



## Roman Hackers

**How did the Romans use maths to create their hacksilver?  
Discover the process of recycling a Roman silver vessel.**

This resource is aimed at the Fourth Level of Curriculum for Excellence, covering Numeracy and Mathematics (MTH 4–19a, MNU 4–20a). You can try it at home or in school.

First watch the video of Dr Fraser Hunter explaining the mathematics of Roman hacksilver in the Early People Gallery at the National Museum of Scotland, then try our activities!



In 1919, a hoard of Roman silver was found in Traprain Law, East Lothian. This was buried in the middle of the 5th Century AD and is one of the biggest hoards of silver to be found outside of the Roman Empire. However, lots of the silver vessels inside were in pieces, appearing to have been hacked up.



During periods of economic instability, the Romans hacked up their precious silver vessels into smaller pieces, also known as hacksilver, as weights of bullion to trade or give as bribes. This wasn't the Romans smashing up their tableware though! In fact, the silver was cut very carefully, using precise angles to trim the pieces according to specific weights. Initially these were cut into large pieces, mostly at  $180^\circ$  and  $90^\circ$  angles. Later, they were often subdivided into secondary cuts, mostly at  $30^\circ$  and  $60^\circ$  angles, when people wanted smaller weights of silver to use.



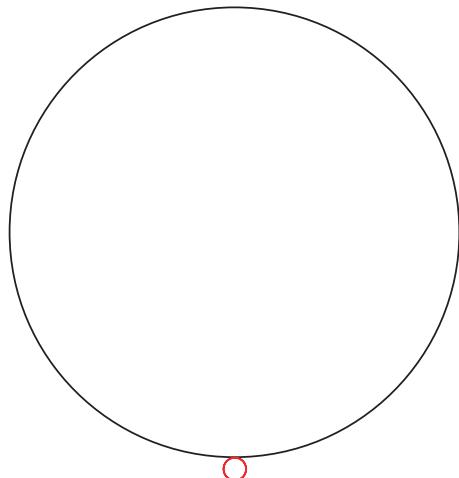
Try our maths design challenge where you can take on the role of a Roman to hack up your own silver vessel, then our extra activities for additional Hackers' treasure!

**Materials:**

Cardboard, Ruler, Pencil, Paper, Scissors, Protractor, Compass (optional)

### Maths Design Challenge

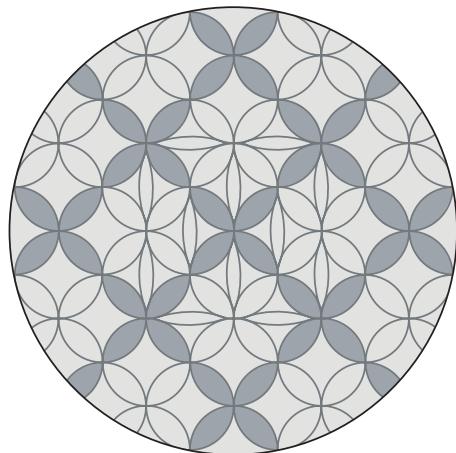
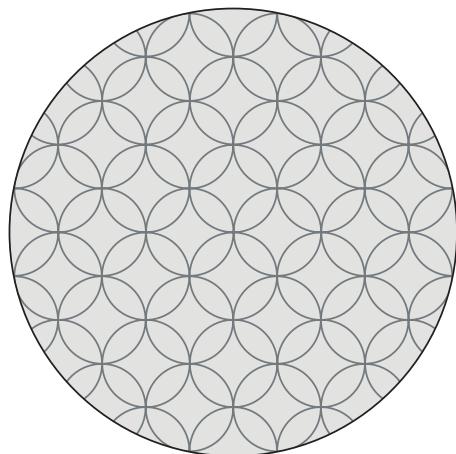
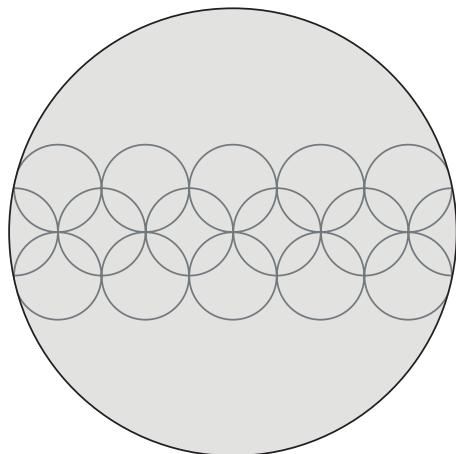
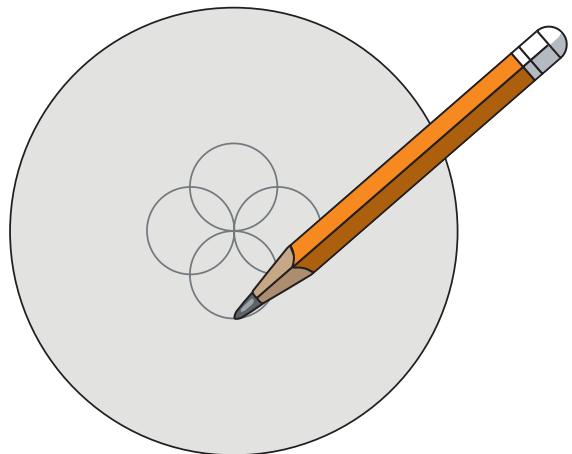
**Step 1:** Find a recycled piece of flat cardboard at home such as a cereal box. Draw a circle with a 20cm diameter on the cardboard and cut it out to create a Roman silver dish.



**Step 2:** Decorate your dish with a pattern using rotational symmetry. Draw the circle above using a compass or a stencil with red O as the centre of the cardboard. You can make the circle as big or small as you like. Rotate the shape about red O to create an order of rotational symmetry of 4. Try repeating the pattern to fill up the cardboard. You could also try drawing some interesting shapes in between the sections to create an ornate design.

**Step 3:** Mark a straight line through the centre of the dish connecting the two edges, then another straight line to make two quarter circles. Use some scissors to make these primary cuts.

**Step 4:** Now you have made two primary cuts, take one of your pieces of cardboard to make secondary cuts on this piece of silver. Use your ruler and protractor to draw lines which divide this piece into three equal parts. Make the cuts along the lines.



You have now successfully hacked your Roman silver vessel! What would you like to trade it for?

## Extra Activities

### Hackers' Treasure

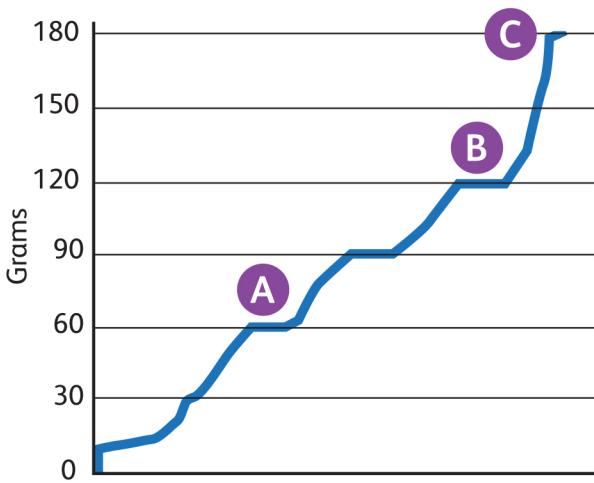
Roman hacksilver was recycled and repurposed for different things. Discuss what you would repurpose your remaining piece of hacksilver into. You could make it into a brooch or a piece of jewellery like this chain. Why don't you try giving it a go using recyclable materials?



### Curator's Conundrum

The Romans used these smaller angles to divide up their hacksilver according to fractions of Roman ounces. Did you notice that your hacksilver pieces were all multiples of twelve? This twelve ounce weight system created a standardised process to trade hacksilver or melt it down to create something new.

Curators like Dr Fraser Hunter use rank size plots to organise all of the hacksilver pieces they find by weight. The rank size plot below is sorted by grams, but the Romans used ounces, or *uncia*. If 1 *uncia* = 30 grams, find where each piece of hacksilver lies on the rank size plot and match each one to the corresponding letter.



4 uncia



2 uncia



6 uncia

