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, ..., 9, A, B, C, ..., Z). For example, base-16 uses the symbols (0, 1, 2, ..., 9, A, B, C, D, E, F) where A represents the value 10, B represents 11, and so on.

Problem Statement

Given integer **D** ($0 \le \mathbf{D} < 10^{12}$) and integer **b** ($16 \ge \mathbf{b} > 1$), 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.