Fast National University of computing and Emerging Sciences

Peshawar Campus

Programming Fundamentals

Practice Problem

If-Else Questions

1. Write a program to check if a number is positive, negative, or zero.
2. Write a program that accepts a grade (A, B, C, D, F) and prints the corresponding message.
3. Create a program to find the largest of three numbers.
4. Write a program to determine if a year is a leap year.
5. Create a program that checks if a number is even or odd.
6. Write a program to determine if a character is a vowel or consonant.
7. Write a program that checks if a triangle is valid based on its sides.
8. Create a program that converts a given temperature from Celsius to Fahrenheit.
9. Write a program to check if a number is prime.
10. Create a program that checks if a given string is a palindrome.
11. Write a program to find the absolute value of a number.
12. Create a program to check if a number is divisible by both 3 and 5.

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13. Write a program that prints a message based on the user's age (child, teenager, adult).
14. Create a program to classify a number as a perfect number.
15. Write a program that displays the corresponding month name based on a number (1-12).
16. Write a program to determine the maximum of two numbers using if-else.
17. Create a program to find the minimum of three numbers using if-else.
18. Write a program that prints the largest digit of a given number.
19. Create a program to determine if a given date is valid.
20. Write a program to check if two strings are anagrams.
21. Create a program to check if a number is an Armstrong number.
22. Write a program that gives a feedback score based on user rating (1-5).
23. Create a program that checks if a character is uppercase or lowercase.
24. Write a program that calculates the tax based on income brackets.
25. Create a program to find out if a number is a perfect square.
26. Write a program to determine the grade based on percentage.
27. Create a program that checks if a number is a Fibonacci number.
28. Write a program that checks whether a character is a special character.
29. Create a program that checks if a person is eligible to vote based on age.
30. Write a program to determine the color of a traffic light based on its input.

Loop Questions

1. Write a program to print numbers from 1 to 100.
2. Create a program that prints the sum of the first n natural numbers.
3. Write a program to print the factorial of a number using a loop.
4. Create a program to print Fibonacci series up to n terms.
5. Write a program to display all prime numbers between 1 and 100.
6. Create a program to reverse a number.
7. Write a program to find the largest number in a series of inputs.
8. Create a program that counts the number of digits in a number.
9. Write a program that prints the multiplication table of a given number.

10. Create a program to display all even numbers between 1 and 100.
11. Write a program to display all odd numbers between 1 and 100.
12. Create a program that prints a pattern of stars in a pyramid shape.
13. Write a program to sum all even numbers between 1 and n.
14. Create a program that prints the numbers in reverse order.
15. Write a program to find the GCD of two numbers using loops.
16. Create a program to print a triangle of stars.
17. Write a program that counts the frequency of digits in a number.
18. Create a program to check if a number is a palindrome using a loop.
19. Write a program that prints the first 10 square numbers.
20. Create a program that prints a square of stars.
21. Write a program that prints a right-angled triangle of stars.
22. Create a program that sums the squares of the first n natural numbers.
23. Write a program to find the sum of digits of a number.
24. Create a program that prints a number pyramid.
25. Write a program to count how many times a digit appears in a number.
26. Create a program to print a zigzag pattern using stars.
27. Write a program to calculate the average of a series of numbers.
28. Create a program to print the factorial of numbers from 1 to n.
29. Write a program that generates random numbers and prints them until a certain number is reached.
30. Create a program to find the maximum difference between any two elements in a series of inputs.

Switch Case Questions

1. Write a program to display the day of the week based on a number (1-7).
2. Create a program that converts numbers to Roman numerals (1-10).
3. Write a program to display the month name based on a number (1-12).
4. Create a program to calculate the area of different shapes (circle, square, triangle).
5. Write a program to determine a student's grade based on marks.

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6. Create a program that simulates a simple calculator using switch case.
7. Write a program to convert between different units (e.g., meters to feet).
8. Create a program to determine the type of triangle based on angles.
9. Write a program that displays the appropriate action based on a user command.
10. Create a program that simulates a vending machine.
11. Write a program to display the corresponding food item based on number input.
12. Create a program that tells you if you need to carry an umbrella based on weather condition codes.
13. Write a program to categorize a number (positive, negative, zero) using switch case.
14. Create a program to find the maximum of three numbers using switch case.
15. Write a program that suggests a color based on user mood input.
16. Create a program that takes a number and outputs the corresponding ASCII character.
17. Write a program to categorize a person based on their height.
18. Create a program that suggests an activity based on the time of day.
19. Write a program to display the suitable dress code based on weather conditions.
20. Create a program that determines if a number is odd or even using switch case.
21. Write a program that outputs the result of a basic mathematical operation based on user choice.
22. Create a program that checks whether the user input is a valid command.
23. Write a program that generates a message based on user input regarding preferences.
24. Create a program to convert temperature from Fahrenheit to Celsius or vice versa.
25. Write a program to categorize types of foods based on their type (e.g., fruit, vegetable).
26. Create a program that suggests a sport based on the user's preference.
27. Write a program that determines whether a number is a prime number or not using switch case.
28. Create a program that decides on a drink based on temperature (hot or cold).

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29. Write a program that provides feedback based on a user rating (1-5).
30. Create a program that gives the status of a game based on a player's score.

Star Patterns

1. Print a right-angled triangle of stars.
2. Print an inverted right-angled triangle of stars.
3. Print a pyramid of stars.
4. Print a diamond shape made of stars.
5. Print a hollow square of stars.
6. Print a full square of stars.
7. Print a hollow pyramid of stars.
8. Print an hourglass pattern of stars.
9. Print a staircase pattern of stars.
10. Print a triangle pattern using numbers.
11. Print a mirrored pyramid of stars.
12. Print a pattern with increasing stars in each row.
13. Print a right-aligned pyramid of stars.
14. Print a cross pattern using stars.
15. Print a star pattern that forms a diamond inside a square.
16. Print a zigzag pattern of stars.
17. Print a circle-like pattern using stars.
18. Print a star pattern that alternates between stars and hashes.
19. Print an arrow pattern using stars.
20. Print a pattern of stars that forms the letter "A."
21. Print a heart shape using stars.
22. Print a pattern of stars with decreasing spaces between them.
23. Print a pattern that forms the letter "X" using stars.
24. Print a spiral pattern using stars.
25. Print a pattern that forms a triangle pointing downwards.
26. Print a checkerboard pattern using stars and spaces.
27. Print a "V" shape pattern using stars.

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28. Print a pattern where each line has increasing and then decreasing stars.
29. Print a star pattern that forms a zigzag.
30. Print a pattern that forms the outline of a box using stars.

Number Patterns

1. Print the first n Fibonacci numbers.
2. Print a series of squares of the first n natural numbers.
3. Print a series of cubes of the first n natural numbers.
4. Print an arithmetic series given a starting number and common difference.
5. Print a geometric series given a starting number and common ratio.
6. Print prime numbers up to n.
7. Print the first n odd numbers.
8. Print the first n even numbers.
9. Print the triangular numbers up to n.
10. Print the factorial of numbers from 1 to n.
11. Print a pattern of numbers in ascending order.
12. Print a pattern of numbers in descending order.
13. Print a sequence of alternating odd and even numbers.
14. Print a number pattern that forms a triangle.
15. Print a pattern that includes the multiplication table of a number.
16. Print a series of numbers that represent the binary equivalent of the first n numbers.
17. Print a number pyramid.
18. Print a series of numbers where each row contains consecutive numbers starting from 1.
19. Print a diamond pattern with numbers in increasing and decreasing order.
20. Print a pyramid of numbers with numbers increasing up to the middle and then decreasing.
21. Print a Floyd's triangle of numbers.
22. Print a pattern with numbers that form a reverse triangle.
23. Print a pattern where each row contains consecutive numbers starting from n down to 1.
24. Print a number pattern in which the digits repeat for the same row (e.g., 1, 22, 333...).

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25. Print a pattern of alternating ones and zeros in each row.
26. Print a spiral pattern using consecutive numbers.
27. Print a pattern of consecutive numbers forming a rectangle.
28. Print a Pascal's triangle pattern.
29. Print a number pattern in which each row starts from the number of that row (e.g., 1, 23, 345...).
30. Print a pattern of numbers forming a step shape.

Functions Questions

1. Write a function to calculate the factorial of a number.
2. Create a function to check if a number is prime.
3. Write a function that returns the largest of three numbers.
4. Create a function to find the GCD of two numbers using recursion.
5. Write a function that checks if a string is a palindrome.
6. Create a function to convert temperature from Celsius to Fahrenheit.
7. Write a function that calculates the sum of an array.
8. Create a function to reverse a string.
9. Write a function to count the number of vowels in a string.
10. Create a function to find the minimum in an array.
11. Write a function that generates the Fibonacci series up to n terms.
12. Create a function that calculates the area of a rectangle.
13. Write a function that sorts an array of integers using selection sort.
14. Create a function that merges two sorted arrays.
15. Write a function that removes duplicates from an array.
16. Create a function that finds the second largest number in an array.
17. Write a function that checks if a number is an Armstrong number.
18. Create a function that returns the reverse of a number.
19. Write a function to find the length of a string without using built-in functions.
20. Create a function that calculates the power of a number.
21. Write a function to print a pattern of stars.
22. Create a function that counts the number of digits in a number.
23. Write a function to swap two numbers using pointers.
24. Create a function that calculates the sum of the first n natural numbers.

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25. Write a function that returns the maximum element in an array.
26. Create a function that checks if two strings are anagrams.
27. Write a function that performs matrix addition.
28. Create a function that returns the unique elements from an array.
29. Write a function to implement a simple calculator.
30. Create a function that checks if a number is a perfect square.

Array Questions

1. Write a program to find the largest element in an array.
2. Create a program to find the smallest element in an array.
3. Write a program to calculate the average of elements in an array.
4. Create a program to reverse the elements of an array.
5. Write a program to sort an array in ascending order using bubble sort.
6. Create a program that merges two arrays into one.
7. Write a program that removes duplicates from an array.
8. Create a program to count occurrences of a specific element in an array.
9. Write a program that rotates an array to the left by k positions.
10. Create a program that rotates an array to the right by k positions.
11. Write a program to find the intersection of two arrays.
12. Create a program that finds the union of two arrays.
13. Write a program to check if an array is a palindrome.
14. Create a program that finds the missing number in an array of n-1 integers.
15. Write a program to implement linear search in an array.
16. Create a program to implement binary search in a sorted array.
17. Write a program to find the second largest element in an array.
18. Create a program that counts the number of even and odd numbers in an array.
19. Write a program to find the sum of all elements in an array.
20. Create a program that finds the maximum difference between two elements in an array.
21. Write a program to implement a 2D array and perform operations like addition and subtraction.
22. Create a program that transposes a matrix.
23. Write a program that checks if two arrays are equal.
24. Create a program that duplicates an array.

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25. Write a program that rotates a 2D matrix 90 degrees clockwise.
26. Create a program that finds the largest sum of a contiguous subarray.
27. Write a program that implements selection sort on an array.
28. Create a program that implements insertion sort on an array.
29. Write a program that finds common elements between two arrays.
30. Create a program that counts how many times a number appears in an array.

2D Array Questions

1. Write a program to initialize a 2D array and print its elements.
2. Create a program that calculates the sum of all elements in a 2D array.
3. Write a program that finds the maximum element in a 2D array.
4. Create a program that transposes a 2D array.
5. Write a program to multiply two matrices.
6. Create a program to add two matrices.
7. Write a program that checks if a 2D array is symmetric.
8. Create a program that finds the row with the maximum sum in a 2D array.
9. Write a program that finds the column with the maximum sum in a 2D array.
10. Create a program that fills a 2D array with random numbers and prints it.
11. Write a program that searches for an element in a 2D array.
12. Create a program that rotates a 2D array clockwise.
13. Write a program to implement matrix subtraction.
14. Create a program that checks if a 2D array is a magic square.
15. Write a program that counts the number of negative elements in a 2D array.
16. Create a program that replaces all even elements in a 2D array with zero.
17. Write a program to find the diagonal elements of a 2D array.
18. Create a program that creates a 2D identity matrix.
19. Write a program that finds the sum of each row in a 2D array.
20. Create a program that finds the sum of each column in a 2D array.
21. Write a program to create a 2D array that represents a chessboard.
22. Create a program that flattens a 2D array into a 1D array.
23. Write a program to print a specific row of a 2D array.
24. Create a program that prints a specific column of a 2D array.
25. Write a program that finds the maximum element in each row of a 2D array.

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26. Create a program that checks for duplicate elements in a 2D array.
27. Write a program to shift all elements of a 2D array to the right.
28. Create a program to create a spiral pattern in a 2D array.
29. Write a program that mirrors a 2D array along its diagonal.
30. Create a program to calculate the determinant of a 2x2 matrix.

Pointer Questions

1. Write a program to swap two numbers using pointers.
2. Create a program that uses pointers to find the length of a string.
3. Write a program to pass an array to a function using pointers.
4. Create a program that allocates memory for an array using pointers.
5. Write a program that demonstrates pointer arithmetic.
6. Create a program that uses pointers to find the largest element in an array.
7. Write a program that implements a simple dynamic array using pointers.
8. Create a program that uses pointers to reverse a string.
9. Write a program to demonstrate the use of double pointers.
10. Create a program that swaps the values of two pointers.
11. Write a program that uses a pointer to find the factorial of a number.
12. Create a program that dynamically allocates memory for a 2D array.
13. Write a program that implements a linked list using pointers.
14. Create a program that finds the sum of elements in an array using pointers.
15. Write a program to demonstrate the difference between pointers and references.
16. Create a program that uses pointers to count vowels in a string.
17. Write a program that concatenates two strings using pointers.
18. Create a program that uses pointers to find the maximum and minimum elements in an array.
19. Write a program that implements a queue using pointers.
20. Create a program that uses a pointer to return multiple values from a function.
21. Write a program that demonstrates the use of pointers with structures.
22. Create a program that finds the common elements of two arrays using pointers.
23. Write a program that uses pointers to copy one string to another.
24. Create a program to demonstrate the use of function pointers.
25. Write a program that uses pointers to implement a stack.

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26. Create a program that implements a binary tree using pointers.
27. Write a program to allocate and deallocate memory using pointers.
28. Create a program that uses pointers to sort an array.
29. Write a program to find the length of a dynamically allocated string using pointers.
30. Create a program that implements a simple hash table using pointers.

String Questions

1. Write a program to count the number of characters in a string.
2. Create a program to reverse a string.
3. Write a program to check if a string is a palindrome.
4. Create a program that concatenates two strings.
5. Write a program to compare two strings lexicographically.
6. Create a program that converts a string to uppercase.
7. Write a program that converts a string to lowercase.
8. Create a program that counts the number of vowels in a string.
9. Write a program that finds the first occurrence of a character in a string.
10. Create a program that removes whitespace from a string.
11. Write a program to split a string into words.
12. Create a program that replaces a character in a string with another character.
13. Write a program that finds the length of a substring.
14. Create a program that checks if two strings are anagrams.
15. Write a program that finds the longest word in a string.
16. Create a program that checks if a string contains only digits.
17. Write a program that counts the number of words in a string.
18. Create a program that implements string tokenization using a delimiter.
19. Write a program that checks if a string ends with a specific substring.
20. Create a program that reverses the order of words in a string.

Recursion Questions

1. **Factorial Calculation**: Write a recursive function to calculate the factorial of a given integer.

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2. **Fibonacci Sequence**: Create a recursive function that returns the n-th Fibonacci number.
3. **Sum of Digits**: Implement a recursive function that calculates the sum of the digits of a given integer.
4. **Power Function**: Write a recursive function to compute the power of a number (base raised to exponent).
5. **Reverse a String**: Create a recursive function that reverses a given string.
6. **Palindrome Check**: Implement a recursive function to check if a given string is a palindrome.
7. **Count Vowels**: Write a recursive function that counts the number of vowels in a string.
8. **GCD of Two Numbers**: Create a recursive function to find the greatest common divisor (GCD) of two numbers using the Euclidean algorithm.
9. **Decimal to Binary Conversion**: Write a recursive function to convert a decimal number to binary.
10. **N-th Triangular Number**: Create a recursive function to find the n-th triangular number.
11. **Count Digits**: Write a recursive function that counts the number of digits in a given integer.
12. **Reverse an Array**: Implement a recursive function that reverses an array of integers.
13. **Count Consonants**: Create a recursive function that counts the number of consonants in a string.
14. **String Length**: Write a recursive function to calculate the length of a string.
15. **Multiply Two Numbers**: Implement a recursive function to multiply two numbers without using the multiplication operator.
16. **Check if Number is Prime**: Write a recursive function to check if a number is prime.
17. **Remove All Occurrences of a Character**: Create a recursive function to remove all occurrences of a specific character from a string.
18. **Sum of Array Elements**: Write a recursive function to calculate the sum of elements in an integer array.
19. **Print Natural Numbers**: Create a recursive function that prints all natural numbers from 1 to n.
20. **N-th Odd Number**: Write a recursive function to find the n-th odd number.

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