van Hiele through Volume

Friday, April 19, 2013: 08:00 AM - 09:00 AM,
Convention Center, 401/402
Session #327

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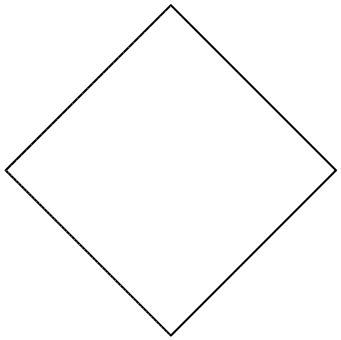
van Hiele Overview

- I: "It's not a square, it's a diamond"
- II: "You give me a side, I'll give you the area"
- III: "Rectangular rhombus? Yup, square."
- IV: "Rhombus w one right angle is sufficient"
- V: "Taxicab circle"
  - V: (See Christopher Smith's article in MT April 2013)



van Hiele I

- Measuring volume through buoyancy
- Materials: scale, document camera, projector, large pitcher or dry foods bin, solid geometric objects

van Hiele II

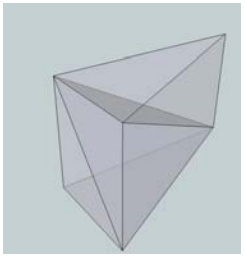
- Volume of a right prism
- Materials: areas of regular polygons corresponding to solid prism bases; calculation device (logger pro? Gsp? Geogebra?)

Intermezzo / lemma

- Cavalieri's principle
- I: Playing cards
- II: (thought experiment with playing cards)
  - Calculus students blindly applying disc/washer/shell/given constant for given cross section
- III: Calculus students following cross sections
- IV: Calculus students deriving cross sections / confirming against geometry formulae
- V: Flatland's last chapter

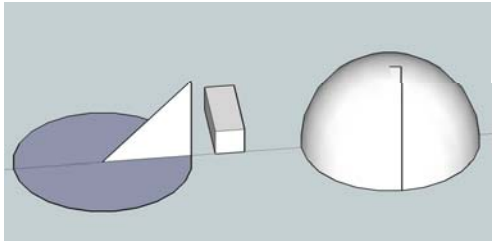
van Hiele III

- Volume of a right triangular pyramid (~~Google~~ Trimble SketchUp)



van Hiele IV

- Go forth and use induction to prove the volume formula for a general pyramid, and argue that it (or Cavalieri) may apply to a cone.



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