STEM & Robotics ERP PRO Set

E30.1 STEM Lessons

The **STEM & Robotics ERP PRO education** set is specially designed for late Primary and Secondary school students of ages 9-12+. It combines the core subjects of STEM together with Robotics and includes high-level projects that lead to a deeper understanding of the underlying theory while also developing 21st century skills. The set comes in a convenient plastic storage tub that contains a large number of Engino structural and technical parts, together with advanced robotic devices such as ERP Pro controller, DC motors, LEDs, touch sensor and IR sensors. The set allows the construction of more than 30 STEM and Robotic models.

Engino® EDUCATION

9-12

Edition: 10/22

Lesson: Catapult

Types of levers

The "catapult" is a construction that was invented by the Greeks. It was perfected by the Romans and used for throwing large arrows, javelins, balls of iron or flammable materials, in distances up to 800 metres. However, we are going to limit the use of our Engino catapult to learn about levers in the following experiment!

Discover:

- How does a catapult work?
- How can we change between different classes of levers?

Materials Needed:
- Engino® STEM & Robotics PRO.
- A small rubber.

Procedure:

1. Build the catapult model.

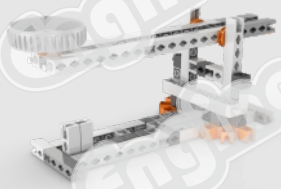
2. Focus your attention on the moving part of the model, and try to find three points: 1) the edge that has the wheel (for loading materials), 2) the joints which the moving part is connected to and 3) the other end where you apply the force with your finger.

3. Join two more wheels on the model with the help of a pulley. For each case you should first build the model that you see in the picture (you can do it easily by changing the position of the pulley) and write in the boxes of **exercise 1** the three elements of a lever: **load, fulcrum** and **effort**.

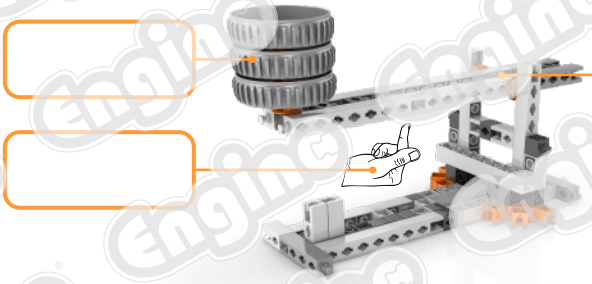
4. Taking into account your answers from exercise 1 indicate which element of the lever is between the other two elements for each case in **exercise 2**.

5. For safety reasons, it is better to conduct the last exercise at a spacious place and make sure that no one is standing to the direction of the projectiles.

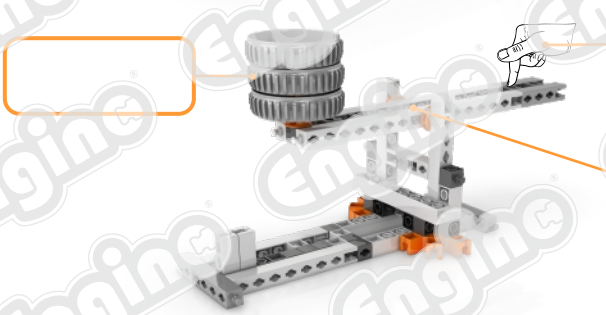
6. Set up the initial model without the extra wheels. Place the rubber onto the wheel, apply a small force and observe the distance the rubber hit the floor for the first time. Repeat the same for cases 2 and 3 by applying the same force. Answer **exercise 3**.



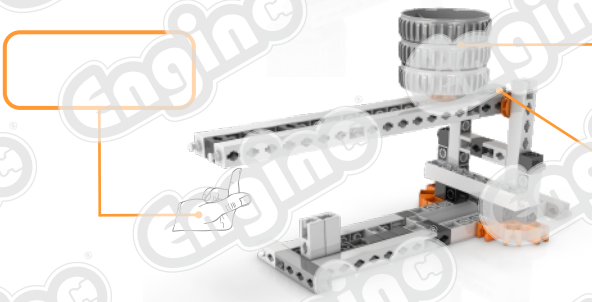
1. Fill-in the boxes using the words: **load, effort, fulcrum.**



Case 1



Case 2



Case 3

2. Which element of the lever (**load, fulcrum, effort**) is placed between the other two elements for each case? What type of lever (**first, second, third**) is it in each case?

Case 1: ..... . It is a ..... class lever.

Case 2: ..... . It is a ..... class lever.

Case 3: ..... . It is a ..... class lever.

3. Which of the above cases is suitable for a catapult to throw objects at a longer distance? Where should the fulcrum be repositioned to get the maximum distance?

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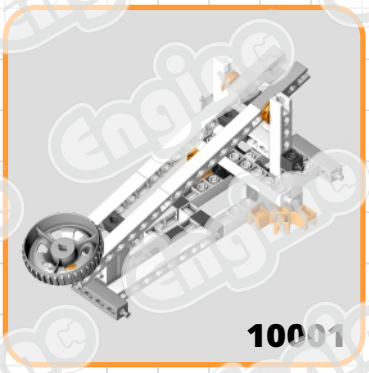
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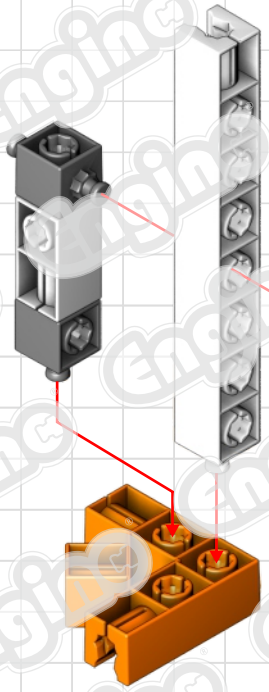

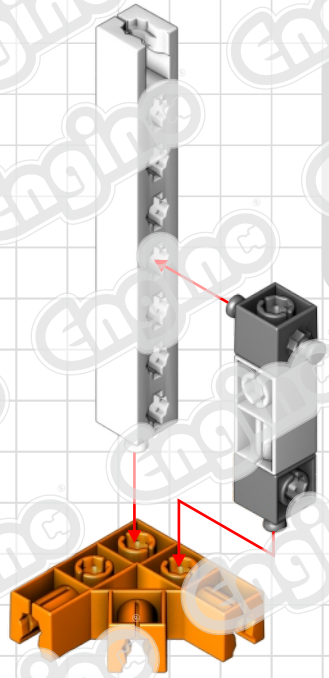


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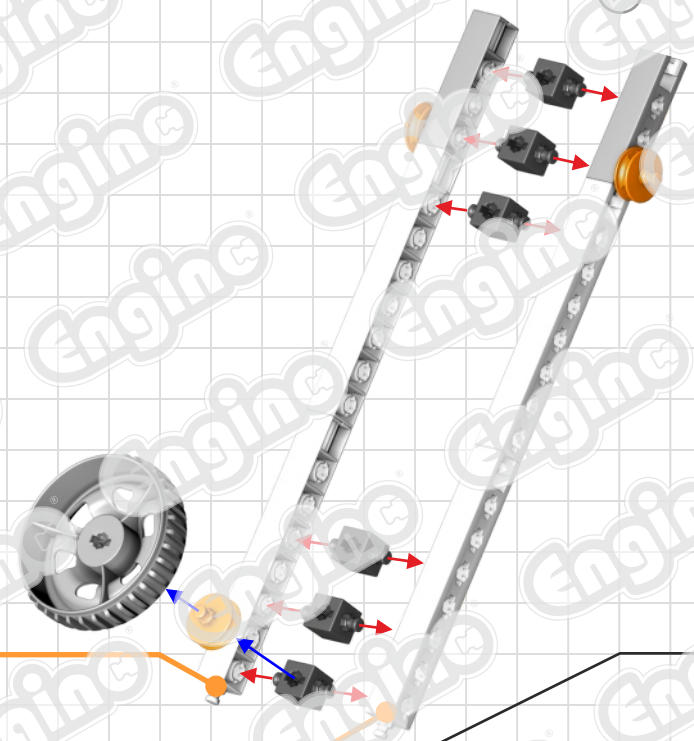
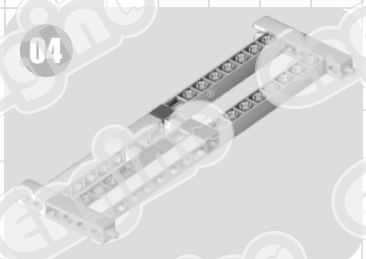
x2




03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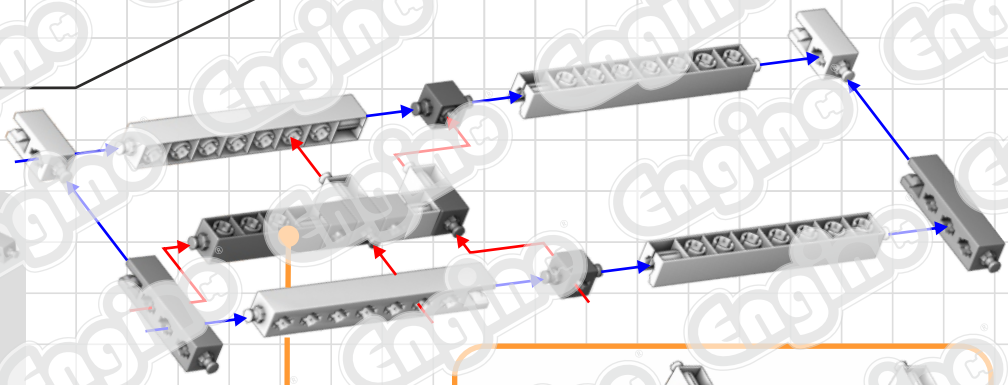

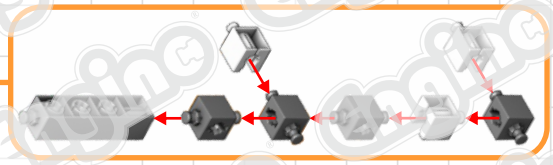

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