Programming Assignment: For Loops

Student Name: _____

Date: _____

Total Points: 100

> **Instructions:** Complete all problems in order. Each section builds upon the previous one. Show your code and test it with different inputs. Write comments to explain your logic. You may use conditional statements (if/elif/else) in combination with for loops where needed.

Section 1: Basic For Loops with range() (20 points)

Problem 1.1 (5 points)

Write a program that prints numbers from 1 to 10, each on a new line.

Expected Output:

```
1
2
3
4
5
6
7
8
```

```
9
10
```

Problem 1.2 (5 points)

Write a program that prints all even numbers from 2 to 20.

> ***Hint:*** *Use range(start, stop, step) with step=2*

Problem 1.3 (5 points)

Write a program that prints numbers from 10 down to 1 (countdown).

Expected Output:

```
10
9
8
...
1
```

Problem 1.4 (5 points)

Write a program that prints the first 5 multiples of 7.

Expected Output:

```
7
14
21
```

```
28
35
```

Section 2: Loops with Calculations (20 points)

Problem 2.1 (5 points)

Write a program that calculates the sum of numbers from 1 to 100 using a for loop.

Expected Output:

```
The sum is: 5050
```

Problem 2.2 (5 points)

Write a program that calculates the factorial of a number entered by the user.

Example: 5! = 5 × 4 × 3 × 2 × 1 = 120

> ***Hint:*** *Start with result = 1, then multiply in the loop*

Problem 2.3 (5 points)

Write a program that asks the user for a number and calculates the sum of all even numbers from 1 to that number.

Problem 2.4 (5 points)

Write a program that prints the multiplication table for a number entered by the user (from 1 to 10).

Expected Output (for input 5):

```
5 x 1 = 5
5 x 2 = 10
5 x 3 = 15
...
5 x 10 = 50
```

Section 3: For Loops with Strings (20 points)

Problem 3.1 (5 points)

Write a program that asks the user for their name and prints each letter on a separate line.

Expected Output (for "Sam"):

```
S
a
m
```

Problem 3.2 (5 points)

Write a program that counts the number of vowels (a, e, i, o, u) in a word entered by the user.

> ***Hint:*** *Use a counter variable and if statements inside the loop*

Problem 3.3 (5 points)

Write a program that asks for a sentence and counts how many spaces are in it.

Problem 3.4 (5 points)

Write a program that reverses a word entered by the user using a for loop.

Expected Output (for "hello"):

```
olleh
```

Section 4: For Loops with Conditionals (25 points)

Problem 4.1 (6 points)

Write a program that prints all numbers from 1 to 50, but:

- For multiples of 3, print "Fizz" instead of the number
- For multiples of 5, print "Buzz" instead of the number
- For multiples of both 3 and 5, print "FizzBuzz"

Expected Output (first 15 numbers):

```
1
2
Fizz
4
```

```
Buzz
Fizz
7
8
Fizz
Buzz
11
Fizz
13
14
FizzBuzz
```

Problem 4.2 (6 points)

Write a program that checks if a number entered by the user is prime or not.

> ***Hint:*** *Use a for loop to check if the number is divisible by any number from 2 to (number-1)*

Problem 4.3 (6 points)

Write a program that finds and prints all prime numbers between 1 and 50.

Problem 4.4 (7 points)

Write a program that asks the user for a positive integer and determines if it's a perfect number. A perfect number is equal to the sum of its proper divisors (excluding itself).

Example: 6 is perfect because 6 = 1 + 2 + 3

Section 5: Nested For Loops (15 points)

Problem 5.1 (5 points)

Write a program that prints a rectangle pattern of stars based on user input for width and height.

Expected Output (width=5, height=3):

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

Problem 5.2 (5 points)

Write a program that prints a right triangle pattern of numbers.

Expected Output (for 5 rows):

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

Problem 5.3 (5 points)

Write a program that prints a multiplication table from 1 to 10 (all tables from 1×1 to 10×10).

Expected Output (first few lines):

```
1 x 1 = 1
1 x 2 = 2
...
2 x 1 = 2
2 x 2 = 4
...
```

Bonus Challenges (15 extra points)

Bonus 1: Fibonacci Sequence (7 points)

Write a program that generates the first N numbers of the Fibonacci sequence, where N is entered by the user.

Fibonacci sequence: 0, 1, 1, 2, 3, 5, 8, 13, 21...

> ***Hint:*** *Each number is the sum of the previous two numbers*

Bonus 2: Diamond Pattern (8 points)

Write a program that prints a diamond pattern of stars. Ask the user for the size (must be odd number).

Expected Output (size=5):

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

```
***
*
```

Submission Checklist

Before submitting, make sure:

- ☐ All programs run without errors
- ☐ You've tested each program with at least 2-3 different inputs
- ☐ Your code includes comments explaining the logic
- ☐ Loop variables are named appropriately (i, j for simple counters, or descriptive names)
- ☐ You understand what range() does in each problem
- ☐ Nested loops are properly indented

Grading Rubric

Category	Points
Code runs correctly	50%
Proper use of for loops	25%
Code readability & comments	15%
Testing & verification	10%

Good luck! Remember: Think about what happens in each iteration of your loop!