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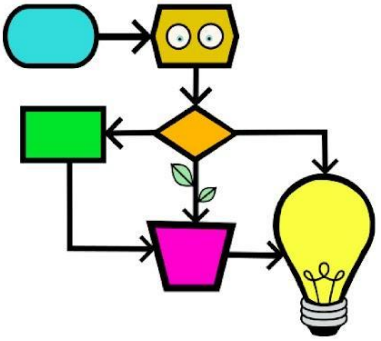
Extra - Micro:bit instruction

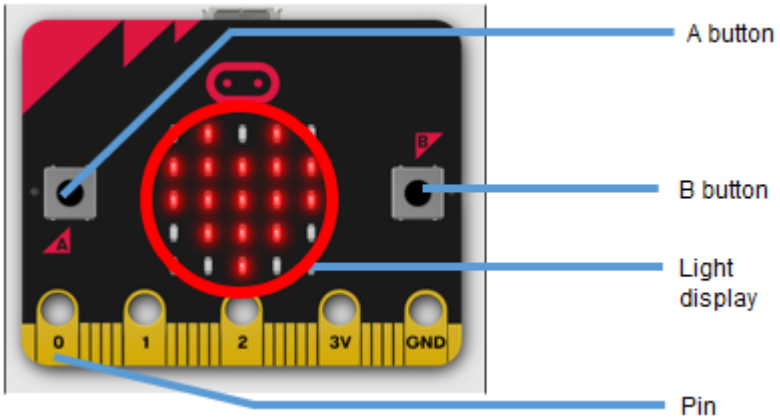


Co-funded by the Erasmus+ Programme of the European Union

The micro:bit:
A micro:bit is a small computer with a display comprising 5 x 5 LED lights, on which you can program messages and icons (see picture). Through buttons and a motion sensor, the micro:bit can interact with the environment. For example, after pressing the A button, the micro:bit shows an icon on the light display. You can also connect components to it that are controlled by the micro:bit, such as an LED light or a mini speaker. To program the micro:bit, there are low-threshold online programs, such as Scratch and MakeCode.

Explanation of each item:

- Light display: 25 LED lights together form a display that you can use to show letters, numbers, and icons.
- A and B buttons: two buttons that can be pressed either separately or simultaneously. The micro:bit responds by, for example, showing something on the light display.
- Pins: pins 0, 1, 2 and GND can be used to connect components, including, amongst other things, a separate LED light or a speaker. The 3V pin is designed to connect an extra voltage source, but this is not necessary in these activities.
- Motion sensor (not visible in the picture): the motion sensor allows the micro:bit to react to shaking and other movements.



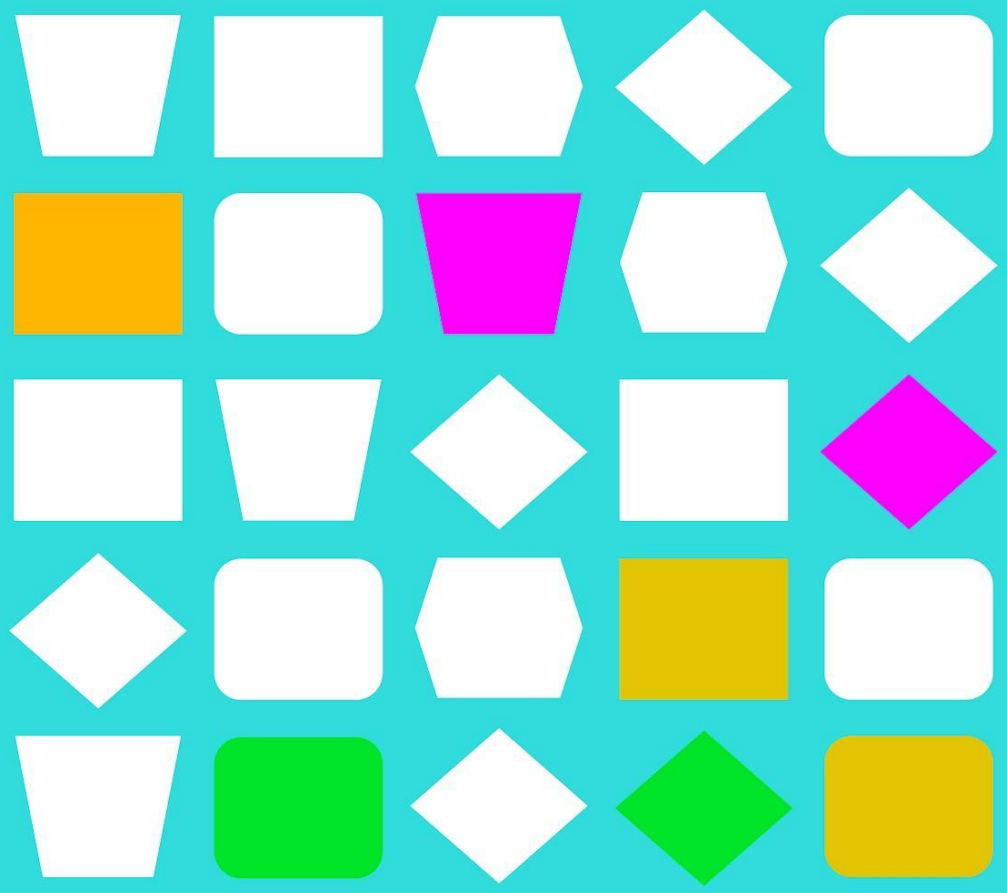
The micro:bit requires voltage to work. As long as it is connected to the laptop, then the micro:bit will receive voltage from the computer. If you want to use the micro:bit separately from the laptop, then you can connect two AAA batteries to the micro:bit's power port using the provided battery holder.

Connecting the micro:bit:

- Connect the micro:bit to the laptop's USB port using the provided cable. The orange light on the back of the micro:bit will flash if it is connected properly.
- Go to https://makecode.microbit.org
- If necessary, change the screen language to Dutch: click the settings icon in the top right-hand corner and select Dutch in the Language menu.
- Click New Project, give the project a name and click Create.
- You will be taken to a new screen. Click the three dots in the bottom left-hand corner next to the Download button.
- In the menu, choose Connect device, then click Next twice.
- In the pop-up menu, click BBC micro:bit CMSIS-DAP or DAPLink CMSIS-DAP and choose Connect.
- The micro:bit should now be properly connected! As long as the micro:bit remains connected to the laptop with the cable, you will be able to put new information on the micro:bit with one click on the Download button.

Connecting components to the micro:bit:
To connect an LED light or a mini speaker, use the power cables with an alligator clip. Although the worksheets mention a red and a black power wire, the actual colour of the power cables does not matter per se. This is simply done to make the instructions clearer for students. To avoid any confusion, you may opt to use only black and red live cables during the lessons as well.
When attaching the alligator clip, make sure it does not protrude over the hole in the micro:bit's pins. If three random lights on the display of the micro:bit light up, then this means that the alligator clip is not connected properly.

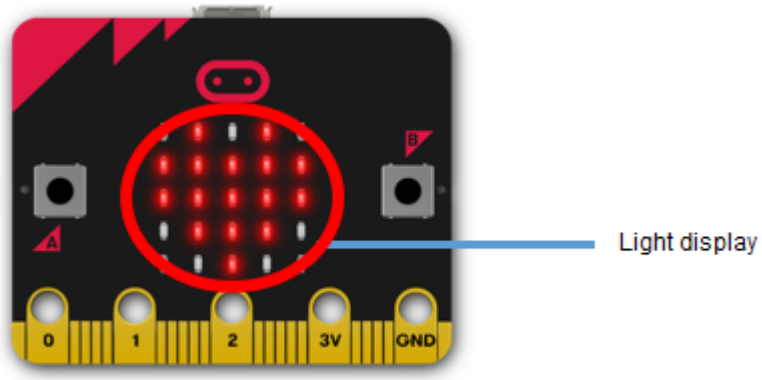
LED light:
An LED light only allows the current to flow in one direction. If the LED bulb does not light up, then turn it over. Be careful with the legs of the LED bulbs, as they can break off if they are bent frequently.



Worksheets

Worksheet 1: Controlling the light display on the micro:bit

This is the most important part you will use in this assignment:



Assignment 1: Show an icon

1. Are there still blocks in the work area? If so, then right-click anywhere in an empty part of the work area and choose Delete all blocks.

2. Click on **Basic** in the menu.

3. Select the **on start** block and drag it to the work area.

4. Choose the **show icon** block and drag that into the on startup block.
   It should now look like this:

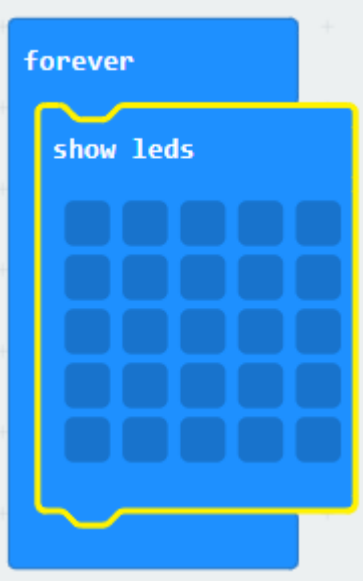
5. Click **Download** to put your code on the micro:bit. Do you see the icon appear on the micro:bit?

Tip
If you click on the little arrow next to the heart icon, can choose another icon.

Assignment 2: Create your own pictogram

1. Drag the **show icon** block from the **on start** block.
2. Click **Base** in the menu, choose **forever** block and then drag that to the work area.
3. Under **Basic**, choose the **show leds** block and drag that into the **forever** block.

It should now look like this:



In the **show leds** block, you can create your own icon by turning the lights on or off. A light is on when the block is white and off when the block is dark blue. By clicking on the block, you can turn the light on or off.

4. Create your own icon and **download** your code on the micro:bit. Do you see your homemade icon appear?

Assignment 3: Displaying a text on the micro:bit

1. Drag the **show leds** block out of the **forever** block.
2. Under **Basic**, choose the **show string** block and drag that into the **forever** block.
3. It should now look like this

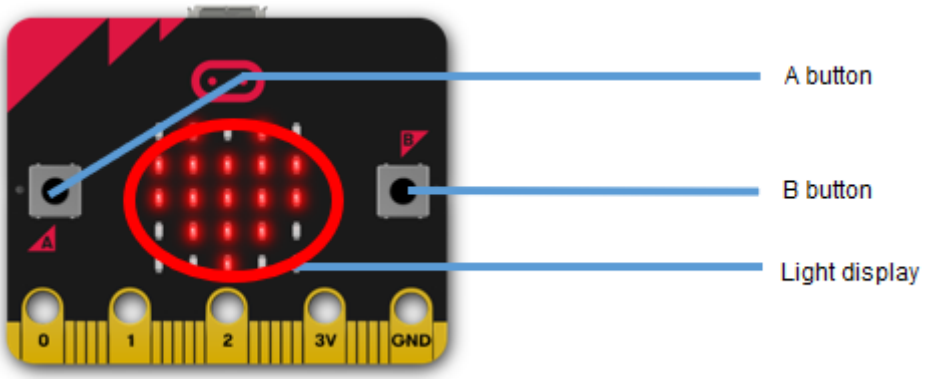
4. Click on **"Hello!"** and type your own text here.
5. **Download** your code on the micro:bit. Do you see your text appear?

Assignment 4: Showing a text and icon at the same time

You can also place multiple blocks in **at startup** or the **forever** block. For example, see what happens if you put in a **show leds** block and a **show string** block at the same time. Always remember to **download** your new code to the micro:bit!

Worksheet 2: Making the micro:bit respond to you

These are the main components you will use in this assignment:



Assignment 1: Doing something when you press the A button, B button or both at the same time

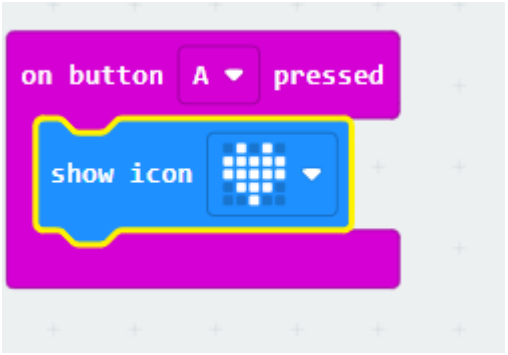
1. Are there still blocks in the work area? Then right-click anywhere in an empty part of the work area and choose Delete all blocks.

2. Click **Input** in the menu.

3. Select the block **on button A pressed** and drag it to the working area.

4. Click **Base** in the menu and choose a block, such as, for example, **show leds, show icon** or **show string**. Drag your block of choice into the block **when button A is pressed**.

6. It might look like this now:



Tip
If you click on the little arrow next to A in the **on button A pressed** block, you can select B or A + B.

5. Click **Download** to put your code on the micro:bit.

6. Press the A button. What do you see happening?

7. Now program the micro:bit itself so that something happens when you press the B button or when you press the A and B buttons simultaneously.

Assignment 2: Do something when the micro:bit is shaken up

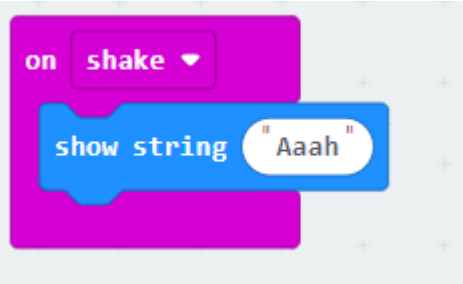
1. Right-click anywhere in an empty part of the work area and choose Delete All Blocks.

2. Click **Input** in the menu.

3. Select the block **on shake** and drag it to the work area.

4. Click **Base** in the menu and choose a block, such as **show leds, show icon** or **show string** block. Drag your block of choice into the **at shake** block.

It might look like this now:



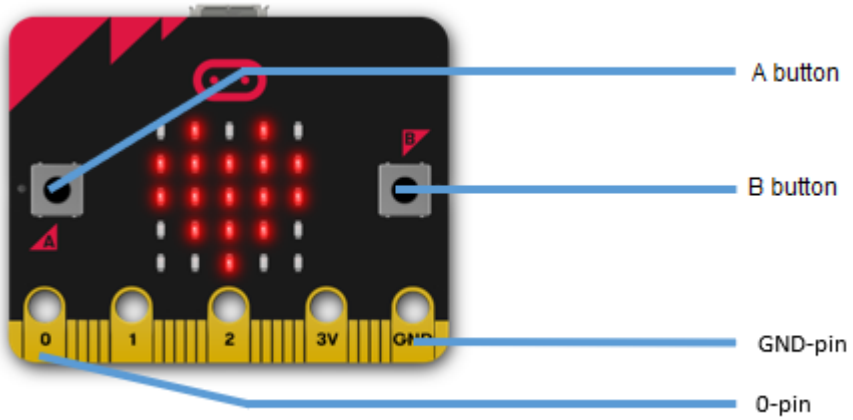
Tip
Want explanation o how the **Input** works? worksheet 1 on how to control the light display on the micro:bit.

5. **Download** your code on the micro:bit.

6. Shake the micro:bit well. What do you see happening?

Worksheet 3: Turning a loose bulb on and off and flashing it

These are the main components you will use in this assignment:



Preparation:
For the tasks in this worksheet, you will need the following materials:

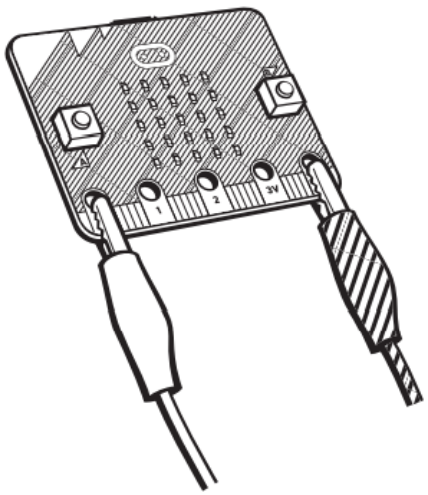
- Two power cables with alligator jaws
- One LED lamp

Assignment 1: Switching the LED light on and off

1. Attach one end of the black power cable to the GND pin.

2. Attach one end of the red power cable to the 0 pin

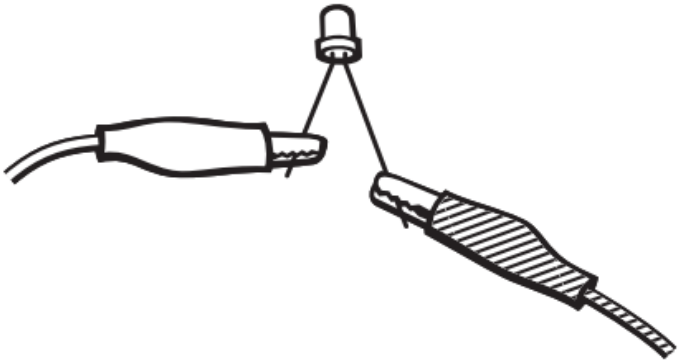
It should now look like this:



Clamp the other mouth of the black power cable to the short leg of the LED light.

3. Clamp the other mouth of the red power cable to the long leg of the LED light.

4. It should now look like this:



5. Are there still blocks in the work area? Then right-click anywhere in an empty part of the work area and choose Delete all blocks.

6. Click **Input** in the menu.

7. Select the block **on button A pressed** and drag it to the working area.

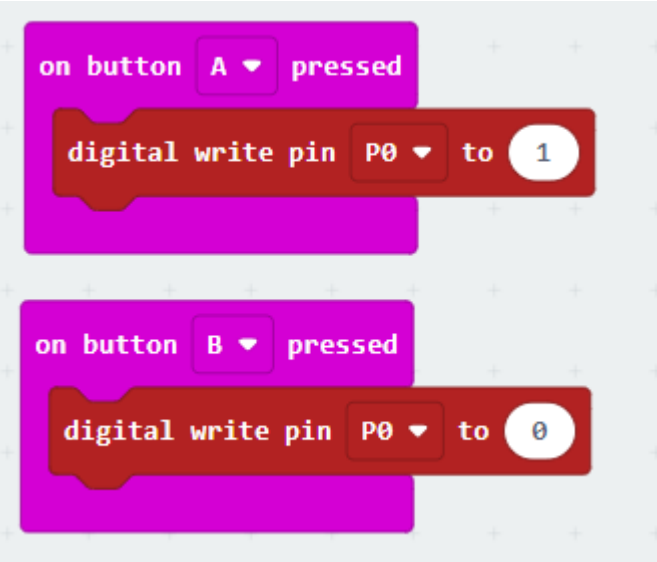
8. Drag another **on button A pressed** block to the work area. Click the arrow next to A and choose B here.

9. Click on **Advanced** in the menu. You will now see more menu items appear.

10. Click **Pins** in the menu and drag the **digital write pin P0 to** block into the block **on button A pressed**. Click 0 in the block with your mouse and change that number to 1.

11. Click **Pins** in the menu and drag the **digital write pin P0 to** block in the block **on button B pressed**.

It should now look like this:



12. Click **Download** to put your code on the micro:bit.
13. Press the A button. Does the LED light come on?
14. Press the B button. Does the LED light go out again?

Assignment 2: Flashing the LED light

1. Right-click anywhere in an empty part of the work area and choose Delete All Blocks.
2. Click on **Basic** in the menu.
3. Select the block **forever** and drag it to the work area.
4. Click **Pins** in the menu and drag the **digital write pin P0 to** block in the block **forever**. Click 0 in the block and change that number to 1.
5. Click on **Basic** in the menu.
6. Select the block **pause (ms)** and drag it under the **digital write pin P0 to** block in the block **all the time**. Change 100 to 1000.
7. Click **Pins** in the menu and drag the **digital write pin P0 to** block in the block **forever.**
8. Click **Base** in the menu, choose the **pause block (ms),** and drag it under the second **digital write pin P0 to** block. Change 100 to 1000.

It should look like this:

9. **Download** your code on the micro:bit.
10. The LED light should start flashing immediately! What happens if you change the number 1000 in one of the **pause (ms)** blocks or in both **pause (ms)** blocks to 100? And what happens if you change the number to 10,000? Always remember to **download** your code on the micro:bit!

Colophon

This document was previously developed as part of the project Creativity as a starting point for connecting artistic ability and technology, and was made possible in part by the Cultural Participation Fund. The illustrations were made by Henk Stolker.

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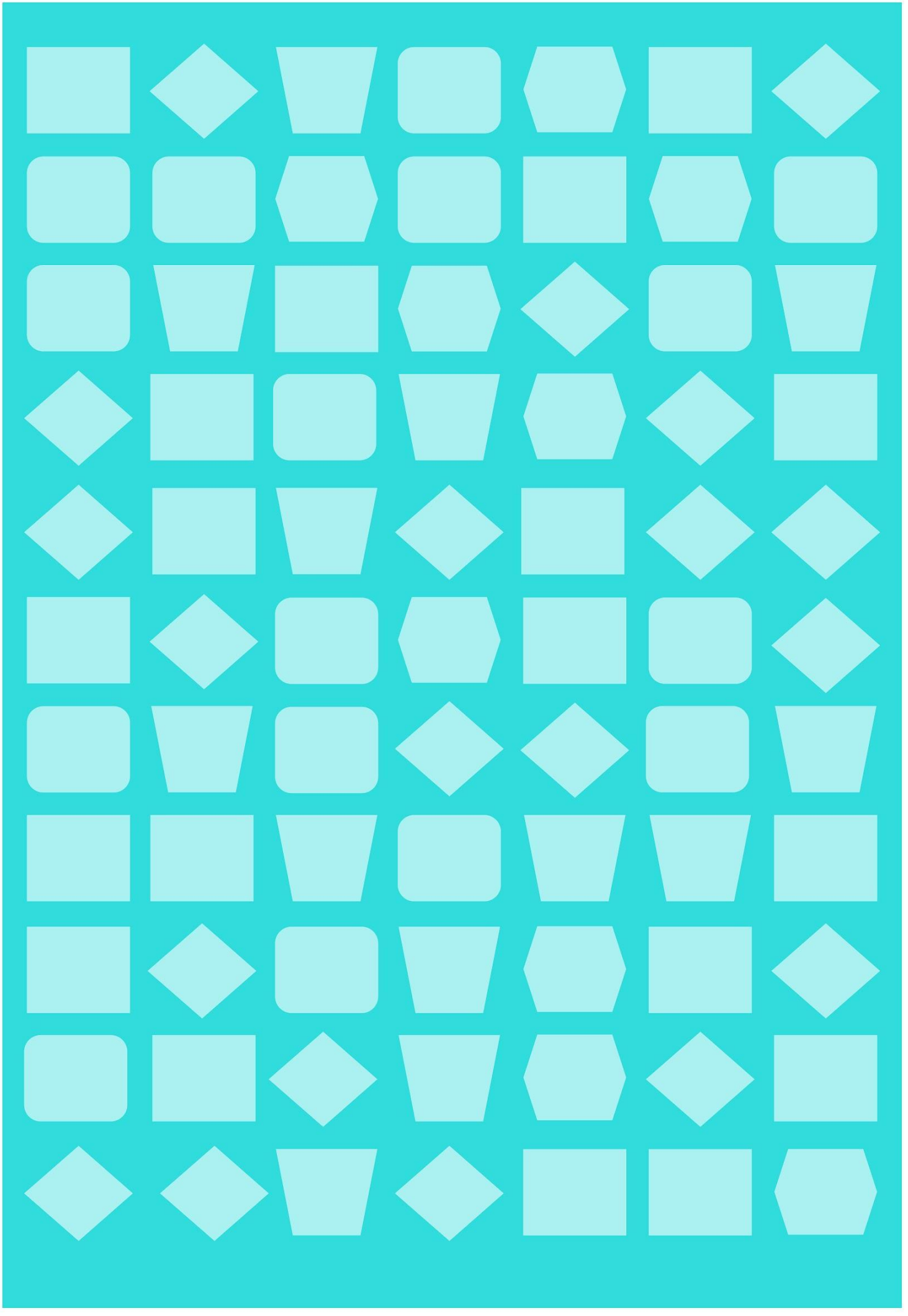
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