**ITSE 1302: Computer Programming Python**

**Assignment: Ch4 Number Facts with Loops**

**Basic Program: Number Facts**

**Worth 50 points**

This lab requires you to think about the steps that take place in a program by writing algorithms. This lab one of the following:

* High level IPO Chart and pseudocode
* Hierarchy chart and pseudocode
* Hierarchy chart and detailed IPO Chart

**Program Summary:** Write a program that allows the user to enter a number between 1 and 1000. If the number is invalid, provide an error message and allow the user to try again until he enters a valid value.

Once you have a valid number, use it to determine and print the following information:

* Number squared: 36
* Number cubed: 216
* List of factor pairs:
  + (1, 6)
  + (2, 3)
  + (6, 1)
* Number Type: Odd or Even Prime (Exactly 2 factors) or Composite (More than 2 factors)

**Technical Requirements:**

* Include the program name, student heading and summary in comments at the beginning of your program
* Include comments throughout your program to explain logic
* Use a condition while loop that will cause the loop to execute if the number entered is not valid. The loop should provide feedback indicating that the number entered was invalid, and provide the user the opportunity to enter a different one.
* Use a counter loop of your choice to determine list of factors
* When determining the number characteristics, do not use any python mathematical functions like sqrt
* Match the sample output as closely as possible

**Sample Test Data:**

Please enter a positive integer less than 1,000: 12

Number Facts about 12:

Squared Value: 144

Cubed Value: 1,728

Factors: (1, 12)

(2, 6)

(3, 4)

(4, 3)

(6, 2)

(12, 1)

Type: Even composite number

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**Moderate Program: Number Facts**

**Worth 65 points**

**Program Summary:** Write a program that allows the user to enter a number between 1 and 999. If the number is invalid, provide an error message and allow the user to try again until he enters a valid value.

Once you have a valid number, use it to determine and print the following information:

Number is 6

Number squared: 36

* Number cubed: 216
* List of factor pairs:
  + (1, 6)
  + (2, 3)
  + (6, 1)
* Number Type: Even composite number  
  *Odd or Even Prime (Exactly 2 factors) or Composite (More than 2 factors)*
* Whether the number is a perfect square: No *(6 does not have an integer square root like 4 or 9)*
* Square Root: (*Print this line only if the number is perfect square*)

**Technical Requirements:**

* Include the program name, student heading and summary in comments at the beginning of your program
* Include comments throughout your program to explain the logic
* Use a condition while loop that will cause the loop to execute if the number entered is not valid. The loop should provide feedback indicating that the number entered was invalid, and provide the user the opportunity to enter a different one.
* Use a counter loop of your choice to determine list of factors
* When determining the number characteristics, do not use any python mathematical functions like sqrt
* Match the sample output as closely as possible

**Test Data:**

Sample Output:

Please enter a positive integer: 12

Number Facts about 12:

Squared Value: 144

Cubed Value: 1,728

Factors: (1, 12)

(2, 6)

(3, 4)

(4, 3)

(6, 2)

(12, 1)

Type: Even composite number

Perfect Square: No

Please enter a positive integer: 9

Number Facts about 9:

Squared Value: 81

Cubed Value: 729

Factors:

(1, 9)

(3, 3)

(9, 1)

Type: Odd composite number

Perfect Square: Yes

Square Root: 3

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**Advanced Program: Number Facts**

**Worth 80 points**

**Program Summary:** Write a program that allows the user to enter a number between 1 and 1000. If the number is invalid, provide an error message and allow the user to try again until he enters a valid value.

Once you have a valid number, use it to determine and print the following information:

*\*Note that in the list of factor pairs, you should not include duplicates.*

* Number squared
* Number cubed
* Number Type: Even composite number  
  *Odd or Even Prime (Exactly 2 factors) or Composite (More than 2 factors)*
* Whether the number is a perfect square: No *(6 does not have an integer square root like 4 or 9)*
* Square Root: (*Print this line only if the number is perfect square*)
* List of factors that exclude duplicates and are printed horizontally on a single line  
  Factors: (1, 12) (2, 6) (3, 4)   
  *(4, 3) (6, 2) (12, 1) should not be included*

**Technical Requirements:**

* Include the program name, student heading and summary in comments at the beginning of your program
* Include comments throughout your program to explain the logic
* Use a condition while loop that will cause the loop to execute if the number entered is not valid. The loop should provide feedback indicating that the number entered was invalid, and provide the user the opportunity to enter a different one.
* Use a counter loop of your choice to determine list of factors
* When determining the number characteristics, do not use any python mathematical functions like sqrt
* Match the sample output as closely as possible

**Sample Test Data:**

Please enter a positive integer: 12

Number Facts about 12:

Squared Value: 144

Cubed Value: 1,728

Factors: : (1, 12) (2, 6) (3, 4)

Type: Even composite number

Perfect Square: No

Please enter a positive integer: 9

Number Facts about 9:

Squared Value: 81

Cubed Value: 729

Factors: (1, 9) (3, 3)

Type: Odd composite number

Perfect Square: Yes

Square Root: 3

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