

STEM & Robotics Produino Set

E40.1 STEM Lessons

The **STEM & Robotics Produino education set** is specially designed for Secondary school children of ages 12+ but is ideal for older students of 12-16+ and even vocational schools and hobby engineers. With innovative experimental activities it covers the core subjects of STEM and moves into advanced programming with textual coding. Besides its main controller, it embeds an additional Arduino processor that enables open DIY projects. The set comes in a convenient plastic storage tub that contains a large number of ENGINO® structural and technical parts and high-level of robotic devices such as the unique Produino controller. It has 2 DC motors, a servo motor, a touch sensor, 2 IR sensors, a color sensor, an ultrasonic sensor and a gyroscope/accelerometer sensor. Besides the programmable screen, it conveniently has a built-in large breadboard for making your own circuitry. It allows the construction of more than 30 STEM and Robotic models.



Lesson: Movable weight scale

First-class lever

I bet all of you have been to the doctor for a general check-up! Do you remember getting on a weird device with movable beams and some strange numbers written on them? What do you think is that device and how does it work exactly? You are about to find out by carrying out the following experiment.

Discover:

- What is a first-class lever?
- How does a balance beam scale work?

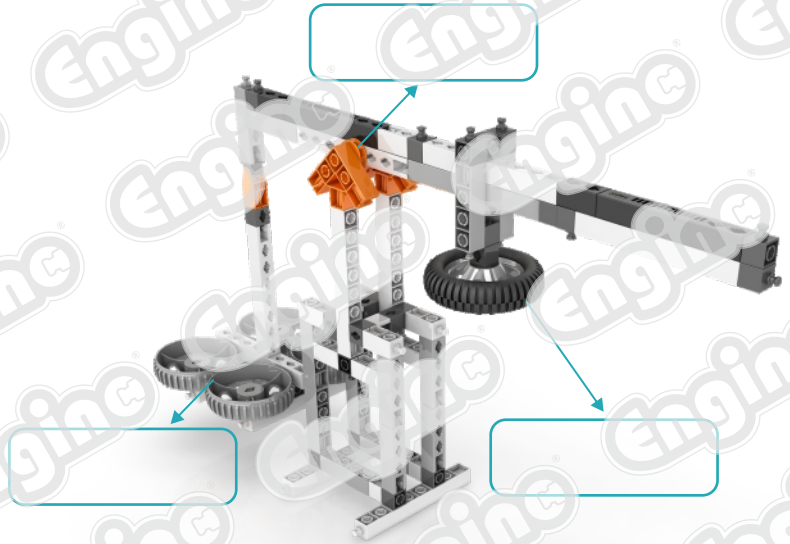
Materials Needed:

- Engino® STEM and Robotics PRODUINO.
- Beans, pebbles or any other small materials.

Procedure:

1. Build the **movable weight scale** model.
2. Complete **exercises 1 and 2**.
3. Try to balance the model with the help of the movable part (the part that contains a wheel) and count the distance from the fulcrum in squares, starting from the unit piece near the fulcrum.
4. Now, we will need some small materials to put as weights on the scalepan (weighing pan). These could be pebbles, beans, erasers or even other Engino parts that are included in your set. Put 3 or 4 of these materials on the scale and observe what happens.
5. You will probably see that the balance is lost and the scale is leaning on the scalepan's side. Restore the balance again by adjusting the movable weight.
6. Place some more materials on the loading base until it's fully loaded and try to balance the beam again. Is it possible? Why does this happen? Answer **question 3** according to your experimentations.
7. Complete **exercise 4**.

1. Look at your Engino® "movable weight scale" and fill-in the boxes with these words: **load, effort, fulcrum**.



2. Which one of the three elements (load, fulcrum, effort) of the lever above is placed between the other two? What class of lever is this?

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3. How does a balance beam scale work?

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4. In the following images you can see some examples of first-class levers. Take a look at the pictures and show with arrows where the load, the effort and the fulcrum are applied.



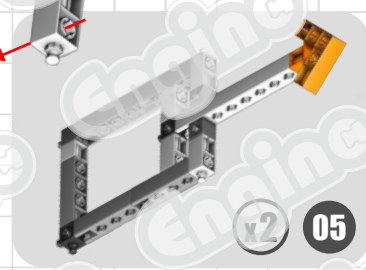
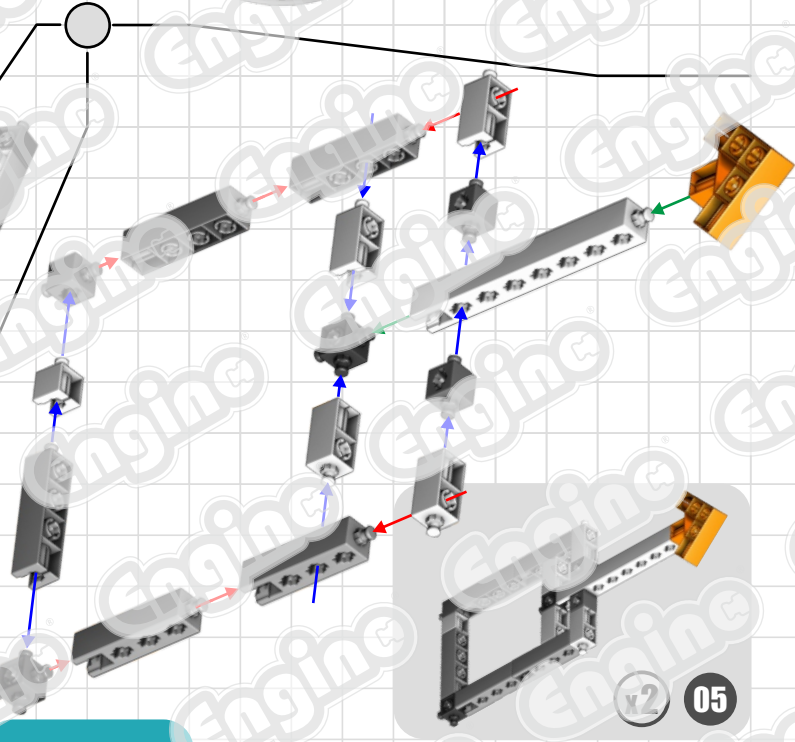
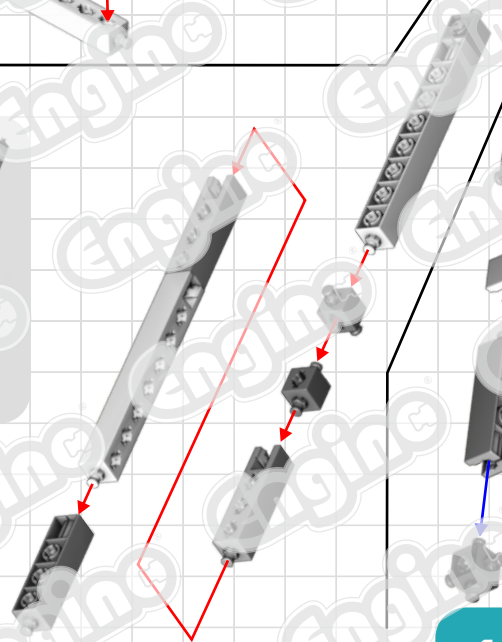
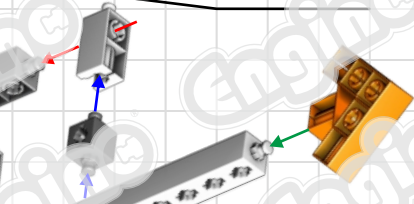
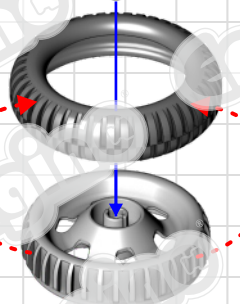
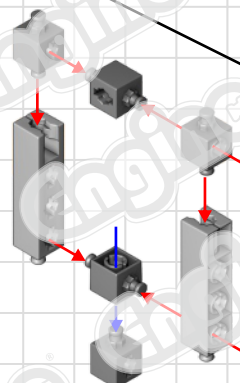
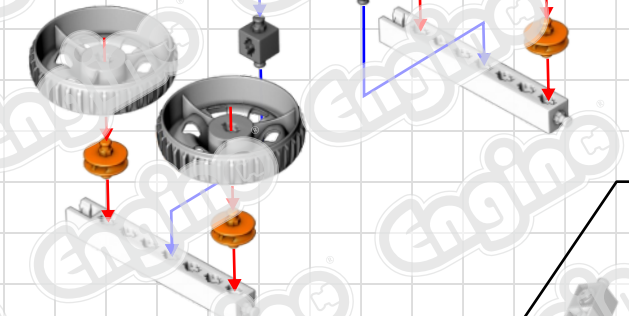
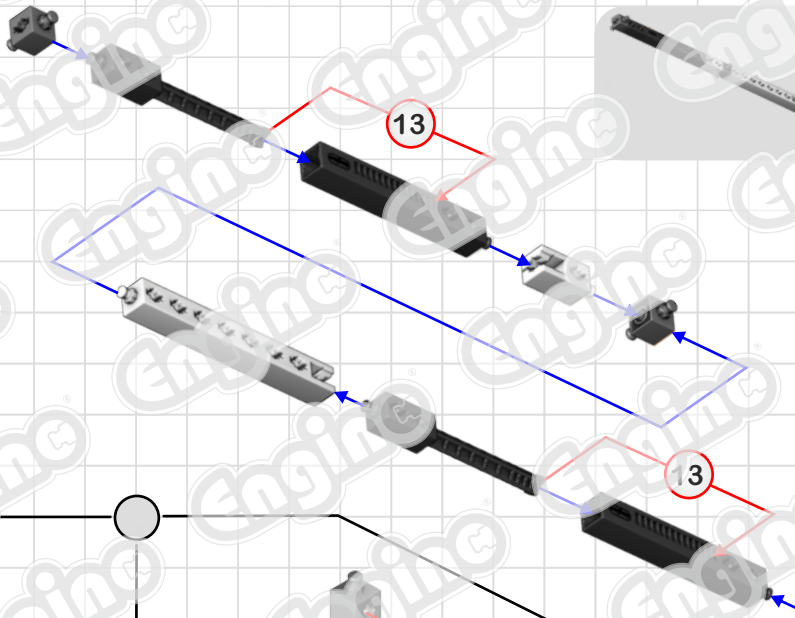
Claw hammer

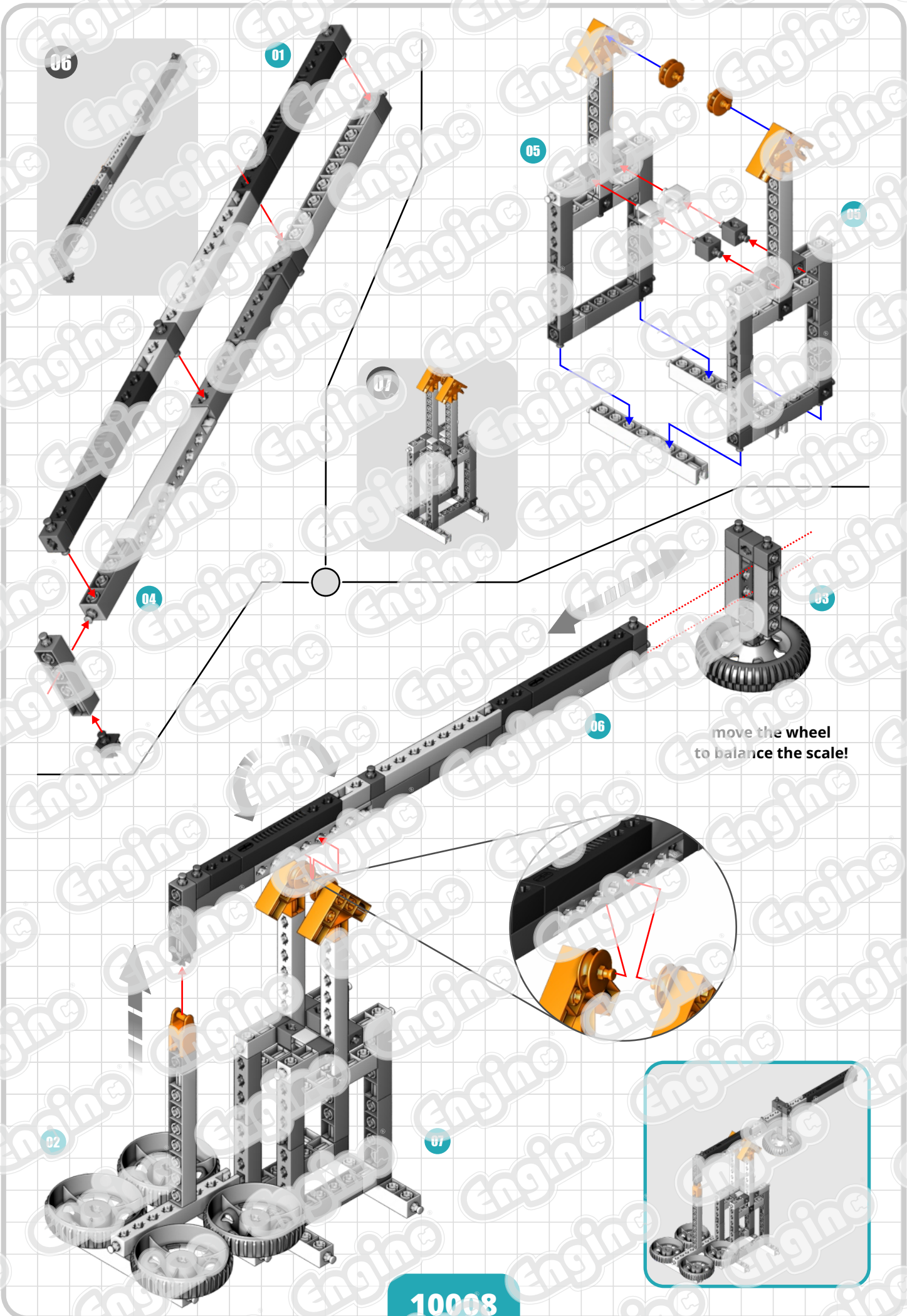
Scissors

Pliers



Engino® "movable weight scale" model





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06

move the wheel
to balance the scale!

02

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