Summary of Descartes's Geometrie

- The full title of Descartes's book (published in 1637) is *Discours de la méthode pour bien conduire sa raison et chercher la vérité dans les sciences* (A Discourse on the Method of Rightly Conducting one's Reason and Searching for the Truth in the Sciences).
- The main text of the book (≈60 pages) contains Descartes main thesis. It is considered to be a work of major importance in the field of general philosophy (and is where the statement "I think, therefore I am" appears), and states his ideas on how a new approach to science ought to be practiced. This was the seed of what might be called today, the Cartesian/Newtonian scientific method.
- The book came with three appendices: *La dioptrique* (Optics), *Les météores* (Meteorology), and *La géométrie*. It is this third appendix for which Descartes is most famous, as he lays down the foundation of Cartesian geometry.
- *La géométrie*, the famous third appendix, is about 100 pages long, and is itself divided into three sections. The first section (Book I, which is what this main lesson block concentrates on) contains an explanation of his new geometry, and shows why it is a significant advance over the Greeks. This first section is 18 pages long (up to page 37, but the pages alternate between French and the English translation), and is, itself, divided <u>into</u> 9 subsections; it deals with the rectangle & square problem and the Pappus problem. **<u>It is only the first section (Book I) that we are concerned with.</u>** The second section (Book II) deals with, among other things, a classification of curves and a method of constructing tangents to curves. The third section (Book III) deals with the solutions of equations of degree greater than two. It is in this third section that he discusses what we now call *Descartes's Rule of Signs*.

- Book I of *La Géométrie* is divided into parts A through I.
  (I spend the most time covering the parts marked with **.)
  - <u>Part A</u> is a general introduction. He states from the start that he has a new method for solving geometric problems whereby the solutions are simply the length of straight lines.
  - **<u>Part B</u> gives examples of simple constructions of multiplying, dividing, and taking square roots. It is three paragraphs long beginning with "For example, let AB…" at the top of page 5.
  - <u>Part C</u> introduces the reader to his algebraic terminology. It is three paragraphs long, starting with "Often it is not necessary…" on page 5. Descartes assumes that the reader has never seen algebraic notation before. So he needs to explain what a "+" means, what exponents are, etc.
  - <u>Part D</u> introduces the idea of his new method. It starts on page 6 with, "If, then, we wish …" and runs to page 13. It isn't necessary that all the details are understood.
  - **<u>Part E</u> gives examples using the three cases of the rectangle & square problem. It starts on page 13 with "For example, if I have…".
  - <u>Part F</u> introduces the Pappus problem. It starts on page 17 with "This is also evident…"
  - <u>Part G</u> talks about how his method can solve the Pappus problem. It starts on page 25 with "First, I discovered…".
  - **<u>Part H</u> gives a specific example on how to solve the Pappus. The is the hardest and most important section. It starts with "Now, since all the angles…" on page 29. (The end of this section contains the "seed statement" of Cartesian geometry.)
  - <u>Part I</u> talks briefly about his method could be used to solve more complicated versions of the Pappus problem. It starts with "This method can be used…" on page 34.