

# SYSTEM #2

Let's look now at the basic rules (axioms) of another system. When you start with a new set of rules, you ignore the old set (System 1) and start off fresh.

## AXIOMS OR RULES

1. Take any pair of members. Then there is exactly one (that is, at least one but no more than one) committee containing both of them.
2. Any two committees have at least one member in common.
3. There is at least one committee.
4. Every committee contains exactly three members.
5. Not all members serve on the same committee.

Do not try to grasp the entire system or to form a mental picture of its model before continuing. The meaning of the axioms and a model of the system will emerge gradually as you work with the system. Just read the axioms several times, then begin the exercises. The exercises are designed to help you understand the axioms.

Exercise 2-1 Which axiom or axioms above is an existence axiom?

Exercise 2-2 Explain why there must be at least three members. (Use a sketch.)

Exercise 2-3 Explain why there must be at least four members and at least two committees. (Start with the fact that there are at least three.)

Exercise 2-4 Explain why there must be at least five members. (Start from exercise 2-3, that is, that there are at least four members.)

Exercise 2-5 Redraw the model for System 1 below and explain why it does not work for System 2.

Exercise 2-6 Using circles or rectangles for committees and letters or numbers for members, build a model for System 2. (This is a tough one! Begin with axiom 3, then use 4, 5, and 1 in that order.)

Exercise 2-7 Does axiom 1 make axiom 3 unnecessary; that is, if axiom 1 is true, doesn't axiom 3 have to be true?

Exercise 2-8 Does axiom 1 make axiom 2 unnecessary?

According to the "new" axiom 3, there is at least one line, so we can make the following sketch:



The "new" axiom 4 says that the line contains three points, so we can add three points to the sketch, like this:



Exercise 2-10 Continue adding to the sketch above using the "new" axioms 5 and 1, and explain why there must be at least four lines and at least seven points.

Exercise 2-11 Construct a "point-line" model for System 2.