ON A METHOD OF COMPARISON FOR STRAIGHT-LINE NETS*

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1. *Introduction.* The problem which led to this investigation of the structure of systems of straight lines in a plane was undertaken for the purpose of reclassifying, if possible, the 36 Weber-Aronhold sets of seven real double-tangents of a plane quartic curve. Different ways of constructing straight-line nets are known, but easy and conclusive methods for comparing systems apparently different are at least not well known.

We exhibit here a new method of comparison for straight-line nets and apply it to show all non-equivalent types for $n=6$, 7, and all *heptagonal* types for $n=8$.

2. *Non-Equivalent Sets of n Lines.* A set of real lines, finite in number, in the plane of projective geometry, divides the plane into convex polygons. If no three of the lines meet in a point, then by Euler's equation n lines form $(n^2-n+2)/2$ polygons. Two sets of n lines are *equivalent* when a one-to-one relation exists between the lines and polygons of the two sets. If $n<6$, the sets are equivalent, but for $n\geqq 6$, four or more non-equivalent sets are known to exist.†

3. *Method of Construction.* Since all sets of five lines are equivalent, any five lines in a set may be selected as the initial five. Adding a sixth line, we construct systems of six lines whose equivalence or non-equivalence is tested by this new method of comparison, and only four different types exist. Employing these four types of six lines as initial sets and adding a seventh line we find that only eleven non-equivalent sets of seven lines exist. Among the eleven non-equivalent sets of seven lines, one set contains a convex heptagon. From this set by adding an eighth line we derive fifteen non-equivalent sets of eight lines, designated as *heptagonal* sets of eight lines.

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† H. S. White, this Bulletin, vol. 38 (1932), p. 59; and L. D. Cummings, this Bulletin, vol. 38 (1932), p. 105; also vol. 38 (1932), p. 700.