

# Early engineering to lift things

<b>Respective blueprint</b>	TRISPASTOS, Roman Crane
<b>Description</b>	<p>This lesson introduces students to the Trispastos, an early Roman crane used to lift heavy objects. Students will learn not only the historical and cultural contexts of the Trispastos, but also how it functions and how it can be used in real life.</p>

<p><b>Learning Objectives</b></p>	<p>At the end of this session, participants will be able to:</p> <ul style="list-style-type: none"> <li>- Understand the use of the Trispastos in its proper cultural and historical contexts.</li> <li>- Explain how the Trispastos works and in which cases it can be used.</li> <li>- Describe the process of creating the Trispastos and reflect on the practical skills and information they have learned.</li> <li>-</li> </ul>
<p><b>Related curricular subject(s)</b></p>	<p>Engineering</p> <p>Mathematics</p> <p>Technology</p>

<p><b>Prerequisites / preparatory actions for teachers</b></p>	<p>Educators should carry out some preliminary research about the Trispastos and other types of ancient cranes. They may consider looking for examples, drawings, and restorations of these cranes in order to better understand the object they are going to build and use.</p>
<p><b>Prerequisites / preparatory actions for students</b></p>	<p>Students should be prepared to work in a hands-on way in this lesson and have basic skills for using the tools and materials required. Also, students should carry out some preliminary research about the Trispastos and other types of ancient cranes.</p>
<p><b>Age of students</b></p>	<p>10-15 years old</p>
<p><b>Duration</b></p>	<p>1.5- 2h</p>
<p><b>Level of difficulty</b></p>	<p>Low - medium</p>

## Step by step description of the tasks

### **Step 1. Give a brief introduction to the historical and cultural context of the Trispastos.**

The crane was invented in ancient Greece. However, it was not long before it was adopted by the Romans. The Trispastos is one type of several cranes used by the Ancient Romans for lifting heavy objects and constructing buildings. This is the simplest Roman crane. It consisted of a gallows with a single beam, a winch, a rope and a block containing three pulleys. A factor that gave it a mechanical advantage of 3 to 1. In other words, a man who could exert an effort of 50 kilograms could lift 150 kilograms.

### **Step 2. Introduce the physical form of the Tripastos**

Next, show an example of the Trispastos (either a photo or a model constructed before the class session) and explain the different parts of the crane.

The mast of this crane was made up of two gigantic pieces of wood in the form of an A. Its articulation was ensured by two dents in the ground. Its stabilization on all types of surfaces (of various slopes) was achieved by two balancing ropes that were held taut with hoists and hand winches, thus providing traction.



The load carried by the crane was lifted or lowered with the help of the “trispasto” and a horizontal axle, the “reel” (where the rope for lifting the load was wrapped). It was turned with the help of mobile levers around specific bases, or “tortoise-like cases”, that were fitted on the joists of the mast. To reduce friction, the axle had small axial rods on both sides that were placed in “tortoises”<sup>1</sup>.

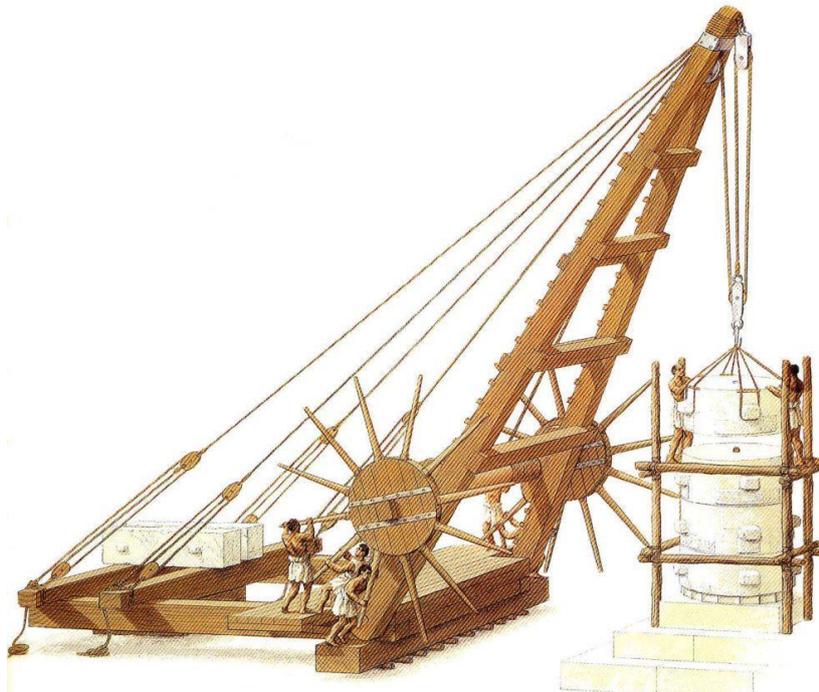


Photo from: <https://www.gruasyequiposgarcia.com/la-primer-grua/>

### Step 3. Build the Trispastos in small groups

In this step, students will build their own real-life versions of the Trispastos in small groups.

<sup>1</sup> <http://kotsanas.com/gb/exh.php?exhibit=0802001>

The educator should divide students into groups of 3-4 and give each group a copy of the corresponding Trispastos blueprint. With the educator's help, students should follow all the steps of the blueprint to create their own versions of the Trispastos in the classroom. It would also be helpful to test their Trispastos to see whether they work to lift small loads, thus putting their creations into practice.

#### **Step 4. Discussion and Debriefing**

The educator should also reserve some time at the end of the session for discussion, either within the small groups or with the whole group together, so that students can brainstorm different real-life uses for the Trispastos. In addition to thinking about its past uses, students can also think creatively about what it might be used for today.

It may be helpful to make a list together on the blackboard or a large sheet of paper, so that students can see the varied uses in one place, in a very visual manner.

If there is time left at the end of the session, students can show each other what they have learned, explain the mechanics of the Trispastos, and discuss their experience of building it (what they enjoyed, what was challenging, etc.) in the larger group. This will help them to process both the experience and the background knowledge they have learned about the Trispastos. It will also help them to develop skills in organizing and presenting information, as well as communication skills.

## Assessment activities

After the lesson, educators may consider posing some questions to students about the historical and cultural context:

- Was the Trispastos crane invented in Ancient Rome?
- Worst job in History: Trispastos crane operator?
- Did Trispastos cranes move around a site during a construction project?

Students may also answer the following questions to test their knowledge of the use of the Trispastos:

- Did Trispastos cranes become dockside lifting machines?
- Are Trispastos cranes still being used today?
- How much weight can be lifted with a Trispastos?