Computer Programming Olympiad

A project of the Institute of IT Professionals South Africa

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Programming Olympiad 2019: Round 1

Not to be used before 29 July 2019

1. This paper is for ALL participants.
2. All OFFLINE answers must be **TYPED** or **PASTED** on your Answer Sheet. Handwritten Answer Sheets will be disqualified.
3. All ONLINE answers must be submitted on the competition website that you received with your login.
4. Each correct answer for question 1 and question 2.1 earns four (4) marks while each correct answer for question 2.2 and question 3 earns eight (8) marks.
5. You have 60 minutes to attempt as many questions as possible.
6. Programs should be readable, concise, and use appropriate variable names.
7. Indicate the question, your name, surname, and the language and version used in a comment statement at the start of every program, e.g. "***Q3 Sam King, Python 2.7***"
8. You may assume that the user input will satisfy the problem specification and so you do not need to validate the input.
9. Do not write code to produce only specific answers, as the external judges may use other test cases.
10. After the contest you may be given time to print out your Answer Sheet (only OFFLINE participants). Do not make any changes during this time.
11. Make sure you save the programs you have created as well as the Answer Sheet in a place where your teacher can find them.
12. **DO NOT MODIFY ANY FILES AFTER THE END OF THE CONTEST AS THIS WILL LEAD TO YOUR DISQUALIFICATION**.
13. **USE OF THE WEBSITE:** Any attempt to access any other website or source of information during the competition will disqualify you.
14. Results will be sent to schools after 2 Aug.

Question 1: Triangle Types

Sipho needs your help distinguishing between different types of triangles. Given three angles, given as three positive integers in degrees, you must first determine if they constitute the angles of a triangle. Note that the angles in a triangle must add up to 180°. If the angles form a triangle, you must then determine if it is an **equilateral**, **isosceles**, or **scalene** triangle.

Write a program that, when given three angles, determines what type of triangle they make. If no triangle can be made with the given angles, output "`IMPOSSIBLE`". Otherwise, if it makes an equilateral, isosceles, or scalene triangle, output "`EQUILATERAL`", "`ISOSCELES`", or "`SCALENE`" respectively (without quotation marks).

Note: An **equilateral** triangle has all three angles equal, an **isosceles** triangle has only two angles equal and a **scalene** triangle has three different angles.

Examples:

Input: `30 60 70` Output: `IMPOSSIBLE`

Input: `40 40 100` Output: `ISOSCELES`
Input: `50 60 70` Output: `SCALENE`

Test your program with the following cases:

a) `60 60 60`
b) `80 20 80`
c) `75 34 12`
d) `79 23 78`

Question 2.1: Prime Numbers

Prime numbers form a fundamental part of mathematics. Recall that a prime number is a positive integer greater than 1 and which is divisible only by itself and 1. The first five prime numbers are 2, 3, 5, 7 and 11.

Given a positive integer n, write a program which outputs the n-th prime number. n

Examples:

Input: `3` Output: `5`
Input: `10` Output: `29`
Input: `15` Output: `47`

Test your program with the following cases: *Give your answer as a number only with no spaces, e.g. 1234*

a) `30`
b) `101`
c) `12321`

Question 2.2: Right-truncatable Primes

Mathematicians have defined many different types of prime numbers. Examples include *balanced* primes, *lucky* primes, and even *strobogrammatic* primes!
We define a **right-truncatable prime** as a prime number such that, if the rightmost digit is successively removed, then all the resulting numbers are prime. For example, 7393 is a right-truncatable prime number, since 7393, 739, 73 and 7 are all prime.

Given a positive integer n, write a program which outputs the n-th right-truncatable prime number, starting from 2. For example, the first four right-truncatable prime numbers are 2, 3, 5, and 7. However, since 1 is not prime, the prime numbers following these, viz. 11, 13, 17, and 19, are not right-truncatable prime numbers. The fifth right-truncatable prime is therefore 23 (since both 23 and 2 are prime).

Examples:

Input: `1` Output: `2`
Input: `5` Output: `23`
Input: `10` Output: `59`

Test your program with the following cases: *Give your answer as a number only with no spaces, e.g. 1234*

a) `15`
b) `20`
c) `30`
d) `50`

Question 3: Digit Word

A **digit word** is a word where, after possibly removing some letters, you are left with one of the single digits: "`ONE`", "`TWO`", "`THREE`", "`FOUR`", "`FIVE`", "`SIX`", "`SEVEN`", "`EIGHT`" or "`NINE`". For example, the word "`BOUNCE`" is a digit word as it becomes "`ONE`" after removing the letters '`B`', '`U`', and '`C`'. The word "`ENCODE`" contains the letters '`O`', '`N`', and '`E`', but not in the correct order, therefore it is not a digit word.

Write a program that, when given a word W containing only uppercase letters of the alphabet, determines if it is a digit word. If W is not a digit word, output the single word "`NONE`". Otherwise, output the English name of the **lowest** digit which W contains in uppercase. For example, if W contains both "`ONE`" and "`EIGHT`", then output "`ONE`" (without quotation marks).

Examples:

Input: `BOUNCE` Output: `ONE`
Input: `ENCODE` Output: `NONE`
Input: `SPHINX` Output: `SIX`
Input: `FOUNDER` Output: `ONE`

(note that `FOUNDER` also contains `FOUR`, but `ONE` is less than `FOUR`)

Test your program with the following cases:

a) `TWOSEVENFIVE`
b) `TELECOMMUNICATIONS`
c) `ZUEXNIMTDJFDJIHSBDRSJDENNBXCSE`
d) `XEULVFMAATXXZOIFRZCMUQSGHAVXCJUJ HXAXOPVZJTD`
e) `ZLXQMVBEHHEPTJDNIBCREPLLGUSJCPXA NBJIQYJYJPCYGAVWBPNYGE`