2020-10-30 ①

The French Connection (in the early 1600s)

Marin Mersenne (1588-1648)

- ordained priest in the Minim order, lectured on theology & philosophy, did math, physics, music, etc on the side.
- he was the centre of correspondence with a large group of scientists and mathematicians, including Galileo, Descartes, Fermat, Huygens, Pascal, ...
- in math he's mainly remembered for Mersenne primes (of which he compiled a list - that turned out to be partly incorrect)

These are primes of the form $2^n - 1$ for some integer n.

(For $2^n - 1$ to be prime, n must be prime.)

The current largest known prime is a Mersenne prime, and there are lots of open unsolved problems about them

eg ① Are there infinitely many Mersenne primes?

② Are there only finitely many primes p for which $2^p - 1$ is not prime?

He published a book on music theory in 1636, (Harmonie Universelle) covering all aspects of music then known, included aesthetics, philosophy, theology, instruments, polyphony, harmony, acoustics, etc. The section on acoustics, along with work of Galileo's, laid the the foundations of acoustics as a scientific discipline

In particular he developed Mersenne's Laws for a vibrating string:

The fundamental frequency of a vibrating string is:

1) inversely proportional to its length. (Pythagoras)
2) proportional to the square root of the force stretching the string.
3) inversely proportional to the square root of the mass of the string per unit length.

In modern terms, this all fits in one equation:

$$f_0 = \frac{1}{2L}\sqrt{\frac{F}{\mu}}$$

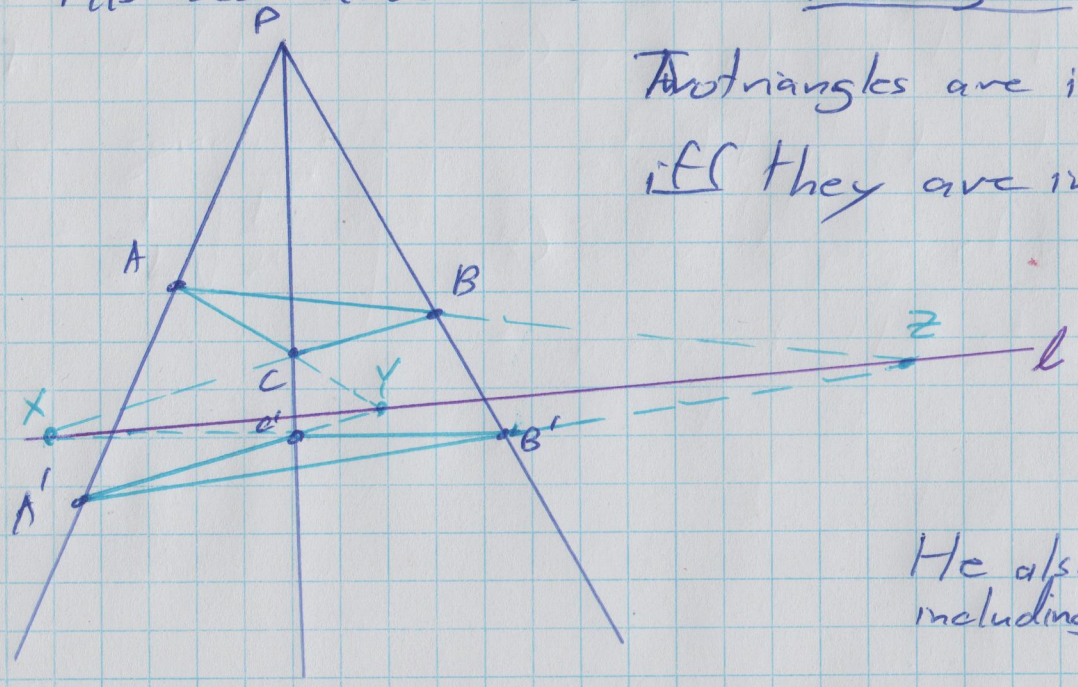
Girard Desargues (1591-1661)
(Gerard)

- engineer and architect by profession
  ↳ designed water systems

- interested in the mathematics of perspective and in geometry
- invented projective geometry in trying to synthesize these subjects.
  ↳ The study of geometrical properties that are invariant under projections.

- his work was largely ignored in his lifetime, partly because of his idiosyncratic choice of terminology (partly borrowed from botany)

- His best-known result is Desargues' Theorem:



Two triangles are in perspective from a point iff they are in perspective from a line.

His system - not that anyone noticed - was a system of geometry that was fundamentally not Euclidean.

He also made contributions to optics, including a thorough explanation of rainbows.