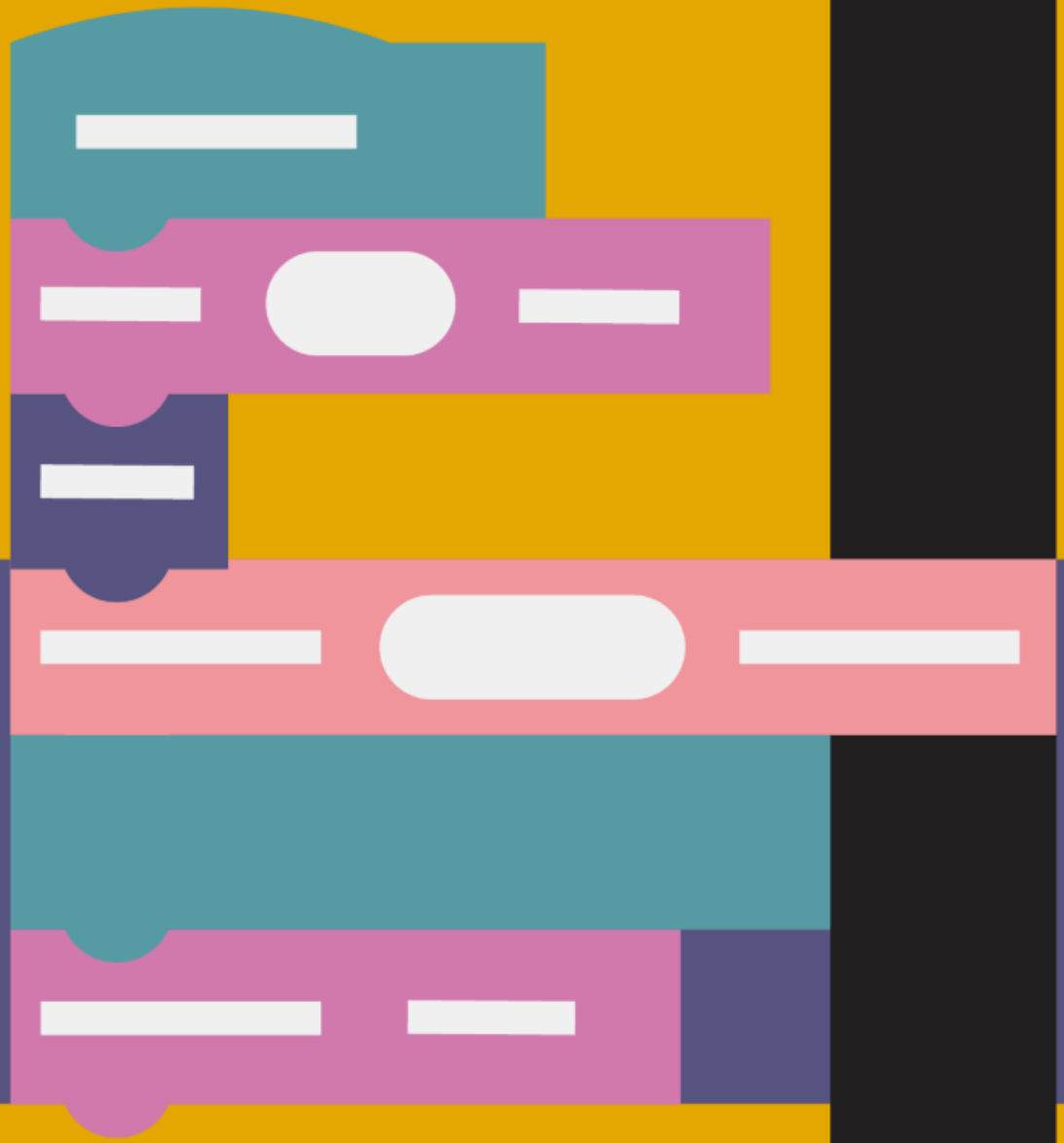

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GEOMETRY

1. Introduction
2. Theory
3. Activity setup
4. Coding
5. Activity summary

1 Introduction

Did you know that with just a few numbers and a bit of imagination, you can create amazing shapes on a computer?

Today, we'll dive into **rectangles**: what they are, how to calculate their size, and how to use them on a plane, just like following a map.

Then, we'll try it out in our **Xploris**, where we'll use blocks to create rectangles that change size, shape and color!

Are you ready to become rectangle experts and digital artists?

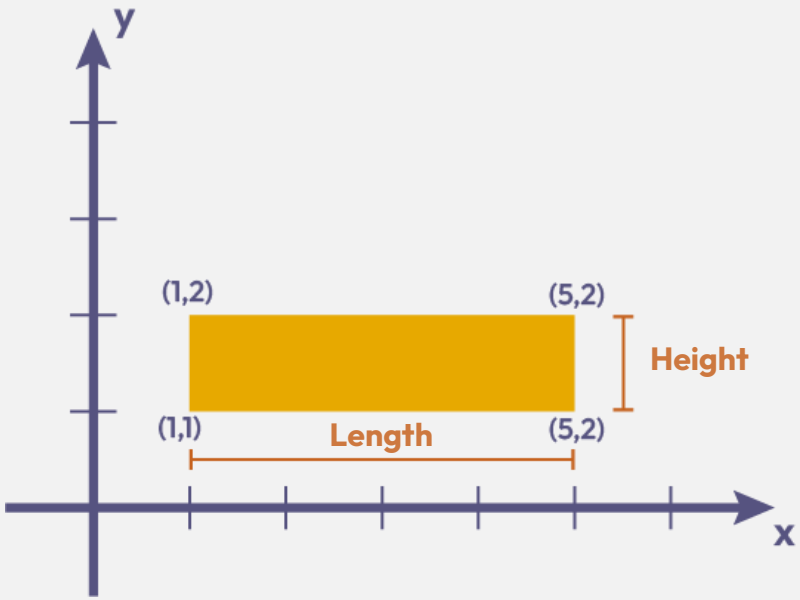
2 Theory

Let's discover Rectangles!

A **rectangle** has four sides, and all its angles are **90 degrees**. Its name comes from the Latin *angulus rectus*, meaning "**right angle**". It's always perfect! To draw a rectangle on a plane (like a map), we'll need to use **coordinates.**

The coordinates tell us:

- Where the rectangle starts: top-left corner **(X, Y).**
- Where the rectangle ends: bottom-right corner **(X, Y).**



2 Theory

How to define a rectangle using XploriLab Blocks

The draw rectangle 

block is using the **Start pixel number** and **End pixel number** to draw rectangles.

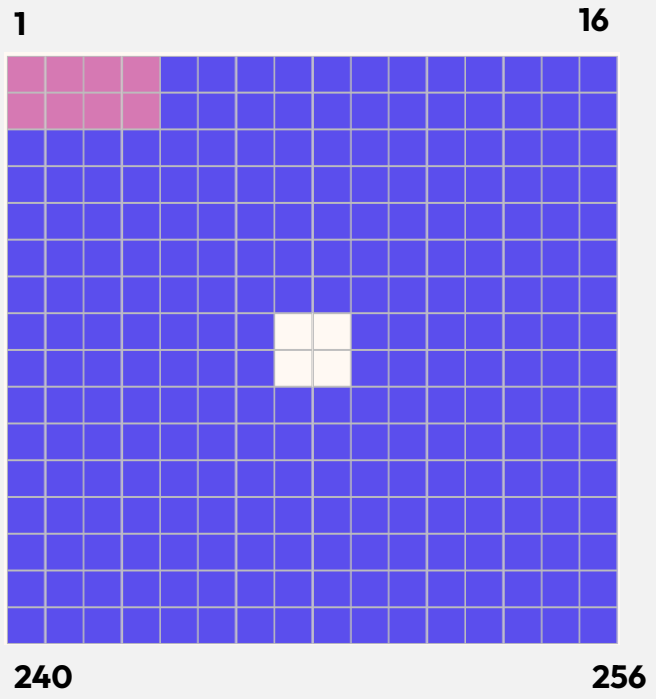
Xploris Display holds 256 pixels. Pixel numbers are shown on the right image.
In our example:

- The blue rectangle start = 1, Stop = 256
- The pink rectangle Start pixel number = 1, but the Stop pixel number = 20
- The small white rectangle Start pixel number = 120 and Stop pixel number = 137

We can define any rectangle using X,Y coordinate:
Start/End Pixel number = (y-1)*16+X

Thus for the white rectangle:

- Start pixel number X=8,Y=8 => (8-1)*16+8 = 120
- End pixel number X=9,Y=9 => (9-1)*16+9 = 137

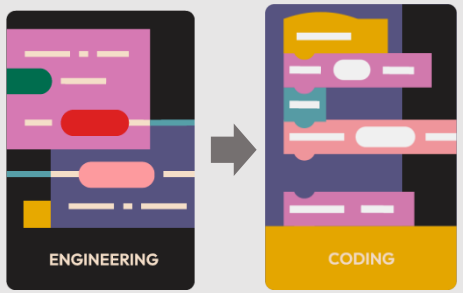


3 Activity setup

Turn on your Xploris and connect it to your computer or tablet.

Open the XploriLab software on your computer or tablet.

Once inside XploriLab, select the icon to connect the device via USB cable or bluetooth as applicable.



Go to the ENGINEERING section and then to CODING.

4 Coding

1

Use the clear screen block in the DISPLAY group to clear the screen of our device. This step will ensure that we have a clean space to display the results of our programming.

Note: If you don't find the block right away, you can scroll the Display section to search for it.
Let's place it as the **first block** in our program

2

From the LOOPS group, use the forever block.

This block will allow us to **repeat indefinitely** the instructions that we place inside it.

Let's drag the **“Forever”** block and place the following instructions inside it!

4 Coding

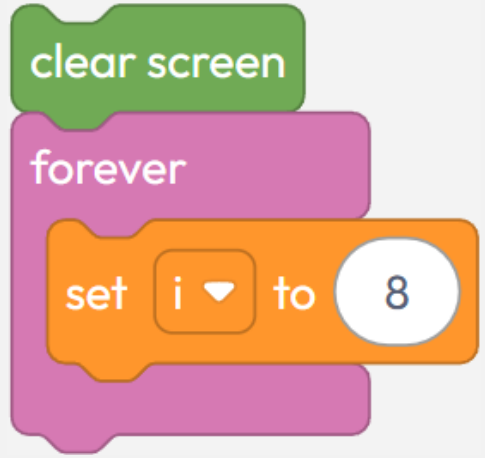
3

Create our first variable by following this sequence:

- Go to the VARIABLES group.
- Select Create variable Name it **“i”**.

Use the set i to block to assign the initial value of 8. You may find the numeric block in the MATH group.

Remember: The orange circles you see in the block are the variables we created in the VARIABLES group. In this case, the variable i.

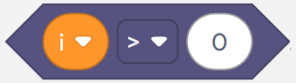


4 Coding

4

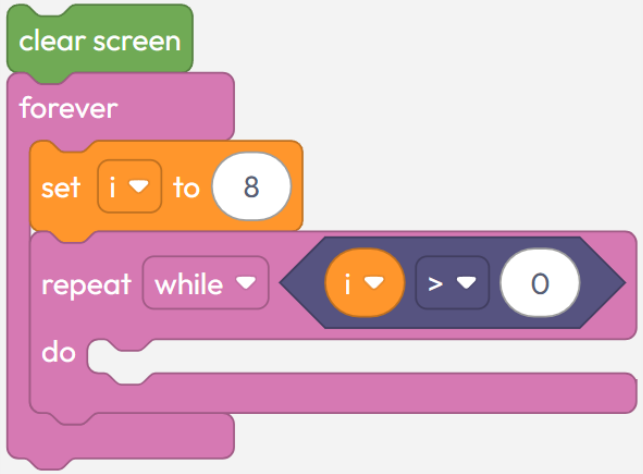
Use a loop to repeat as long as "**i**" **is greater than 0**. To do this, we need to:

- Place the 

block of the LOOPS group.
- Within the condition, use the “i > 0” block 

of the LOGIC group.

The variable i represented by the **orange** circle, comes from the VARIABLES group, while the value **0** is a numeric block from the MATH group.



4 Coding

5

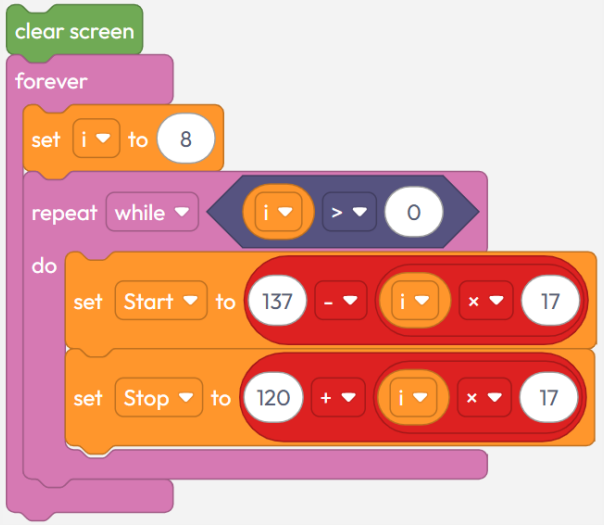
To calculate the starting and ending points of the rectangle, we need to do the following:

- Create two new variables: **Start** and **Stop**. To do this, go to the VARIABLES group and select Create variable.
- Use the set Start to block and create a formula with operation blocks from the MATH group 

The variable "**i**" is an orange circle from the **Variables** group, and the values **137 and 17** are numeric blocks from the **Math** group.

- Use the set Stop to block and set the formula 

As before, "**i**" is a variable, **120** and **17** are numeric blocks.



4 Coding

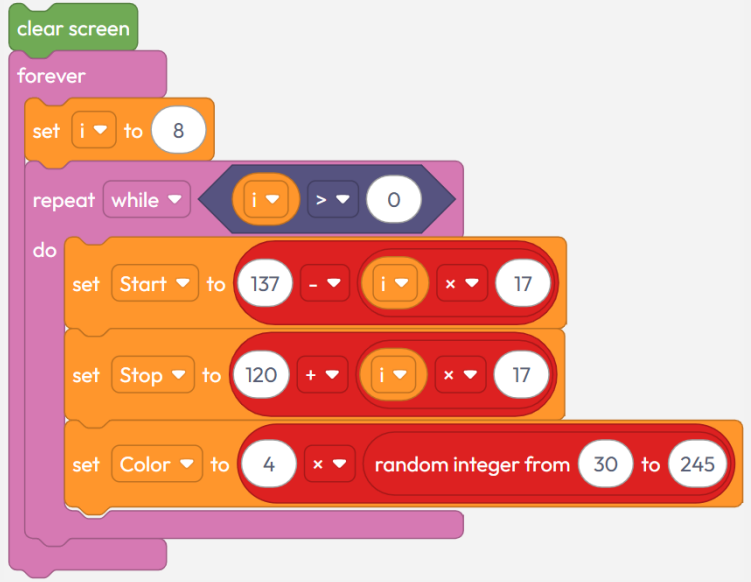
6

We're going to choose a random color for the rectangle. To do this, follow these steps:

- Create a new variable called **Color** in the VARIABLES group.
- Use the set Color to block and create a formula with blocks from the MATH group : 4 × random integer from 30 to 245.

This ensures that the program is choosing colors that are different from each other.

To obtain the random number, use the "**random integer from**" block from the Math group, and place numeric blocks in the values **30 and 245**.

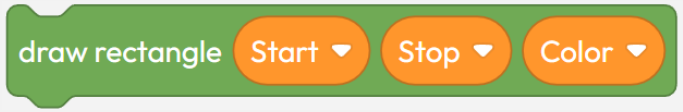


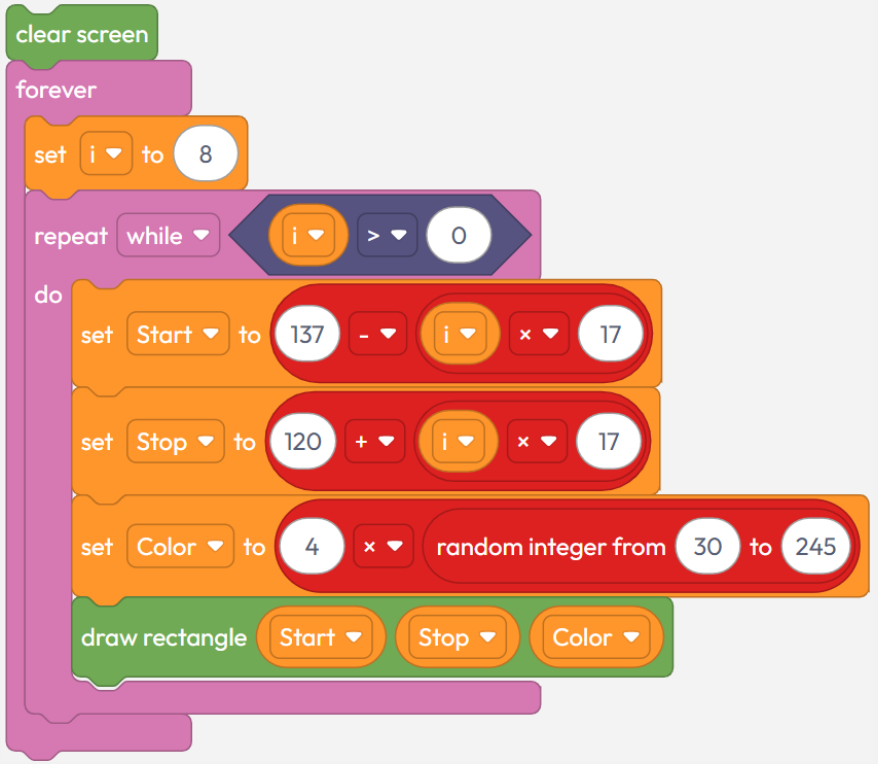
4 Coding

7

Draw the rectangle on the screen of our device:

- Using the draw rectangle block from the DISPLAY group.
- This block needs the variables **Start**, **Stop**, and **Color**, represented by orange circles of the VARIABLES group.
- Place them in the corresponding spaces.

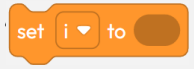


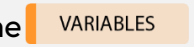


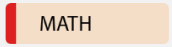
4 Coding

8

Decrease the value of "i", for this purpose we will:

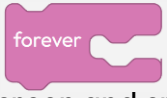
- Use the 

block in the 

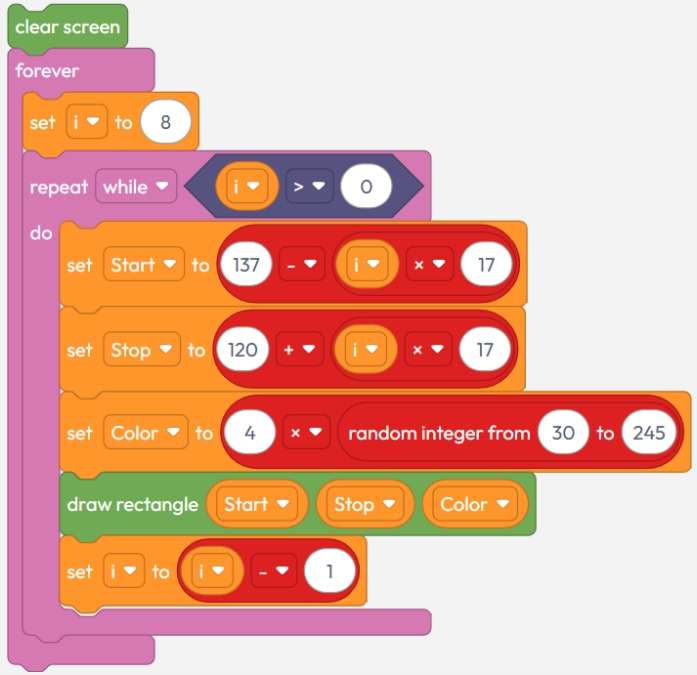
group to decrease the value of "**i**".
- Create a formula with blocks from the 

group: 

- The variable "**i**" is an orange circle, while the value **1** is a numeric block.
- When "**i**" reaches 0, 

block will end. But since it is inside a 

block, the program will start over. It will clear the screen and create new magic rectangles with different colors and positions.



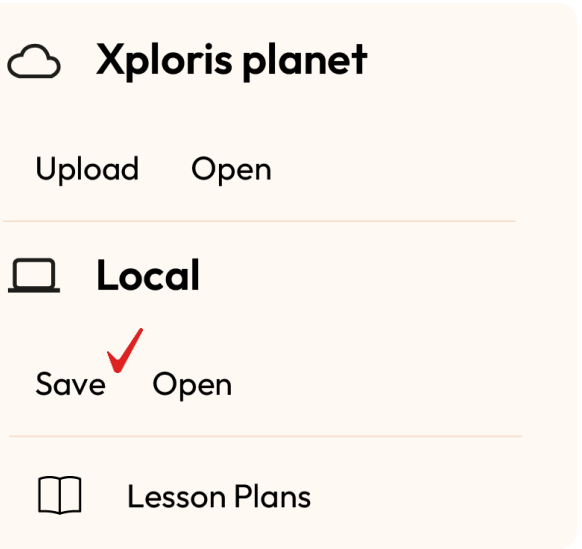
4 Coding

To make sure that the program works correctly, we will follow these final steps:

Press the three-bar icon at the top and select the “Save” option. Then, assign a name and save your program.

Press the “Upload” button in the Xplorilab interface. This will transfer the program to the Xploris device.

Once the program is loaded, press the “Play” button on Xplorilab software. Look the rectangles on the screen change size and color with each repetition - it's like watching a work of art in motion!



5 Activity summary

We learned what a rectangle is, how to calculate its size and its importance in geometry.

We designed a program in Xploris to create rectangles that change size and color on the screen.

We used different programming blocks, such as:

- **Display:** to draw rectangles on the screen.
- **Logic:** to establish the start and end conditions.
- **Variables:** to store coordinates and colors.
- **Math:** to calculate the start and end pixels of the rectangles and choose their random colors.
- **Loops:** to repeat the drawing automatically and create several rectangles.

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