(str);
    for (int i = 0; i < len / 2; i++) {
        if (str[i] != str[len - 1 - i]) {
            return 0; // Not a palindrome
        }
    }
    return 1; // Palindrome
}

int main() {
    char input[100];
    printf("Enter a string: ");
    scanf("%s", input);

    if (isPalindrome(input)) {
        printf("The string is a palindrome.\n");
    } else {
        printf("The string is not a palindrome.\n");
    }

    return 0;
}
```

}

6Q: Discuss the role of the substring() method in Java for manipulating strings.

Answer:

The substring() method in Java is used to extract a portion of a string. It takes a starting index and an optional ending index, allowing for flexible substring extraction. For example: `String str = "Hello World"; String substr = str.substring(6, 11);` // Extracts "World".

7Q: Explain the term "string interpolation" and provide an example using Python.

Answer:

String interpolation involves embedding expressions within a string. In Python, this can be achieved using f-strings. Example: `name = "Alice"; age = 25; print(f'My name is {name} and I am {age} years old.')`

8Q: Describe the purpose of the strlen() and strcpy() functions in the C programming language.

Answer:

The strlen() function calculates the length of a string, excluding the null terminator. The strcpy() function copies one string to another, including the null terminator. Example: `char source[] = "Hello"; char destination[10]; strcpy(destination, source);`

9Q: How does the concept of "string immutability" impact memory management in programming languages like Java?

Answer:

String immutability in Java means that once a string is created, its value cannot be changed. This impacts memory management positively by facilitating string pooling, where identical string literals are stored in a common pool, reducing memory usage.

10Q: Discuss the role of escape sequences in representing special characters within strings. Provide examples.

Answer:

Escape sequences are combinations of characters that represent special characters. For example, `\n` represents a newline character. In C: `printf("Hello\nWorld");` would print "Hello" on one line and "World" on the next due to the newline escape sequence.

7MARK QUESTIONS

1Q: Explain the process of dynamic memory allocation for strings in C. Provide an example code snippet to demonstrate.

Answer:

Dynamic memory allocation for strings in C involves using functions like malloc or calloc to allocate memory based on the string's size. An example code snippet:

```
#include <stdio.h>

#include <stdlib.h>

#include <string.h>

int main() {

    char* dynamicString;

    dynamicString = (char*)malloc(20 * sizeof(char)); // Allocating memory for
    20 characters

    if (dynamicString != NULL) {

        strcpy(dynamicString, "Dynamic Memory");

        printf("Dynamic String: %s\n", dynamicString);

        free(dynamicString); // Freeing allocated memory

    }

    return 0;

}
```

2Q: Discuss the concept of string immutability in programming languages like Java. How does it impact memory management and security?

Answer:

String immutability in Java means that once a string is created, its value cannot be changed. This impacts memory management positively by allowing string pooling, reducing memory usage. It enhances security by preventing

unintentional modification of strings, making them more reliable in scenarios where data integrity is crucial.

3Q: Compare and contrast the use of single quotes and double quotes in representing characters and strings in programming.

Answer:

Single quotes (' ') are used to represent individual characters in programming languages, while double quotes (" ") are used for string literals. Single-quoted characters are typically of type char, and double-quoted sequences are of type string or char[].

4Q: Discuss the importance of Unicode in representing characters in strings. Provide examples to illustrate the need for Unicode.

Answer:

Unicode is essential for representing a wide range of characters, including those from different languages and symbols. ASCII, being limited to 128 characters, falls short in supporting diverse linguistic characters. Unicode provides a standardized encoding that allows representation of characters beyond the ASCII range. For example, emojis and characters from non-Latin scripts.

5Q: Write a Python program to reverse a string without using built-in string reversal functions.

Answer:

```
def reverse_string(input_str):
    reversed_str = ""
    for char in input_str:
        reversed_str = char + reversed_str
    return reversed_str

user_input = input("Enter a string: ")
reversed_result = reverse_string(user_input)
print("Reversed String:", reversed_result)
```


6Q: Explain the concept of string interpolation in programming languages. Provide examples using at least two programming languages. (10 marks)

Answer:

String interpolation involves embedding expressions within a string. In Python, this is achieved using f-strings: `name = "John"; age = 25; print(f"My name is {name} and I am {age} years old.")`. In JavaScript, template literals provide a similar functionality: ``My name is ${name} and I am ${age} years old.``.

7Q: Discuss the role of regular expressions in string manipulation. Provide examples to illustrate their use.

Answer:

Regular expressions are powerful tools for pattern matching and searching within strings. For example, in Python, the `re` module enables regular expression operations. The pattern `'\d+'` matches one or more digits in a string.

```
import re

input_str = "There are 123 apples and 456 oranges."

numbers = re.findall(r'\d+', input_str)

print("Extracted Numbers:", numbers)
```

8Q: Elaborate on the potential security risks associated with improper string handling in software development. Provide examples.

Answer:

Improper string handling can lead to vulnerabilities such as buffer overflows and SQL injection. For example, not validating input lengths may result in buffer overflows, allowing attackers to overwrite adjacent memory. In SQL injection, improperly handled strings in database queries may enable attackers to manipulate or disclose data.

9Q: Write a Java program to count the occurrences of a specific character in a given string.

Answer:

```
java
code
import java.util.Scanner;
public class CharCount {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String inputString = scanner.nextLine();
        System.out.print("Enter a character to count: ");
        char targetChar = scanner.next().charAt(0);
        int charCount = 0;
        for (char c : inputString.toCharArray()) {
            if (c == targetChar) {
                charCount++;
            }
        }

        System.out.println("Occurrences of '" + targetChar + "': " + charCount);
    }
}
```

10Q: Discuss the role of escape sequences in representing special characters within strings. Provide examples using C and Python.

Answer:

Escape sequences represent special characters within strings. In C: `printf("New line\nTab\tBackslash\\");`. In Python: `print("New line\nTab\tBackslash\\")`. Escape sequences facilitate the inclusion of characters that are challenging to type directly and are essential for formatting output.

Multiple-Choice Questions (MCQs):

1Q: Which of the following is used to represent a single character in programming languages?

- A. Double quotes (" ")**
- B. Single quotes (' ')**
- C. Parentheses (())**
- D. Square brackets ([])**

Answer: B

2Q: What is the primary purpose of the escape character in strings?

- A. Concatenation**
- B. Substring extraction**
- C. Representing special characters**
- D. Reversing a string**

Answer: C

3Q: In C programming, which function is used to calculate the length of a string?

- A. length()**
- B. strlen()**
- C. len()**
- D. size()**

Answer: B

4Q: What is the significance of string immutability in Java?

- A. Improved performance**
- B. Enhanced security**
- C. Dynamic memory allocation**
- D. Simplified syntax**

Answer: B

5Q: Which programming construct is used for dynamic memory allocation in C for strings?

- A. malloc()**
- B. free()**
- C. new()**
- D. delete()**

Answer: A

6Q: In Python, what is used for string interpolation, allowing the embedding of expressions within a string?

- A. Templates**
- B. Interpolators**
- C. F-strings**
- D. Concatenation**

Answer: C

7Q: What is the primary role of regular expressions in string manipulation?

- A. Concatenation**
- B. Pattern matching**
- C. Substring extraction**
- D. Reversing a string**

Answer: B

8Q: Which escape sequence is used to represent a new line in strings?

- A. \n**
- B. \t**
- C. \r**
- D. \b**

Answer: A

9Q: In JavaScript, what is used for string interpolation, allowing the embedding of expressions within a string?

- A. Concatenation**
- B. Templates**
- C. Interpolators**
- D. Backticks**

Answer: D

10Q: Which of the following functions is used to copy one string to another in C?

- A. strcat()**
- B. strcpy()**
- C. strncpy()**
- D. strcopy()**

Answer: B

Fill in the Blanks :

Q1: In Python, the + operator is used for _____ of strings.

Answer: concatenation

Q2: The _____ character is used to represent special characters within strings.

Answer: escape

Q3: The _____ function in Java is used to count the occurrences of a specific character in a string.

Answer: charAt()

Q4: Regular expressions provide a powerful tool for pattern matching and searching within _____.

Answer: strings

Q5: String _____ involves embedding expressions within a string for dynamic content.

Answer: interpolation

Q6: In C programming, the _____ function allocates memory for a string based on its size.

Answer: malloc()

Q7: Unicode is crucial for representing a wide range of characters, including those from different languages and _____.

Answer: symbols

Q8: String _____ in Java ensures that once a string is created, its value cannot be changed.

Answer: immutability

Q9: Escape sequences are combinations of characters that represent special characters within _____.

Answer: strings

Q10: The escape sequence \t is used to represent a _____ in strings.

Answer: tab