Thinking 3D

FROM LEONARDO TO THE PRESENT

GEOMETRY TRAIL

Poly (many) + gonos (angled) = polygon

Poly (many) + hedra (seat/base/face) = polyhedron

Ge (earth, land) + -metria (a measuring of) = geometry

Look

Think

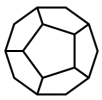
Write

Luca Pacioli was one of the most famous maths teachers of the Renaissance.

In the picture on the wall, which objects is he using to teach?

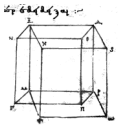
Look around the exhibition to find polyhedra represented in different ways:

printed images with solid sides

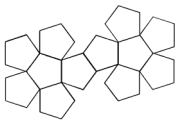


printed images with only edges shown

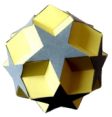
hand-drawn diagrams



nets showing the whole shape 'exploded'



paper, wooden and plastic models



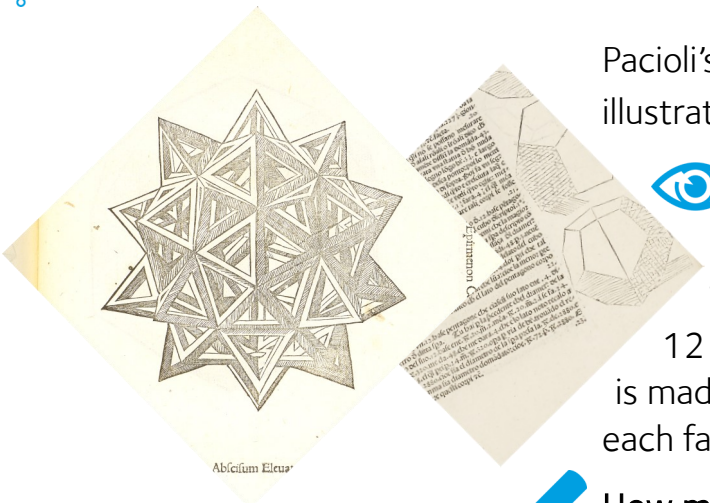
If you could only use one of these to study advanced geometry, which would you find most useful?

5

Two books on maths published by Luca Pacioli are in this exhibition.

Compare these two books. Who illustrated the later one, and what made the diagrams more effective than the illustrations for the first book?

6



Pacioli's second book contains the first ever printed illustration of the elevated icosidodecahedron.

Nearby, find another way of illustrating 3D geometry which was a world first.

The icosidodecahedron has 20 triangular faces and 12 pentagonal faces. The elevated icosidodecahedron is made by creating a pyramid of equilateral triangles on each face.

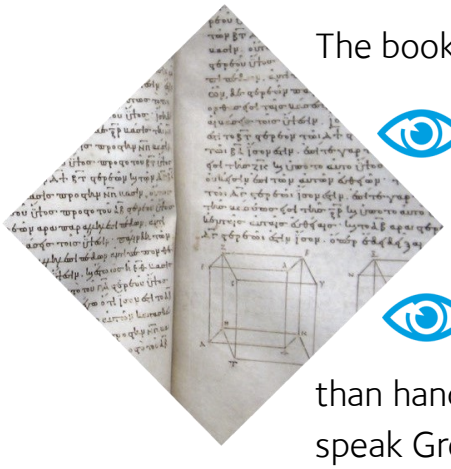
How many triangles would you need to do this? .....

Instead of being hand-written, the books in this display case were printed on printing presses, with woodcut illustrations. Pacioli wrote in Italian, and Dürer wrote in German (although the Latin translation is on display here.)

What difference would the new technology of the printing press and the choice of language have made for Renaissance learning?

Name: .....

Euclid's *Elements* is the most influential textbook in the world. Written around 2,300 years ago, it collects the mathematical wisdom of the ancient Greeks, applying mathematical logic to the three-dimensional world by defining 2D and 3D shapes.



The book survived at first by being copied by hand.

1

Find a Greek version made in 888CE by a scribe called Stephanus. He illustrated the text with simple pen and ink diagrams.

14

Find the first English translation of Euclid's *Elements*. Published in 1570, and printed rather than hand-written, the translation let people who didn't speak Greek study this key mathematical text.

What else did the author do to make his illustrations clearer, and help students understand geometry?

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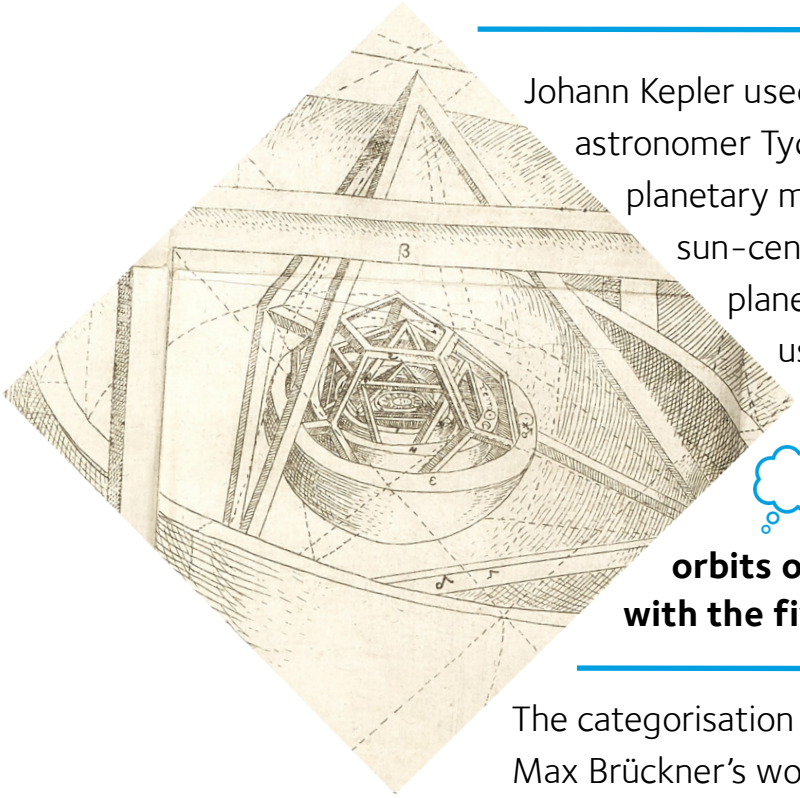


18

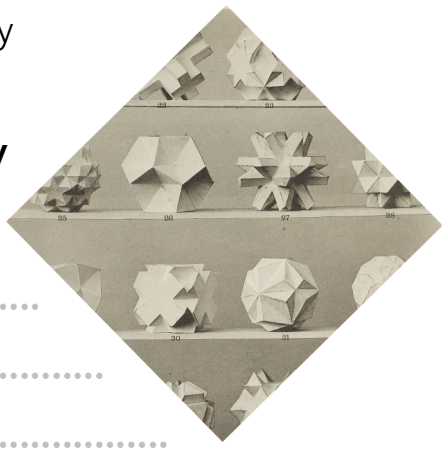
Johann Kepler used the astronomical data gathered by astronomer Tycho Brahe to create his three laws of planetary motion. Kepler's theories built on the sun-centred model of Copernicus by defining the planets' elliptical orbits. In turn, Isaac Newton used Kepler's ideas to come up with his law of universal gravitation.

Why do you think Kepler also created this strange diagram, where the orbits of the six known planets are overlaid with the five Platonic solids?

30

The categorisation of page after page of polyhedra in Max Brückner's work might seem pointless to some.

But why do you think humans have been fascinated by geometry for thousands of years?



Look around the exhibition and list some reasons why people might study geometry.

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