

***Geometry!!* Read the Book—Don't Wait for the Movie**

1. Geometry and Secondary Teaching:

1.1. Bloom's Taxonomy, a good thing to bring up in a High School classroom

1.1.1.(check with your education experts)

Sometimes education folk like education concepts brought up in the school classroom, sometimes they hate it, so make up your own prejudices, but don't argue with education teachers.

Read up about Bloom's Taxonomy. It gives a basis for thinking about what is going on in your classroom, as well as a way of addressing performance with your better pupils.

1.2. The Van Hiele Hierarchy

This is a once-and-for all thing in this class. But it gives a context for establishing appropriate goals when you are assigned different levels of classes to teach.

Who was van Hiele? Is there much agreement about what was said, or are there contradictory accounts on the Web? Does the Hierarchy provide anything useful? If not, why not; if so, why?

2. Geometry you know already

Make a list of 15 *geometrical results (facts)* you know.

Which of these results can you *prove*?

Did you learn any proofs in school? Which ones (even if you cannot remember them now)?

Is there any result everyone knows, and everyone can prove...?

Did you write paragraph proofs, or were they 3-column proofs?

3. Tools:

3.1. Rulers, compasses, try-squares, and, of course, *Sketchpad*.

3.2. Constructions, and their importance

3.2.1. Perpendicular Bisector

3.2.2. Angle bisector

3.2.3. Perpendicular from a point to a line

3.2.4. Circle through three points

3.2.4.1. Is this circle unique? How do we know?

3.2.4.2. Given a circle, can we find its center?

4. Definitions

4.1. Definitions cannot all be given at once

5. The Triangle, our big conceptual tool

5.1. Criteria for congruence

5.1.1. SAS, the one Euclid chose as an *axiom*

5.1.2. The other criteria

6. The structure of Geometry

6.1. Primitive terms (cannot be defined)

6.2. Axioms (cannot be proved)

- 6.3. Definitions (expand the language of the primitive terms)
- 6.4. Theorems (expand the number of known facts)
- 6.5. Circular logic, and how to avoid it
- 7. Easy Theorems: Theorems about Parallelograms
 - 7.1.1. A close relative: the Midpoint Theorem
- 8. Easy Theorems: Theorems about Kites
- 9. Easy Theorems: Theorems about Circles
- 10. Foundations: Axiomatic Theories
 - 10.1. Spies and Plots
 - 10.2. Models
 - 10.3. Equivalent Theories –an informal approach
 - 10.4. Incidence Geometry
 - 10.5. Duality –an informal approach
- 11. Euclid’s Postulates and Euclid’s Primitives
 - 11.1. Some additional primitives added by Hilbert in 1899
 - 11.1.1. Between
 - 11.2. Postulate 1
 - 11.2.1. Definitions of
 - 11.2.1.1. The line through two points
 - 11.2.1.2. The segment between two points
 - 11.2.1.3. The ray emanating from one point, passing through another point
 - 11.2.1.4. Angle
 - 11.2.1.5. Supplement of an angle
 - 11.2.1.5.1. Interior of an angle,
 - 11.2.1.6. Right Angle
 - 11.3. Postulate 2
 - 11.4. Postulate 3
 - 11.4.1. The definition of the circle with a given center and radius
 - 11.5. Postulate 4
 - 11.6. Postulate 5
 - 11.6.1. The Big Deal about the Parallel Postulate (AKA Fifth Postulate)
 - 11.6.1.1. Do we really need it?
 - 11.6.1.2. Models, do we really need them?
 - 11.7. Postulate 6
 - 11.7.1. Definition of congruence of figures
 - 11.7.1.1. Theorem: *the General Principle of Congruence*: if every pair of points in one figure A are joined together, and every pair of points in a different figure B are joined to each other, and if every triangle in figure A is congruent to the corresponding triangle in figure B , then figure A is congruent to figure B .
- 12. Starting from Scratch: proving straight from the axioms
 - 12.1. What can we prove?