Projective space

Geometry, Topology, Algebra, Analysis, Combinatorics.

"Down to earth". 

\[ l_1 \cap l_2 = p \]

Fix \( l_1 \), move \( l_2 \).

\( p \) moves. Two lines should always intersect. As \( l_2 \) slopes \( l_2 \) moves, \( p \) moves "out". Want them still to intersect in some ideal sense. So to a copy of the plane join a set of all "directions"

in the plane. 

\[ \text{plane} \cup \{ \text{all directions}\} \]

the same "edge".

Then any two lines in this geometric setting always have a unique point of intersection:

\[ l_1 \cap l_2 = p \]

Okay. 

\[ l_1 \cup l_2 = p \] (both "points" are \( p \)).

In fact, the classical algebraic geometers deal with more than lines (Bézout's Theorem, e.g.) and other problems...