Base Notation

Background

Base-10 or the *decimal* number system is a frequently used notation for writing numbers. Base-10 makes use of the symbols (digits) \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}. On the other hand, computers use of the binary number system or base-2 to represent numbers. The symbols \{0, 1\} are the only digits used in base-2. More generally, a number in base-\(n\) uses the first \(n\) symbols in the sequence \(0, 1, 2, \ldots, 9, A, B, C, \ldots, Z\). For example, base-16 uses the symbols \(0, 1, 2, \ldots, 9, A, B, C, D, E, F\) where A represents the value 10, B represents 11, and so on.

Problem Statement

Given integer \(D\) \((0 \leq D < 10^{12})\) and integer \(b\) \((16 \geq b > 1)\), write a program to compute the following:

- base-\(b\) representation of \(D\).
- whether or not the base-\(b\) representation of \(D\) is a palindrome*.

The integers read from standard input are in base-10 notation.

* A palindrome is a sequence of characters that reads the same when starting from either the first or last character. For example:
  
madam, BOB, 12121 are palindromes.

Sample Program Operation

User input is colored green.

Sample Instance 1

Enter a non-negative decimal Integer : **111**
Convert to Base ? **11**

Base-11 representation of 111 : A1
A1 is not a palindrome.

Sample Instance 2

Enter a non-negative decimal Integer : **15**
Convert to Base ? **16**

Base-16 representation of 15 : F
F is a palindrome.
Grading Criteria

- The program compiles. If the program does not compile no further grading can be accomplished. Programs that do not compile will receive a zero.
- (15 Points) The program executes without exception and produces output. The grading of the output cannot be accomplished unless the program executes.
- (30 Points) Correct conversion to user specified base.
- (30 Points) Correct identification of palindromes.
- (5 Points) The program is documented (commented) properly.
- (5 Points) Proper indentation.
- (5 Points) Descriptive and consistent naming standards followed.
- (10 Points) Variable declarations
  - Variables' scope is reasonably constrained (e.g., your program should not have global variables)
  - Type of variables (e.g., use constant when value of variable should not change)

Concepts Tested

Arithmetic, Strings, Comparison, Loops, etc.