

COMP 10280

Programming I (Conversion)

Practical Sheet 17
Tuesday, 15 October 2019

For each of the following questions, write an algorithm in pseudocode first before writing a Python program. Submit your algorithms in pseudocode as well as your Python programs.

When writing functions, use one-line or multi-line docstrings, as appropriate, to document your functions.

1. Two suggested optimisations for the algorithm to calculate the divisors of a number are to initialise the divisors tuple to include 1 and the number itself and to only search from 2 and as far as half of the number. Revise the solution on Pages 14–17 of the slides to include these optimisations.

Save this program as p17p1.py.

2. Using your solution for the previous question as a guide, implement a optimised solution for calculating the common divisors of two numbers.

Save this program as p17p2.py.

3. Write a Python program that checks whether the strings “cat” and “dog” appear the same number of times in a given string input by the user.

Save this program as p17p3.py.

4. Implement the recursive solution presented in lectures for checking whether given strings input by the user are palindromes.

Save this program as p17p4.py.

5. Implement a variation of the palindrome program that prints out messages to allow you to trace how it works. For example, modify the `isPal` function as follows:

```
def isPal(s):
    """Checks whether the string s is a palindrome

    Assumes that s is a str with only lowercase letters and no non-letters.
    Returns True if s is a palindrome;
    Returns False otherwise.
    Recursive function.
    Has print statements to trace its operation."""
    print 'isPal function called with argument', s
    if len(s) <= 1:
        # A palindrome of length 0 or 1 is a palindrome
        print 'About to return True from isPal from the base case'
        return True
    else:
        # Compare the first and the last letters and check the remainder of the string
        result = s[0] == s[-1] and isPal(s[1:-1])
        print 'About to return result', result, 'from isPal with argument', s
        return result
```

Ensure you understand how this works.

Save this program as p17p5.py.

**Please upload your work to
the Brightspace site before Thursday
evening.**

**You should keep a copy of your programs
for your portfolio.**