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MATH 402 Worksheet 1
Friday January 18, 2019

Exercise 1. We are studying the system of a small experimental school, which would like to implement the following rules in the new semester:

(A) There will be 5 offered courses: art, biology, history, math, sociology.

(B) To maximize focus, every student will take exactly two courses.

(C) To maximize interaction among students, every pair of courses will have exactly one common student.

Call this "axiomatic system" S_5. Find a way to geometrically model this system, and then answer the following questions (and prove your answers using only the given axioms (A)-(C)).

(1) For the new scheme to work, how many students ought to be enrolled in the school?

(2) Show that any two students can have at most one course in common.

(3) How many students are in each class?

(4) How would the answers to the previous questions change if there are n offered courses, where n is an arbitrary natural number? Call such a system S_n.

(5) Make a sketch for S_3, S_4, S_5.

Exercise 2. Take a look at the definitions, postulates, and common notions in Euclid's elements. Identify the undefined terms, defined terms, and the axioms. Do you think there are any problems, holes, or gaps with Euclid's attempt at formalizing plane geometry?

You do not need to turn in this worksheet. However, you should make sure to work out the problems. The problems that appear on worksheets may appear on the examines, so be sure to work out solutions even if you don't finish in class. Come to office hours if you have questions.