

SCENARIO

Title	FIRST DEGREE EQUATION - PROBLEM 2	
Summary	This activity consists of the calculation of first degree equations, with the aim of facilitating students' understanding of mathematical problems. In addition, a very visual example is presented for a better understanding of the problem, where the student will have to pose the equation.	
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DIDACTIC OBJECTIVES

- Teach math in a different and attractive way.
- Teach first degree equations.
- Know how to formulate equations

Physics
 Mathematics
 Information Technology
 Robotics
 Programming

Education Level:
 10-12 years
 12-14 years

PROBLEM STATEMENT

Some students have problems understanding the concept of what the mathematical problem asks, so through a visual example it is intended to facilitate learning and understanding.

BOM (Bill Of Materials needed)

- Arduino Device
- Board
- (x2) Leds (Red and Green)
- (x3) Cables
- (x2) Resistors

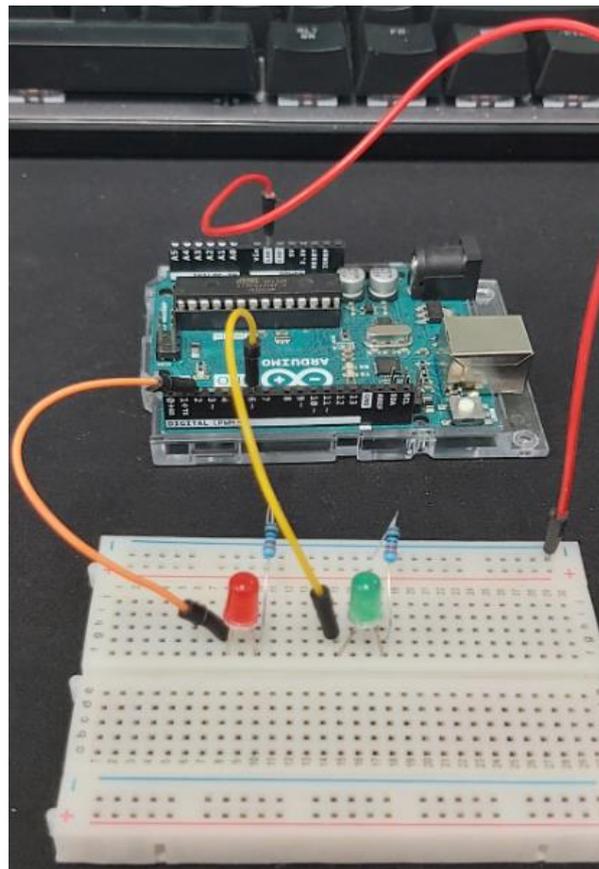
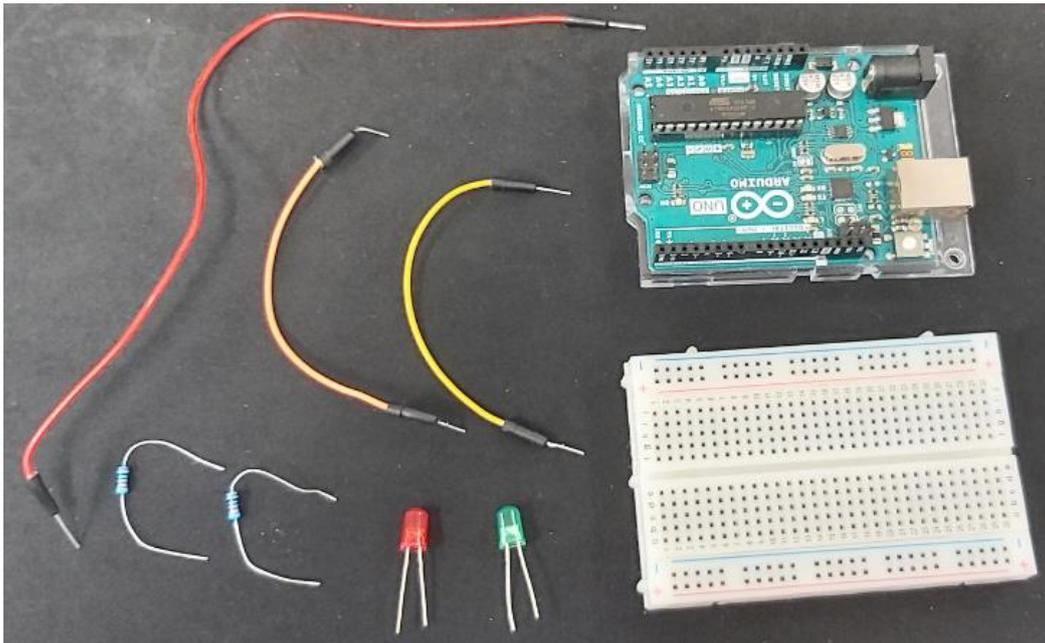


Erasmus+



InnoExperiment

INNOVATIVE APPROACH TO TEACHING THROUGH EXPERIMENT



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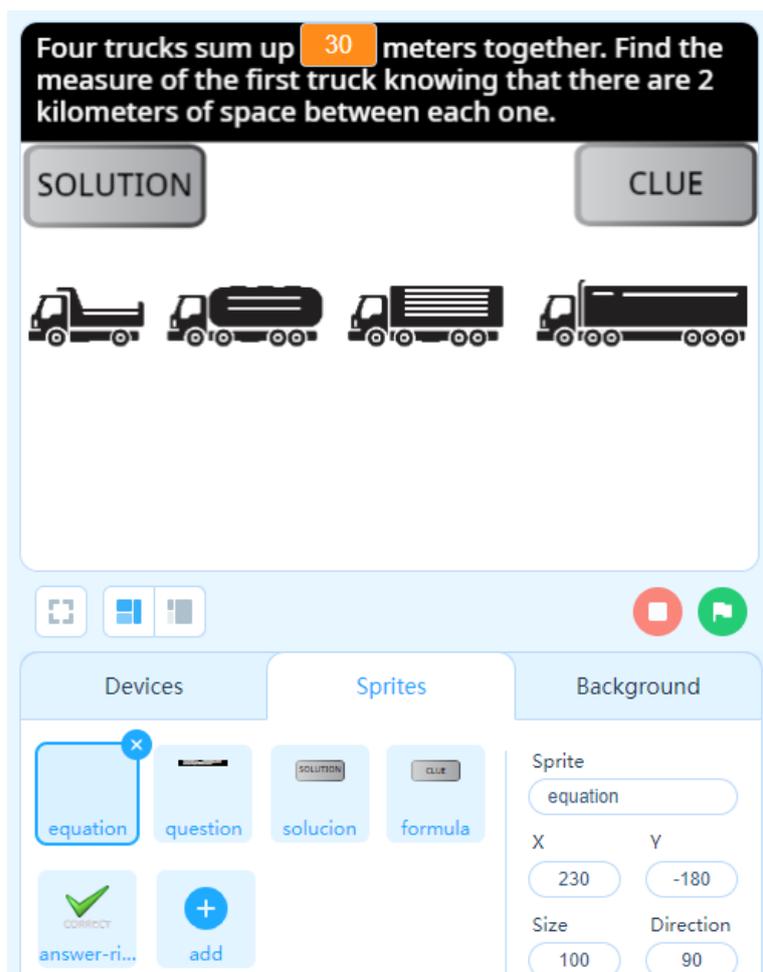
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ACTIVITY DESCRIPTION

For the development of the activity, we will use software that allows us to unify the game developed in Scratch with the use of the Arduino board. In this case, we have used the mBlock software: (<https://mblock.makeblock.com/en-us/>)

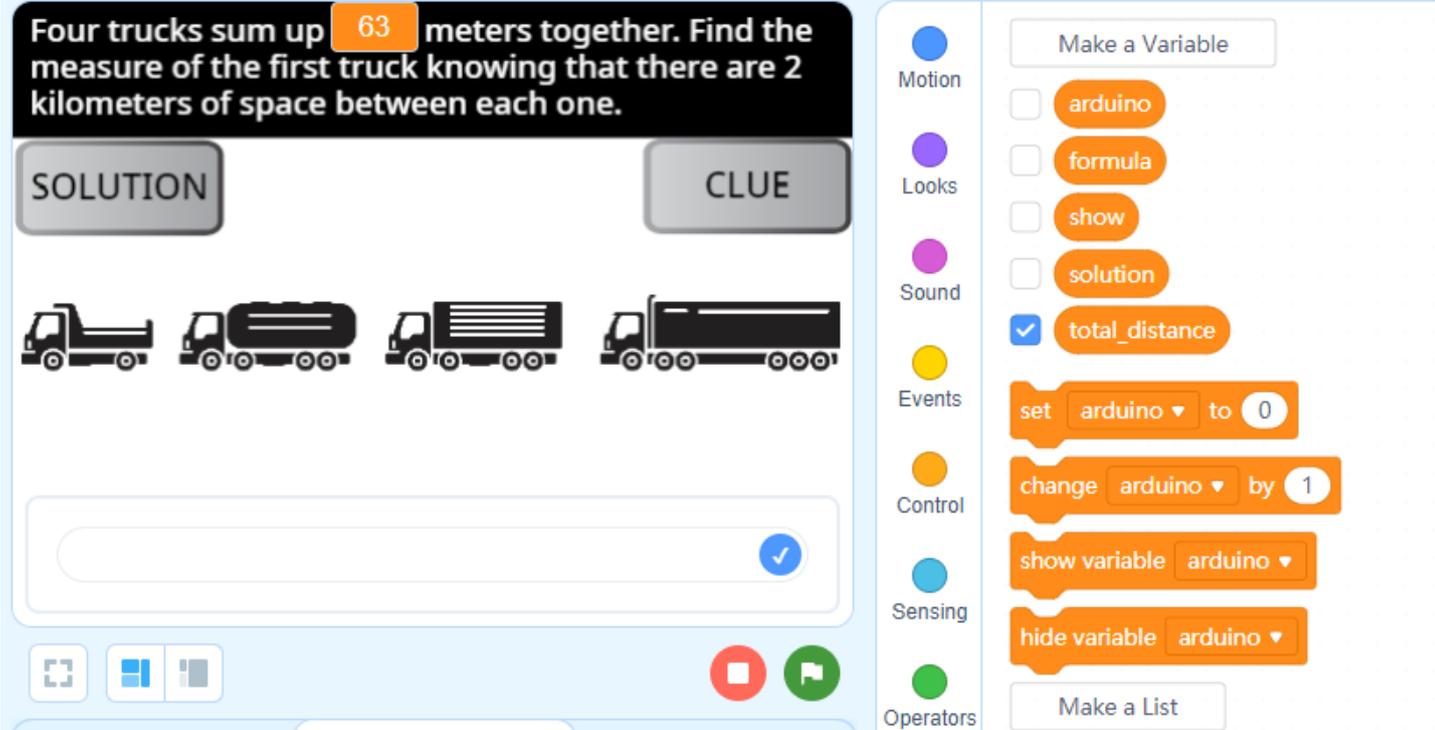
First of all, we will make the graphic composition of the activity:



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We will create the variable "total_distance" to calculate the total distance that the 4 trucks add up to. We will also create the variable "formula" to pose the equation taking into account the distance, and the variable "show", which when clicking on the "Clue" button, will show the approach of the equation:



The screenshot displays the InnoExperiment interface. On the left, a problem is presented: "Four trucks sum up 63 meters together. Find the measure of the first truck knowing that there are 2 kilometers of space between each one." Below the problem are two buttons: "SOLUTION" and "CLUE". Underneath the buttons are four truck icons. At the bottom of the problem area is a text input field with a blue checkmark icon. On the right, the Scratch-style programming palette is visible, showing categories: Motion, Looks, Sound, Events, Control, Sensing, and Operators. The "Make a Variable" block is expanded, showing variables: "arduino", "formula", "show", "solution", and "total_distance" (checked). Below this, a script is built with the following blocks: "set arduino to 0", "change arduino by 1", "show variable arduino", and "hide variable arduino".

In addition, we will create the "Solution" variable, which will be the one that calculates the solution to the problem, and the "Arduino" variable, which will be in charge of sending to the Arduino board when and that the corresponding LED lights up.

Once we have the graphic composition and the variables created, we will start with the programming:

1. We will start by setting the visual background that we want to appear while the mathematical/physics problem is being posed and we will set the "Arduino" variable to 0, so that the LEDs are off. In addition, for the "total_distance" variable, random value will be created, so that whenever the Activity starts, different values come out:

```

when clicked
  set arduino to 0
  switch backdrop to camion-silhouettes-vector
  forever
    hide variable solution
    show variable total_distance
    set total_distance to pick random 20 to 100
    set formula to join x + (x + 2) + (x + 4) + (x + 6) = total_distance
  
```

2. Then, we apply the formulas that will calculate the problem:

```

set solution to total_distance - 12 / 4
  
```

3. Next, the system wait for the user to write the result:

```

ask answer and wait
  
```

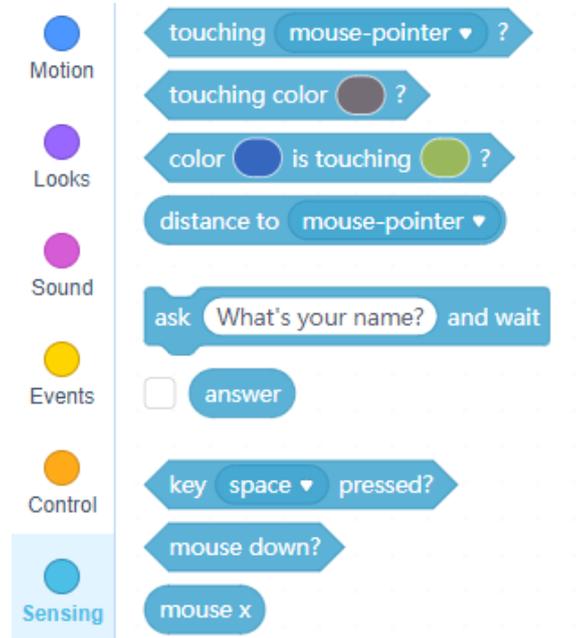
Four trucks sum up 63 meters together. Find the measure of the first truck knowing that there are 2 kilometers of space between each one.

SOLUTION

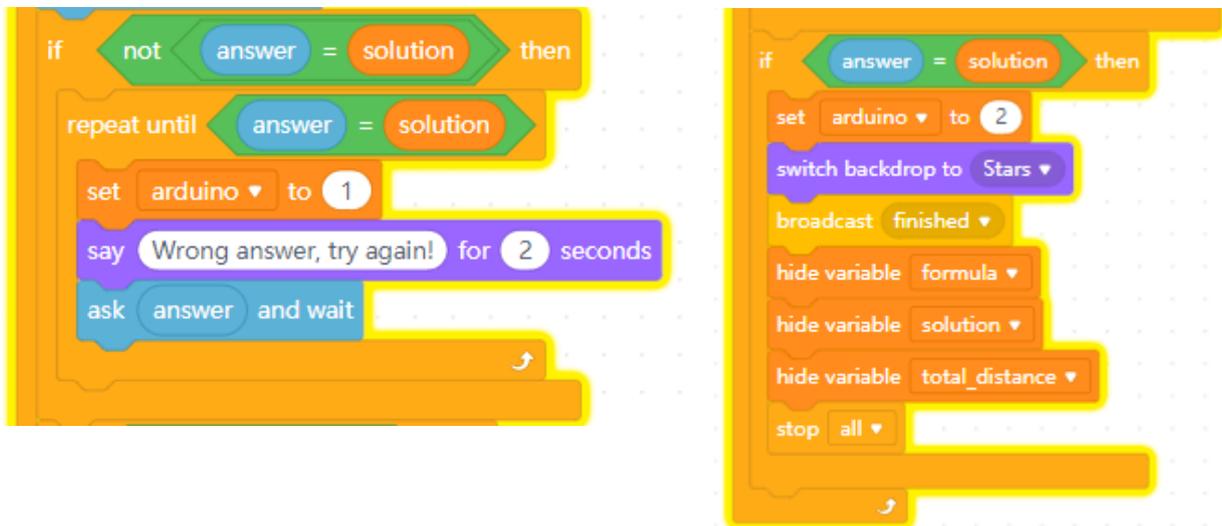
CLUE



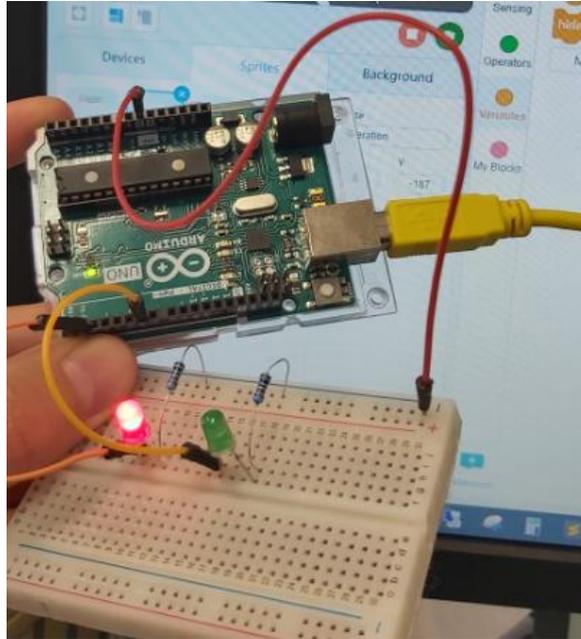
4. The result indicated by the user will be saved in a variable called “answer”, which will be created in the “Sensing” section:



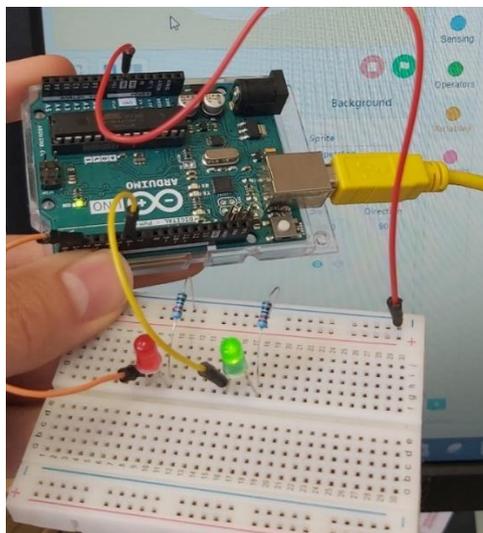
5. Once the answer has been inserted, the programming will check to verify the result:



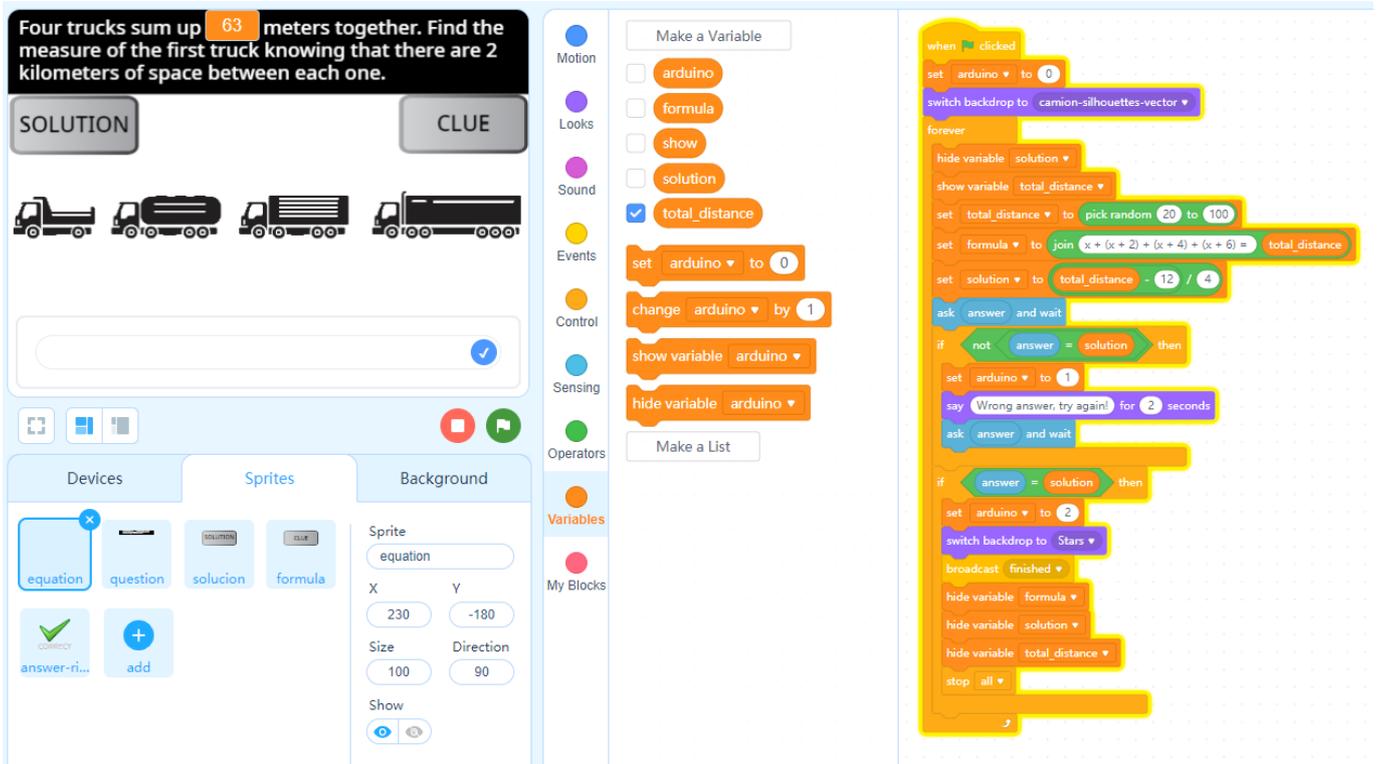
6. If the entered result is wrong, the game will display "Wrong answer, try again!" and will prompt the user to retype the answer. In this block the Red LED of the Arduino will light:



7. If, on the contrary, the user types the correct answer, the Green LED will light up and the variables will be hidden and the background will change:



8. The main Code would be as follows:



Four trucks sum up 63 meters together. Find the measure of the first truck knowing that there are 2 kilometers of space between each one.

SOLUTION CLUE

equation question solucion formula

answer-ri... add

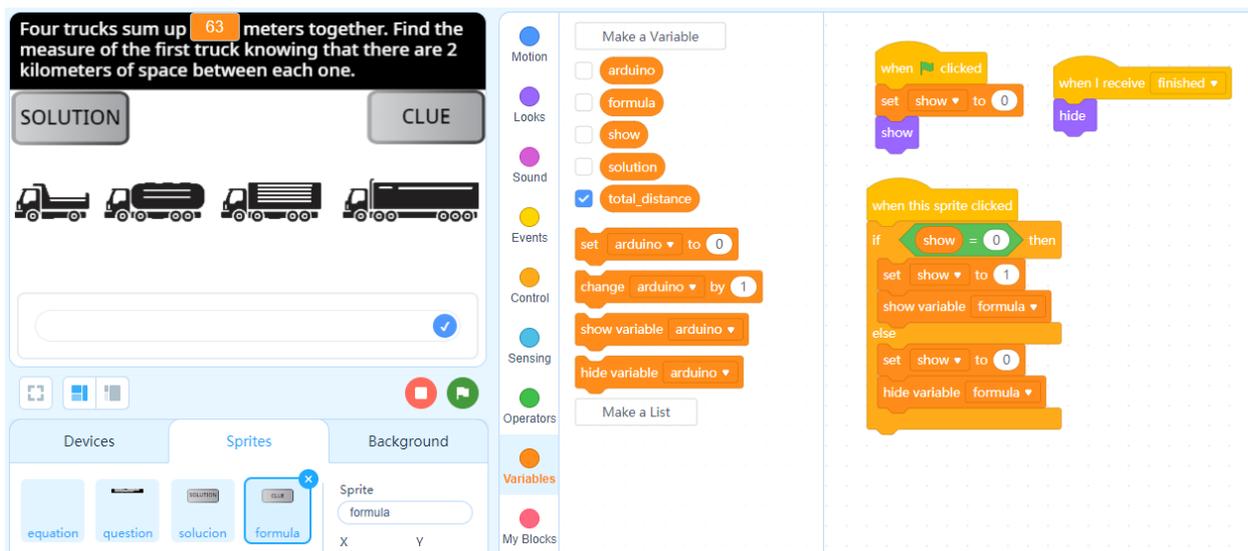
Sprite: equation, X: 230, Y: -180, Size: 100, Direction: 90

Make a Variable: arduino, formula, show, solution, total_distance

```

when clicked
  set arduino to 0
  switch backdrop to camion-silhouettes-vector
  forever
    hide variable solution
    show variable total_distance
    set total_distance to pick random 20 to 100
    set formula to join x + (x + 2) + (x + 4) + (x + 6) = total_distance
    set solution to total_distance - 12 / 4
    ask answer and wait
    if not answer = solution then
      set arduino to 1
      say Wrong answer, try again! for 2 seconds
      ask answer and wait
    if answer = solution then
      set arduino to 2
      switch backdrop to Stars
      broadcast finished
      hide variable formula
      hide variable solution
      hide variable total_distance
      stop all
  
```

9. And the code that we use to show how to formulate the equation when pressing the "Clue" button is the following:



Four trucks sum up 63 meters together. Find the measure of the first truck knowing that there are 2 kilometers of space between each one.

SOLUTION CLUE

equation question solucion formula

answer-ri... add

Sprite: formula, X: , Y: , Size: , Direction: , Show:

Make a Variable: arduino, formula, show, solution, total_distance

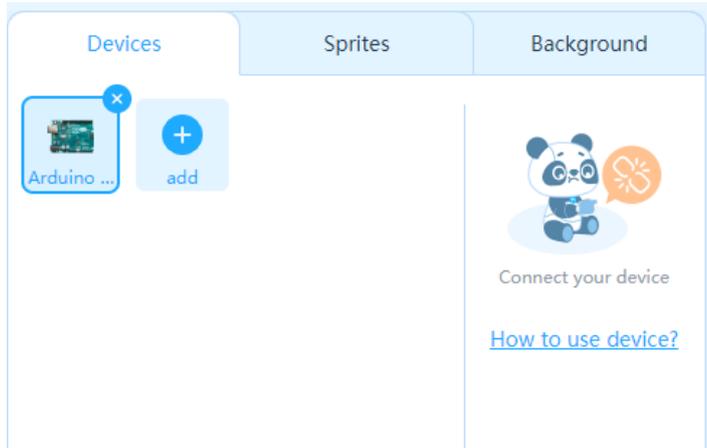
```

when clicked
  set show to 0
  show

when this sprite clicked
  if show = 0 then
    set show to 1
    show variable formula
  else
    set show to 0
    hide variable formula
  
```

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10. The code that would be in charge of lighting the LEDs on the Arduino board would be as follows:



```

when clicked
if arduino = 0 then
  set digital pin 2 output as low
  set digital pin 6 output as low
if arduino = 1 then
  set digital pin 2 output as high
  set digital pin 6 output as low
if arduino = 2 then
  set digital pin 2 output as low
  set digital pin 6 output as high
  
```

STUDENTS' EVALUATION

The way to evaluate the students would be for them to demonstrate on paper how they have developed the exercise and to use the program / game to check the solutions.

SCALABILITY

Regarding the concept of scalability, the complexity could be increased by adding equations of the second or third degree