Computer Programming Olympiad

A project of the Institute of IT Professionals South Africa
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Programming Olympiad 2020: Round 1

Not to be used before 27 July 2020

1. This paper is for ALL participants.
2. All answers must be **TYPED** or **PASTED** in the appropriate place online.
3. All answers must be submitted on the competition website that you received with your login.
4. Each correct answer for question 1, question 2 and question 3 (a) and (b) earns eight (8) marks while each correct answer for question 3 (c) and (d) earns ten (10) 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, username and the language and version used in a comment statement at the start of every program, e.g. "***Q3 Sam King, username, 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. Make sure you upload your programs before you log off, and as an extra precaution, save the programs you have created in a place where your teacher can find them.
11. **DO NOT MODIFY ANY FILES AFTER THE END OF THE CONTEST AS THIS WILL LEAD TO YOUR DISQUALIFICATION**.
12. **USE OF OTHER WEBSITES:** Any attempt to access any other website or source of information during the competition will disqualify you.
13. Results will be sent to schools after 31 July.

Question 1 – Farmer and Legs

A farmer has chickens with 2 legs, cows with 4 legs, and bees with 6 legs on his farm. Write a program that, given the number of chickens, cows and bees, will output the total number of legs.

Input

3 space-separated integers, the number of chickens, cows, and bees, in that order.

E.g. 5 2 10 means 5 chickens, 2 cows and 10 bees.

Output

A single integer, the total number of legs.

E.g. 5 chickens, 2 cows and 10 bees give a total of 78 legs (10+8+60).

Examples:

Input	Output
5 2 10	78
3 0 7	48
2 11 13	126

Test your program with the following cases:

a) 5 8 1
b) 42 41 54
c) 625 946 958
d) 8330 1450 3957

Question 2 – How much wheat?

There is a row of tiles of length N. The tiles are alternatingly coloured black and white, with the first tile being black.

Now, 1 grain of wheat is placed on the first tile, 2 grains on the second, 4 grains on the third, and so on, doubling each time.

Write a program to calculate the total number of grains of wheat on all the black tiles.

Note, this number may be large. To avoid integer overflow, you should be using a 64-bit integer datatype:

Language	Datatype	Example
Java	long	long i = 1;
C++	long long	long long i = 1;
Delphi/Pascal	Int64	var i : Int64;

Python and Scratch users need not worry.

Input

The input, N is the length of the row of tiles indicated as a single integer.

Output

The output is the total number of grains of wheat on all the black tiles indicated as a single integer.

Examples:

Input	Output
3	5
6	21
41	1466015503701

Test your program with the following cases:

a) 19
b) 29
c) 37
d) 51

Question 3 – Order Letters

Write a program which, given a string consisting of uppercase letters (A, B, ..., Z) separated by + characters, will output that string with the letters in reverse alphabetical order.

Input

A single string consisting of uppercase letters separated by + characters.

Output

The string with the letters in reverse alphabetical order: All Z's before all Y's, and all Y's before all X's, and so on. The + characters must not move.

Examples:

Input	Output
Q+B+Q+Z	Z+Q+Q+B
B+B+U+U+P+G+S+B+H+D	U+U+S+P+H+G+D+B+B+B
B+B+A+C+B+C	C+C+B+B+B+A

Test your program with the following cases:

(each case should be input as a single line)

a) A+A+C+C+B+C+B+C+A+B+B+B+C+A+B+C
+B+C+C+B+A+A+B+C+A+C+A+A+B+B+A+
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