Programming Olympiad 2016 : Round 1
Not to be used before 1 August 2016

1. This paper is for ALL candidates.
2. All answers must be **TYPED** or **PASTED** on your Answer Sheet. Handwritten Answer Sheets will be disqualified.
3. Each correct answer for questions 1, and 2 earns 8 marks; each correct answer for question 3 earns 9 marks.
4. You have 60 minutes to attempt as many questions as possible.
5. Programs should be readable, concise, and use appropriate variable names.
6. Indicate the question, your name, surname and the language and version used at the start of every program e.g. "*Q3 Sam King, Python 2.7*"
7. Save your program as Qn Name Surname e.g. *Q3 Sam King*
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. Do not make any changes.
11. Make sure you save the programs you have created and 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 DISQUALIFICATION**.

1. Speeding

Gauteng has introduced a system of measuring the speed of cars over distance. Write a program that will ask for a time in seconds and a distance in metres as input and will give the speed in km/h as output. Your program must discard fractions of a km (if any). For example, if the speed is 75.9 km/h your program must give 75 as the answer.

The speed for test case (d) was clocked by a special vehicle at Hakskeen Pan.

Examples:

Input: Time? 30 Distance? 1000
Output: 120

Input: Time? 4 Distance? 75
Output: 67

Test your program with the following and type or paste each answer in the correct block on your Answer Sheet (or in the correct block on your screen if you are taking part online).

a)   20 seconds, 800 metres
b)   90 seconds, 1800 metres
c)   5100 seconds, 168000 metres
d)   22 seconds, 7900 metres

2. Maths

Write a program that asks for a positive integer value N, then calculates all the factors of N (other than N itself) and adds them together to give the answer. A factor is a positive, whole number that divides N exactly. For example, the factors of 8 are 1, 2, and 4. The sum: 1 + 2 + 4 = 7

Examples:
Input: N? 8
Output: 7

Input: N? 12
Output: 16

Test your program with the following and type or paste each answer in the correct block on your Answer Sheet (or in the correct block on your screen if you are taking part online).

a) N= 6
b) N = 100
c) N = 30030
d) N = 119451

3. Encryption

The ACME Code Company has released their new encryption algorithm: Urgh^{TM}. To encrypt a message using the Urgh^{TM} algorithm is simple.

Each letter ends up *N* letters to the right of its original position, and the last *N* letters wrap around to the beginning. In addition the letters are replaced by letters *N* places further in the alphabet.

For example:
If you shift the word APPLE by *N=2* then it becomes LEAPP
If you then replace the letters by letters 2 places further in the alphabet, LEAPP becomes NGCRR

If you shift the word ENCRYPTION by *N=4* you get TIONENCRYP. If you then replace the letters by letters 4 places further in the alphabet, you get XMSRIRGVCT

Write a program that, given a word and the integer number *N*, will output the encrypted word.

Examples:
Input: Word? APPLE   N? 2
Output: NGCRR

Input: Word? ENCRYPTION   N? 4
Output: XMSRIRGVCT

Test your program with the following and type or paste each answer in the correct block on your Answer Sheet (or in the correct block on your screen if you are taking part online).

a) CAT   N = 1
b) ACT   N = 2
c) NEOAOQNL   N = 4
d) EMDVENZKCFUTJXUGKYSARH   N = 10