

Due 3/28¹

CSC 236 - Lab 4 (3 programs) stacks

1. For a given integer $n > 1$, the smallest integer $d > 1$ that divides n is a prime factor. We can find the prime factorization of n if we find d and then replace n by the quotient of n divided by d , repeating this until n becomes 1. Write a java program that uses a stack to print the prime factors of a positive integer in descending order. For example, for $n = 3960$, your program should produce

$11 * 5 * 3 * 3 * 2 * 2 * 2$

2. A stack can be used to print numbers in other bases (multibase output).

Examples:

a) (Base₈) $28_{10} = 3 * 8^1 + 4 * 8^0 = 34_8$

b) (Base₄) $72_{10} = 1 * 4^3 + 0 * 4^2 + 2 * 4^1 + 0 * 4^0 = 1020_4$

c) (Base₂) $53_{10} = 1 * 2^5 + 1 * 2^4 + 0 * 2^3 + 1 * 2^2 + 0 * 2^1 + 1 * 2^0 = 110101_2$

Write a java program using stacks that takes 3 non-negative (base 10) long integer numbers and a base B (B is in the range 2-9) and writes the number to the screen as a base B number. The program prompts the user for 3 numbers and bases, and then outputs them.

Use as input:

a) 72_{10} Base 4

b) 53_{10} Base 2

c) 3553_{10} Base 8

1. LL-based

2. array-based

3. LL-based

$72_{10} = 6 * 8^1 + 7 * 8^0 = 67_8$

$3553_{10} = 3 * 8^3 + 5 * 8^2 + 5 * 8^1 + 3 * 8^0 = 3553_8$

3. A palindrome is a string that reads the same forward and backward, i.e., the letters are the same whether you read them from right to left or from left to right.

Examples:

- a) radar → is a palindrome
- b) Able was I ere I saw Elba → is a palindrome
- c) good → not a palindrome

Write a java program to read a line of text and tell if the line is a palindrome. Use a stack to read each non-blank character on a stack. Treat both upper-case and lower-case version of the letter as being the same character.

- Provide these 5 sample outputs and tell if each is a palindrome or not.

Too bad--I hid a boot ✓

Some men interpret eight memos X

"Go Hang a Salami! I'm a Lasagna Hog" ✓

(title of a book on palindromes by Jon Agee, 1991) X

A man, a plan, a canal—Panama ✓

Gateman sees my name, garageman sees name tag X 7