2015-NL-01-EN Tyre robot

0 ----	I: ----	II: hard	III: medium	IV: medium

☐ ALG	☐ INF	☒ STRUC	☐ PUZ	☐ SOC	☐ USE

Answer Type: Interactive Mandatory for: none

Body

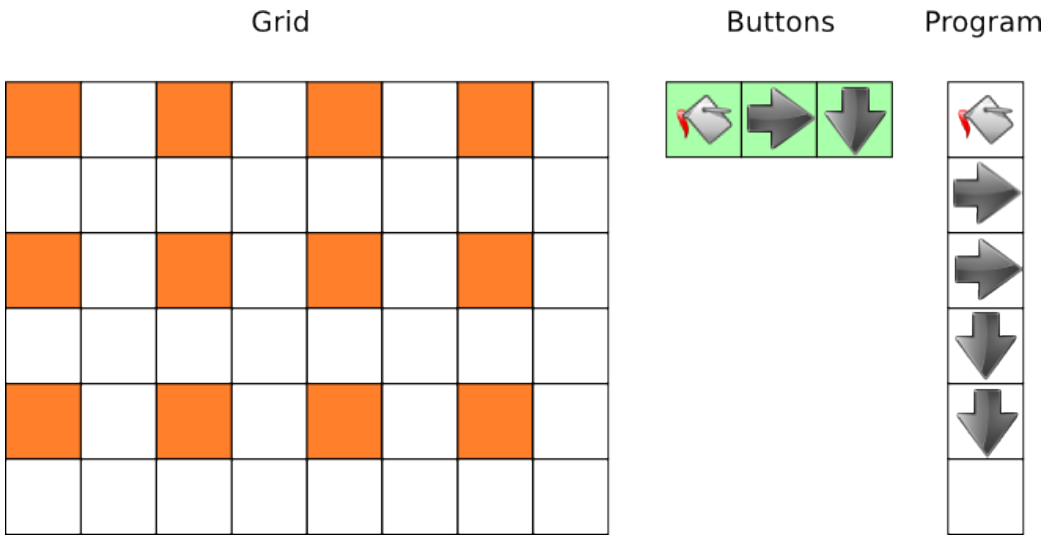
A computer screen consists of a grid of pixels. A small part of the computer screen is shown in the image below. It consists of 6 rows of 8 pixels. The pixels on this screen can only be white or colored.

You can instruct a robot to color (some of) these pixels. You can give three different instructions:

Color	Color the current pixel. If the cell already has color, the program terminates.
Right	The robot moves one pixel to the right. If it would walk of the screen it moves the leftmost pixel of the same row.
Down	The robot moves one pixel down. If it would walk of the screen it moves to the top pixel of the same column

The robot starts in the pixel at the top left corner when the screen is completely white. The robot will keep repeating the set of instructions until it tries to color a pixel that has already been colored.

The following animated image shows what happens with the program that is shown.



Question

Write a small program that will color all pixels on the screen.

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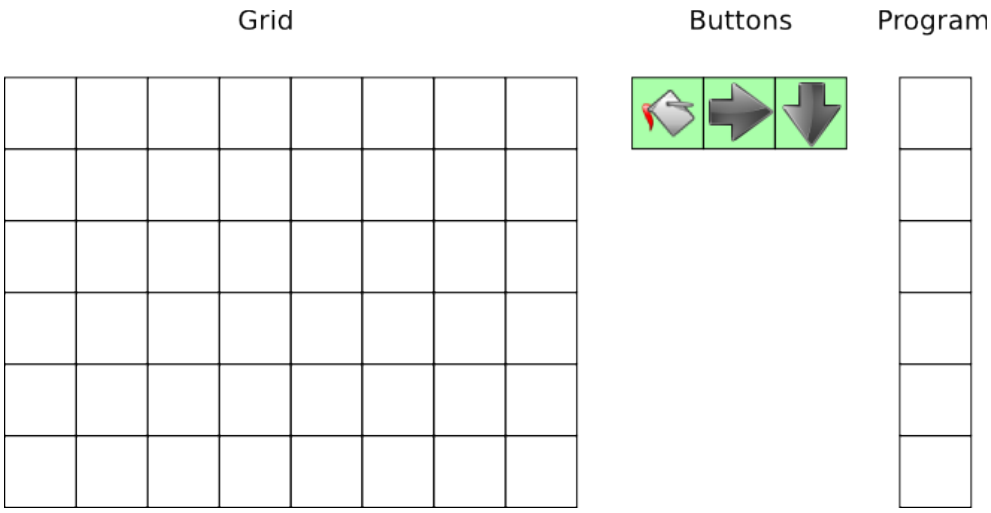
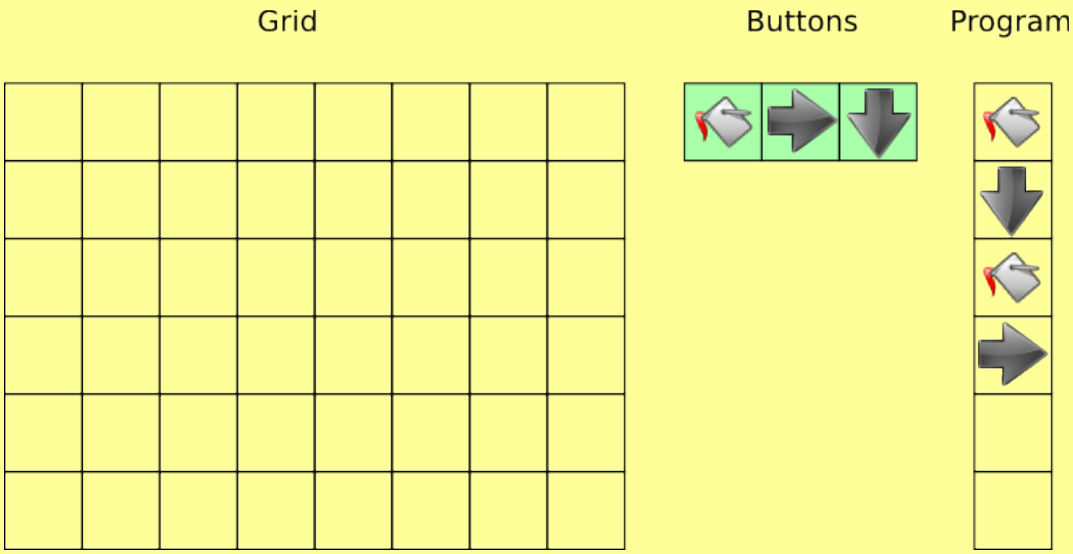
Answer



Explanation



This is the shortest possible program. Note each program needs to contain at least one Color-command, otherwise it will not terminate.
A program of 1 step is not possible; you will color, and then it terminates.
A program of 2 steps can only contain one arrow, so it will form a line and terminate.
A program of 3 steps can contain two different arrows; then only half of the pixels will be colored. If it contains two arrows of the same type, it will never leave the line, so it will not color all pixels.

It's informatics

The task is about planning and programming a simple device.
The commands are repeated until a condition is met to terminate the program.

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Because the grid wraps around, it is actual a torus, on which you can keep moving.

Keywords

Programming
command
repetition
grid

Websites

Internal Use

Wording

Comments

Willem van der Vegt, w.van.der.vegt@windesheim.nl 13-04-2015
New version at the Bebras Workshop. Kim changed the text, Adil worked the graphics.

Graphics

Home made and to be improved

Files

All additional files for this task (graphics, scripts, etc.)
2015-NL-01-EN.odt (this file)
2015-NL-01-question.png
2015-NL-01-ans.png
Add more

Authorship

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