Instruction

- Each student must complete **three** exercises from **three different topics** (Type-A, Type-B, or Type-C), assigned randomly. (Refer to the assignment list.)
- **Basic requirement:** The student must be able to program according to the exercise's requirements.
- **Advanced requirement:** The student must be able to handle possible exceptions.

Submission Instruction: Each student prepares and submits a report, including:

- **Source code** (asm) the three exercises, with clear comments and explanation in the source code.

to the "*Midterm Exam Report*" assignment on Teams.

Note: Students should name their file as: **MSSV_NguyenVanA_x_y.asm** and (where x represents topics A, B, or C, and y is the exercise number corresponding to the topic).

Midterm Exercises

Type-A. Integer Numbers

1. Enter a positive integer N from the keyboard, print all the positive integers less than N that are divisible by 3 or 5.
2. Enter a positive integer N from the keyboard, print out the Fibonacci numbers less than N.
3. Write a function to check if a number is a prime number. Then enter two positive integers M and N from the keyboard, print out all the prime numbers between M and N.
4. A perfect number is a number that equals the sum of its divisors excluding itself. Write a function to check if a number is a perfect number. Enter a positive integer N from the keyboard, print out all the perfect numbers less than N.
5. A number is called a lucky number if the sum of the digits in its left half equals the sum of the digits in its right half. Enter a positive integer N from the keyboard, check if the number is a lucky number.

6. Enter a positive integer N from the keyboard, print out the sum of the digits in the binary representation of N.
7. Write a function to check if a number is a perfect square. Then enter a positive integer N from the keyboard, print out all the square numbers (or perfect squares) less than N.
8. Enter a positive integer N (with at least 3 digits) from the keyboard. Print out the largest digit of N.
9. Enter a positive integer N (with at least 3 digits) from the keyboard. Print out the smallest digit of N.
10. Enter a positive integer N (with at least 3 digits) from the keyboard. Print out the number formed by reversing the digits of N.
11. Enter a positive integer N (with at least 5 digits) from the keyboard, print out the sum of odd digits and the sum of even digits of N.
12. Enter a positive integer N (with at least 2 digits) from the keyboard, print out the octal representation of N.
13. Enter three positive integers A, B, and C from the keyboard. Check if A, B, and C are the sides of a triangle. If they form a triangle, check if it is an isosceles triangle.
14. Enter three positive integers A, B, and C from the keyboard. Check if A, B, and C are the sides of a triangle. If they form a triangle, check if it is a right triangle.
15. Enter two positive integers M and N from the keyboard. Print out the greatest common divisor (GCD) of M and N.
16. Enter two positive integers M and N from the keyboard. Print out the least common multiple (LCM) of M and N.
17. Enter two positive integers M and N from the keyboard (M is greater than N). Find and print out the largest integer divisible by N and less than M.
18. Enter two positive integers M and N from the keyboard (M is greater than N). Find and print out the smallest integer that is a divisor of M and greater than N.
19. Enter a positive integer N from the keyboard, print out the smallest prime number greater than N.

20. Enter a positive integer N from the keyboard, print out the smallest perfect square greater than N.
21. Enter a positive integer N from the keyboard, print out the largest power of 2 less than N.

Type-B. Arrays

"Enter an array of integers" involves entering the number of elements and the elements themselves.

1. Enter an array of integers from the keyboard. Count the elements of the array that lie within the range (M, N), where M and N are two integers entered from the keyboard.
2. Enter an array of integers from the keyboard. Count the elements of the array that lie outside the range (M, N), where M and N are two integers entered from the keyboard.
3. Enter an array of integers from the keyboard. Print out the pair of adjacent elements with the largest product. For instance, enter the array [3, 6, -2, -5, 7, 3], the adjacent pair with the largest product is 7 and 3.
4. Enter an array of integers from the keyboard. Print out the pair of adjacent elements with the smallest sum. For instance, enter the array [3, 6, -2, -5, 7, 3], the adjacent pair with the smallest sum is -2 and -5.
5. Enter an array from the keyboard. Sort the positive elements in ascending order while keeping the rest in their original positions. For instance, enter the array [-1, 150, 190, 170, -2, -3, 160, 180], the result after sorting is [-1, 150, 160, 170, -2, -3, 180, 190].
6. Enter an array from the keyboard. Sort the negative elements in descending order while keeping the rest in their original positions. For instance, enter the array [-1, 4, -3, -2, 2, 5, 6, -4], the result after sorting is [-1, 4, -2, -3, 2, 5, 6, -4].
7. Enter an array of integers from the keyboard. Print out the sum of the negative elements and the sum of the positive elements in the array.
8. Enter an array of integers from the keyboard. Print out the sum of the even elements and the sum of the odd elements in the array.

9. Enter an array of integers from the keyboard. Print out the position and value of the two smallest positive elements in the array.
10. Enter an array of integers from the keyboard. Print out the position and value of the two largest negative elements in the array.
11. Enter an array of integers and a number K from the keyboard. Delete the element at position K from the array.
12. Enter an array of integers and a number M from the keyboard. Assume the array is sorted in ascending order. Insert the integer M into the array while maintaining the ascending order.
13. Enter an array of integers from the keyboard. Print out the number of distinct elements in the array.
14. Enter an array of integers from the keyboard. Print out the element that appears the most in the array.
15. Enter an array of integers from the keyboard. Print out the element that appears the least in the array.
16. Enter an array of integers from the keyboard. Sort the array so that positive numbers come first in ascending order, and negative numbers come last in descending order.
17. Enter an array of integers from the keyboard. Print out the largest even number that is smaller than all the odd numbers in the array.
18. Enter an array of integers from the keyboard. Print out the smallest odd number that is greater than all the even numbers in the array.

Type-C. Strings

1. Enter a string, check if it is a palindrome. For instance, “abc121cba” is a palindrome.
2. Enter a string, print out the distinct characters in the string.
3. Enter a string, print out the shortest word in the string. Assume there is only one space between words and no space at the beginning or end of the string.
4. Enter a string, print out the longest word in the string. Assume there is only one space between words and no space at the beginning or end of the string.

5. Enter a string, print out the most frequent uppercase letter ('A' to 'Z') in the string and its positions.
6. Enter a string, print out the least frequent lowercase letter ('a' to 'z') in the string and its positions.
7. Enter two strings S1 and S2, check if S2 is a substring of S1.
8. Enter a string and a character C from the keyboard. Print the occurrence of character C in the string (case-insensitive).
9. Enter a string, convert the first letter of each word to uppercase and the remaining letters to lowercase. For instance, enter the string “xIn chAO cac bAn”, then the result is “Xin Chao Cac Ban”.
10. Enter two strings S1 and S2, check if they are the same (case-insensitive). For instance, S1 = “xin Chao 2023”, s2 = “XIN chao 2023”, then the two strings are the same.
11. Enter a string, reverse the words in the string. For instance, enter the string “Hello World”, then the result is “olleH dlroW”.
12. Enter a string, convert the uppercase letters to lowercase and the lowercase letters to uppercase. All other characters remain unchanged. For instance, enter the string “xIn chAO 2023”, then the result is “XiN Chao 2023”.
13. Enter two strings A and B, print out the lowercase letters that appear in A but do not in B.
14. Enter two strings A and B, print out the uppercase letters that appear in both A and B.
15. Enter two strings A and B, print out the digits that do not appear in either A or B.
