October 9th 2020
Shapesin Action:

SYMMETRY IN PROJECTIVE GEOMETRY

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Topics (with links) discussed during Friday's session:

One-dimensional correspondences:

A correspondence is a rule for associating every point X with every point X' so that there is exactly one X' for each X and exactly one X for each X'. (H.S.M. Coxeter)

Perspectivity
(https://en.wikipedia.org/wiki/Perspectivity)

Projectivity
(https://en.wikipedia.org/wiki/Homography)

A projectivity may be defined as the product of several perspectivities.

– Hyperbolic projectivity (two invariant points)
Where are the invariant points?
What determines if the projectivity is direct or opposite?

– Parabolic projectivity (one invariant point)

– Connection to arithmetic

Geometric series
(https://en.wikipedia.org/wiki/Geometric_series)

Exercise: Construct a range of points related to each other by a parabolic projectivity, then project that range to another line so that the fixed point goes to infinity.

– Elliptic projectivity (no invariant points)

– A projectivity having more than one invariant points can only be the identity.

Desargues's theorem
(https://en.wikipedia.org/wiki/Desargues%27s_theorem)

Two triangles are in perspective with respect to a point if and only if they are in perspective with respect to a line.

Configurations
(https://en.wikipedia.org/wiki/Configuration_(geometry))

quadrilateral / quadrangle

Desargues configuration
(https://en.wikipedia.org/wiki/Desargues_configuration)

Exercise: In the Desargues configuration you constructed, find another instance of the Desargues's theorem, there are ten of them.

Desargues's theorem's three-dimensional proof, Aalto Math&Arts logo
(http://matharts.aalto.fi/AaltoMathArts.jpg)