STEM & Robotics ERP Mini Set

The **STEM & Robotics ERP Mini education** set is specially designed for Early Primary school students of ages 7-9. It combines the core subjects of STEM together with Robotics. The set comes in a convenient plastic storage tub that contains a large number of Engino - Qboidz plastic parts along with robotic devices such as controller Mini, DC motor, LED, touch sensor, IR sensor. The extra ENGINO® technical parts allow the construction of 40 complex models that come with theory and experimental activities to cover not only engineering design but also Coding, Mechanics and Science. There are two generations of robotic models doable with this set, simpler ones with the Qboidz parts for the younger children or for the introduction of coding as these feature in E15, and complex ones with the classic ENGINO® parts for more advanced models

Engino
EDUCATION

7-9

Lesson: Small windmill

Mini controller and EnginoRobot BT app

Windmills are machines that use the power of the wind to grind grain into flour, to pump water or to produce electricity. A windmill has a number of blades that spin around when wind blows on them. While the blades turn, their rotational motion is converted to other forms of energy.

Discover:
- What inputs and outputs are.
- How to program a robot manually.
- How to control your robot wirelessly.

Materials Needed:
- Engino STEM & Robotics MINI.
- Smart device with EnginoRobot BT app installed.

Procedure:
1. Build the **Windmill** model.

2. Install 3 AAA batteries on the back of the MINI controller and power up the device with the On-Off button.

3. Set the motor's switch at position **I**. Press the motor buttons (input) on the MINI controller according to **exercise 1** and write the results you observe (output). Fill in the table using the words **clockwise** (in the same direction as the clock markers) or **anticlockwise** (in the opposite direction as the clock markers) according to the rotation direction of the windmill.

4. Read **exercise 2** and learn how to create a manual program with the MINI controller. Record the sequence and check if the sequence is correct. Then do **exercise 3**.

5. MINI controller can connect wirelessly with a smart device. To enable this feature scan for Bluetooth devices through the EnginoRobot BT app and connect your device. Choose the first option "**ERP Mode**" and record the program of **exercise 4**.

Engino®
"Windmill"
model

Exercise 1. Push the buttons on the MINI controller (input) and write briefly the outcome you observe on the model (output).

Input	Output
Motor A *switch in position **I***	

Exercise 2. Press the "**Program**" button.

Notice that the red flashing light indicates that the device is recording the commands. Then, push the appropriate buttons to create the following sequence:

- *the blades rotate clockwise;*
- *the blades rotate anticlockwise.*

Once finished, press the "**Program**" button again to store it on the device memory.

To execute the program, press the "**Play**" button to check, if the command sequence is correct.

Exercise 3. The program above can be executed for a specific period of time. Record the program agian by adding specific time:
- *the blades rotate clockwise for 2 seconds;*
- *the blades rotate anticlockwise for 3 seconds.*

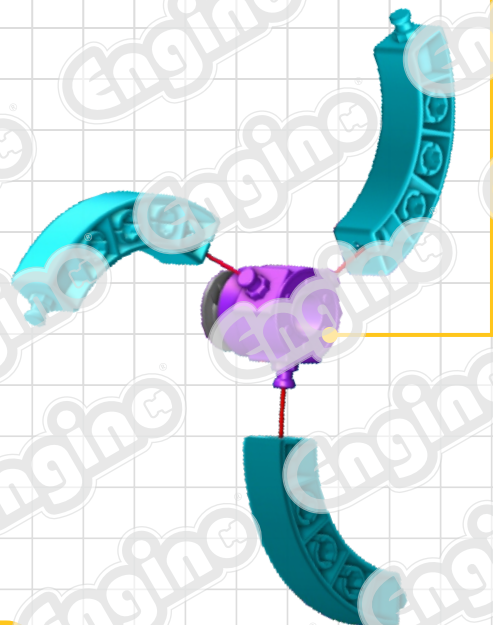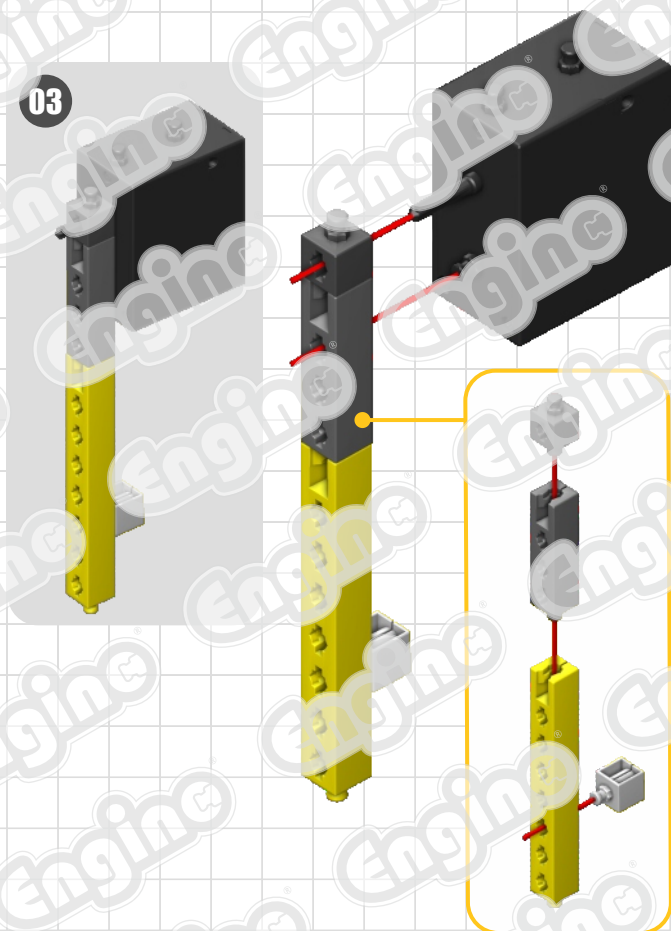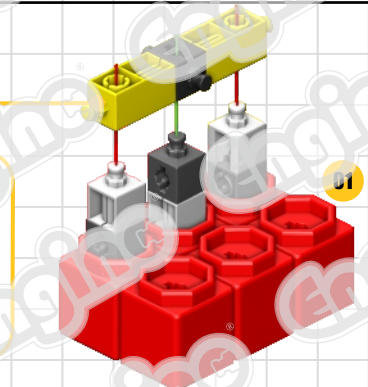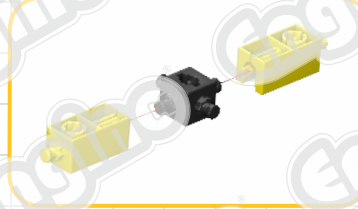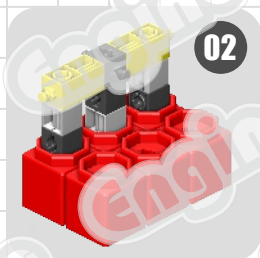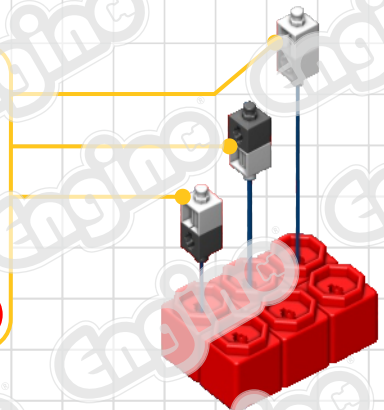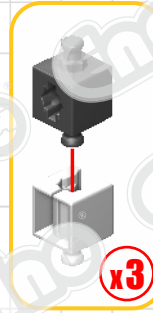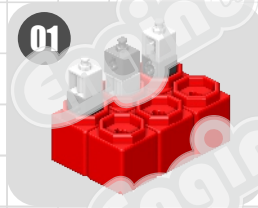Tip: Count the time you press the button for each command.

Exercise 4. Press the appropriate buttons on your smart device to record the following sequence:
- *the blades rotate clockwise;*
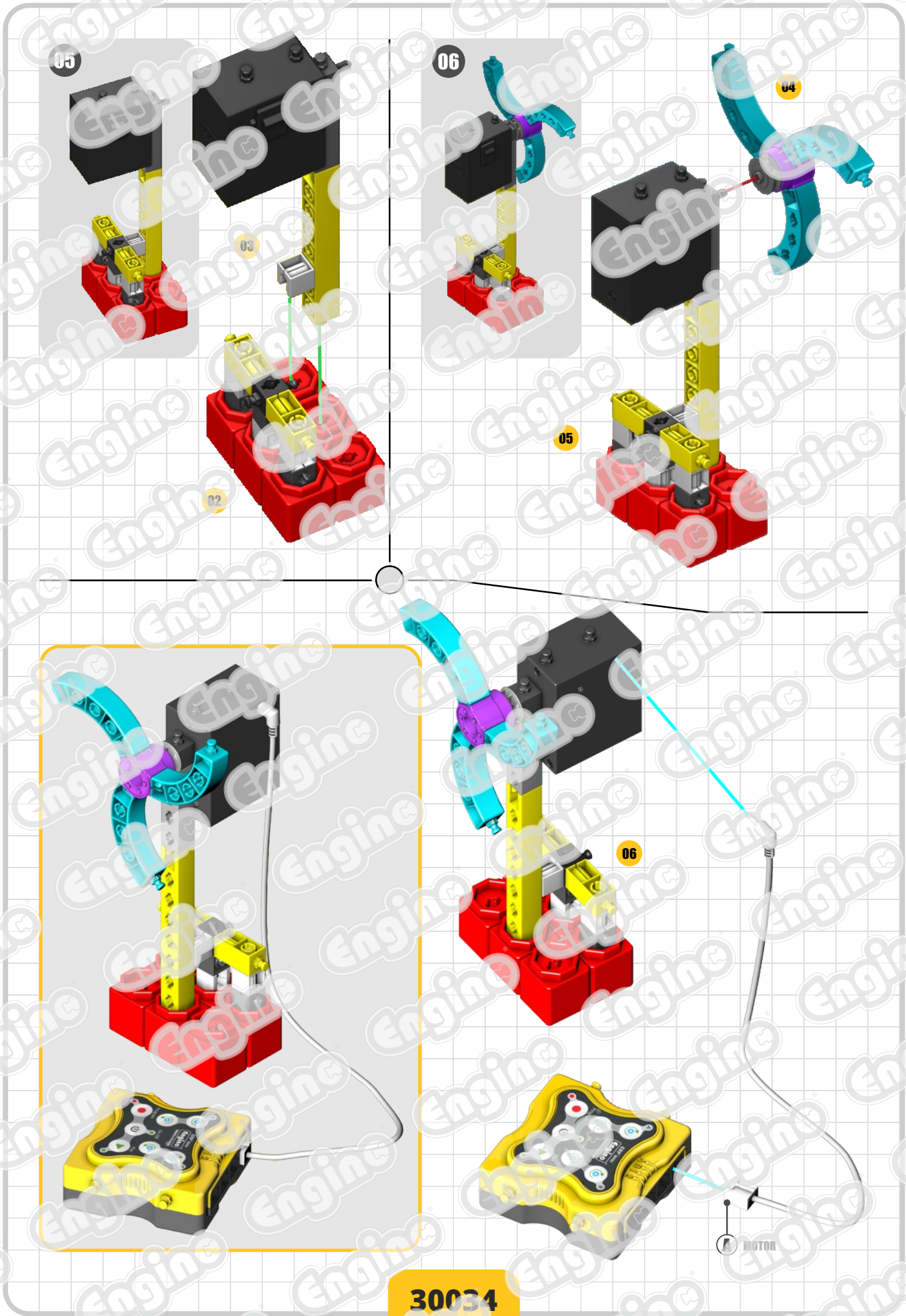- *the blades rotate anticlockwise;*
- *the blades rotate clockwise.*

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MOTOR

Simulator and Flow Diagram

A carousel is also known as merry-go-round. It is a ride found in an amusement park or in playgrounds ans includes a circle-shaped rotating platform. Children have a seat and the carousel spins! Sometimes it goes so fast that it becomes a challenge not to get scared.

Discover:

- How to improve the construction.
- How to create a program from the Simulator panel.
- What a Flow Diagram is.

Materials Needed:
- Engino STEM & Robotics MINI.
- PC or Smart device with KEIRO™ software installed.

Procedure:

1. Build the **Carousel** model.

2. Test the stability of your model by pushing the model from different sides. **Do not push hard** as this may break the construction! Follow **exercise 2**, to build a support for the carousel. Place them to the carousel as it is shown on the picture on the right.

3. Create the manual program of **exercise 2** and learn how to run a manual program in a **loop**.

4. Connect the MINI controller to a PC using the USB cable or to a smart device via Bluetooth. **Open** the KEIRO™ software and click the **connect USB** or **Bluetooth** button.

5. On the menu bar of the software click the "**Receive program**" button to upload the recorded sequence on the PC and from the pop-up window choose Motor for Port A. The blocks are created vertically on the "**Flow Diagram**" and the simulator set up automatically.

6. Clear the screen by clicking the icon "**New**". Connect the controller again with the PC or the smart device. Open the simulator panel and follow the instructions of **exercise 3**.

*Engino®
"Carousel"
model*

Exercise 1. Build two extra parts to support your model. Place them on the carousel and test the stability again. The image inside the box can help you build a robust construction.
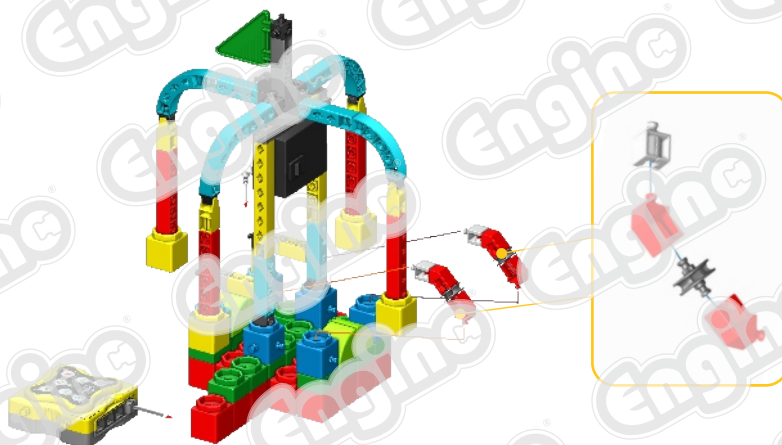
Exercise 2. Record the following sequence on the MINI controller:
- *the carousel rotates clockwise;*
- *the carousel rotates anticlockwise.*

Press the "Play" button to test the program. The program will run once.

Now, **press** the "**Play**" button continuously for **3 seconds.** This way the program will be executed in a **loop**. Press the "Play" button again to stop the execution.

Then, follow the procedure 5 and 6 to upload the program on your computer or smart device and observe the recorded program on the screen.

Exercise 3. Press the motor buttons on the simulator and observe what happens. Then, click the **"Program"** button on the simulator and record the following program:
- *the carousel rotates anticlockwise;*
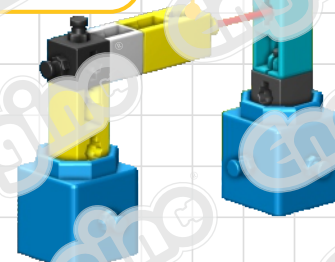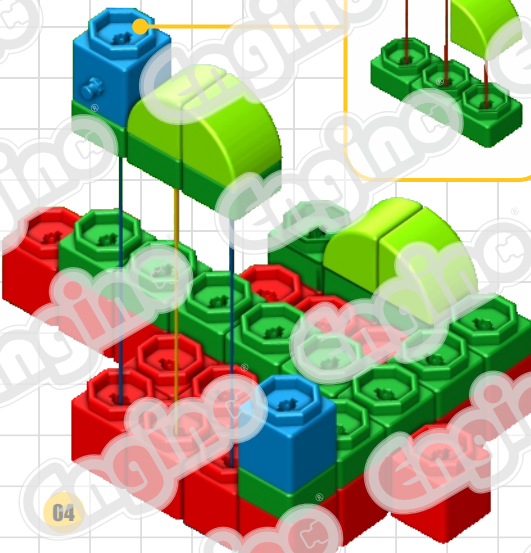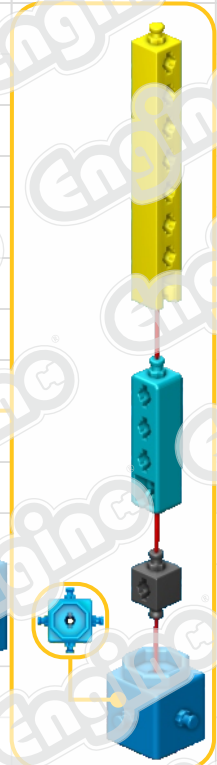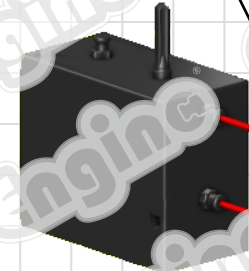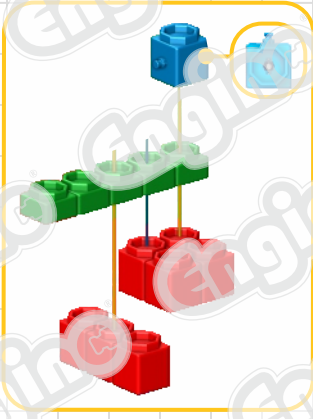- *the carousel rotates clockwise.*
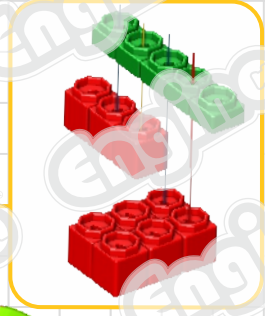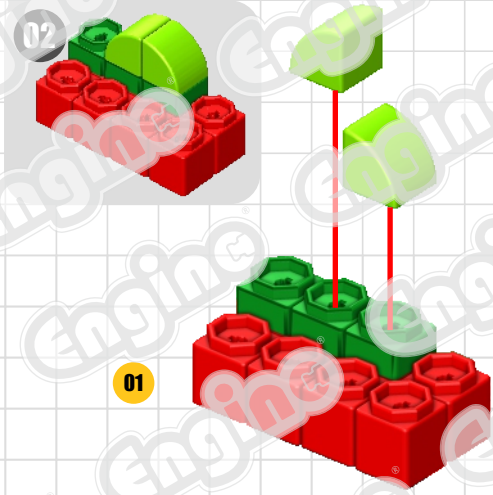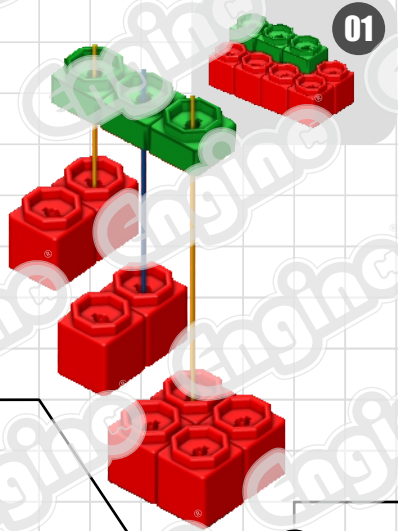
Tip: Remember to press the "Program" button on the simulator to save the program and the "Play" button to test it.

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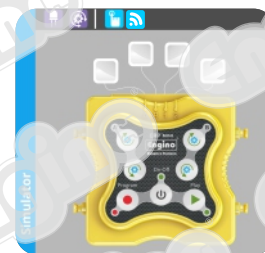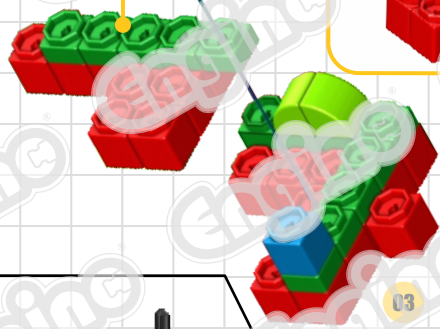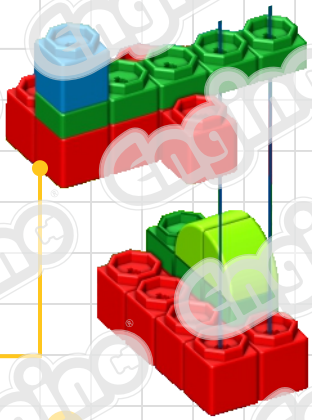
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