

GROMA

Name of the object	Groma - Roman measurement tool
Recommended ages (from...)	Starting from 10 years old
Thematic areas combined (STEAM)	Technology Engineering Mathematics
Materials needed	<ul style="list-style-type: none"> • Wooden pole, 1.5 or 2 meters long, for the upright. • Wooden sticks, 1.5 or 2 meters long, for the rostro. • Marker Peg • Rope and eyebolts • Plumb lines (at same weight) • Ruler • Saw • Bolts
Instructions step by step	<p>Step 1. Setting up all the materials and looking at the instructions and models.</p> <p>Step 2. Building the Upright, a one-and-a-half to two-meter-long pole.</p> <p>Step 3. Building the Rostro, an upwardly curving right-angled extension, with an end fixed to the top of the upright via a swivel mount.</p> <p>Step 4. Building the Stelletta or Groma, a simple cross of wood with arms of equal length.</p> <p>Step 5. Combining all parts together and preparing the Marker Peg.</p>



Step by step: how to build the Groma

Step 1

Time needed: 10 minutes.

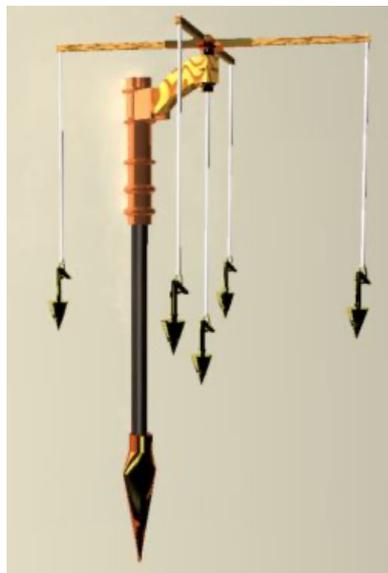
Setting up all the materials and looking at the instructions and models.

- Timbers cut to the appropriate dimensions (take a look into materials).
- Bearings for the rotating elements.
- Some parts such as the spike that sticks into the ground, which must be made of metal, can be recycled from a small gardener's spade.
- Decoration of the pole at the discretion of the person carrying out the activity.
- Fishing weights for making the plumbs.
- The wood for the Rostro should be cut beforehand.



All the pieces ready to mount.ⁱ

This is how the Groma should look when finished:



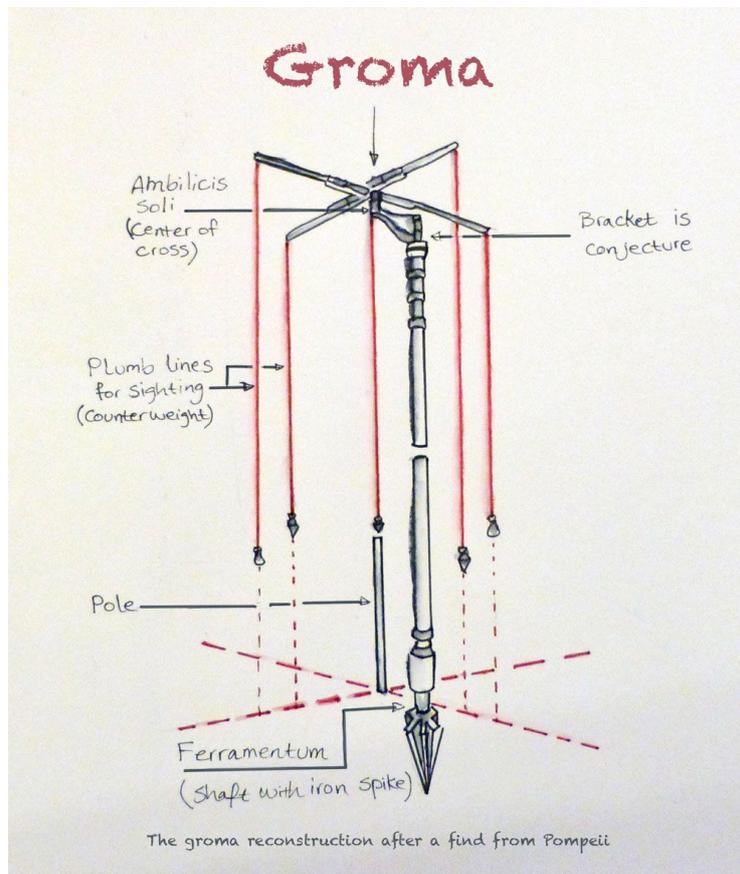
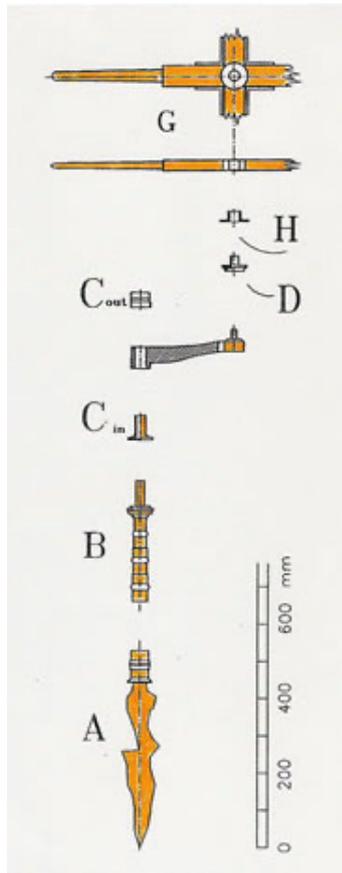
A Groma built in 3D simulation.ⁱⁱ

Step 2

Time needed: 25 – 35 minutes

Build **the Upright**, a one-and-a-half to two-meter-long pole. One end was metal tipped to facilitate pushing it into the ground (A). C and D are the bearings. Pay attention to the construction of the arm, the wooden piece that connects the pole to the Rostro.

Parts of the Groma.ⁱⁱⁱ



Groma parts on built scene.^{iv}

Step 3

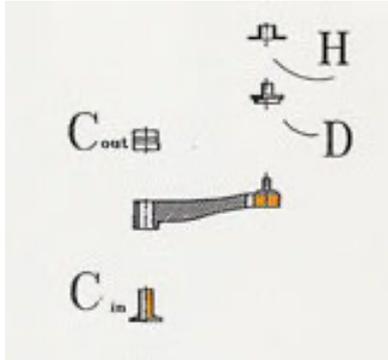
Time needed: 20 minutes

Build **the Rostro**, an upwardly curving right-angled extension, with an end fixed to the top of the upright via a swivel mount. This extension rotated horizontally, 360 degrees. The centre-point of the groma was attached horizontally to the upper vertical end of



this extension via a swivel mounting. A plumb line was fixed beneath the groma's mounting point to act as a third sighting point.

The rostro is the piece between the C and D points on the graphic (vi).



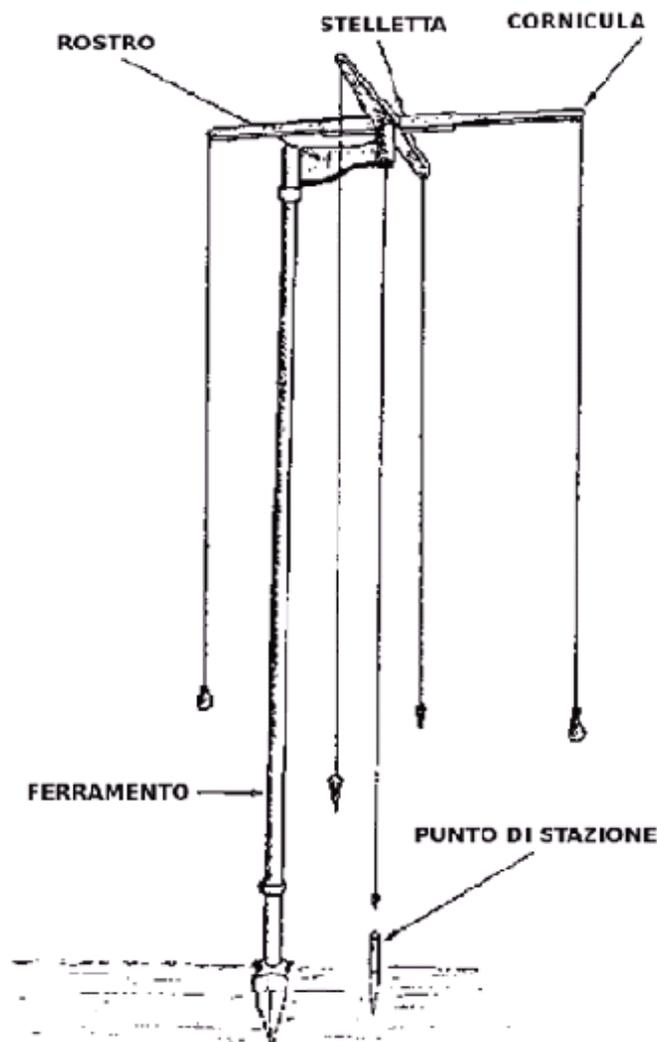
Building bearings to the rostro piece, between the pole and the “stelleta” (the wood cross with the plumbs).



Step 4

Time needed: 15 minutes

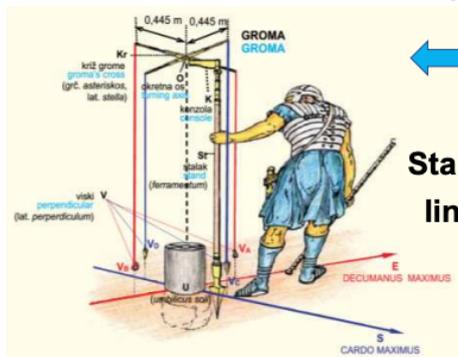
Build the **Stelletta or Groma**, a simple cross of wood with arms of equal length (approx. 45cm long per arm) Each arm had a plumb line suspended from the end of it; each line was equal in length to the other three plumb lines. All four plumb lines feature plumbs of equal weight to ensure the horizontal stability of the Groma.



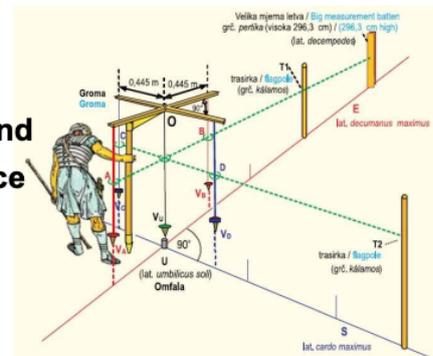
Stelletta or Cross.^v

An idea of the use of the Groma

Groma for pegging out a right angle in the field



Stake-out the right angle and line by using Groma device



Length of the Cross of the Groma.^{vii}

ⁱ Image from <http://www.artesolare.it/groma.htm>

ⁱⁱ Image Groma simulation 3D from <https://www.vgwacademy.com/groma/groma.html>

ⁱⁱⁱ Image graphic of Groma's parts are from <https://www.cartographyunchained.com/rm3/>

^{iv} Image part and how to build are from <https://thebluecurls.files.wordpress.com/2013/10/groma1.jpg>

^v Image from <http://www.artesolare.it/groma.htm>

^{vi} Image from <http://www.artesolare.it/groma.htm>

^{vii} Graphic and measures of the Groma. Excerpt from https://www.fig.net/resources/proceedings/fig_proceedings/fig2018/ppt/fig10a/FIG10A_hosbas_pirti_et_al_9296_ppt.pdf