

HOMEWORK SET #12 / CO1A / Fall 2009

- 1.) In a Steiner triple system with $v = 9$, find b and r .
- 2.) The following nine blocks form a part of a Steiner triple system with nine elements:

$$\{a, b, c\}, \{d, e, f\}, \{g, h, i\}, \{a, d, g\}, \{c, e, h\}, \{b, f, i\}, \{a, e, i\}, \{c, f, g\}, \{b, d, h\},$$

How many missing blocks are there? Add additional blocks that will lead to a Steiner triple system.

- 3.) If a town has 924 clubs, each club has 21 members and any 2 persons belong to exactly 2 clubs jointly, then how many inhabitants does the town have? How many clubs does each person belong to? (Don't be surprised: this is a very small town, and everybody belongs to many clubs)
- 4.) The following 10 blocks are from a BIBD on 8 elements with $\lambda = 3$: $\{a, b, c, d\}, \{b, c, f, g\}, \{a, d, e, h\}, \{a, b, e, f\}, \{c, d, g, h\}, \{e, f, g, h\}, \{a, d, f, g\}, \{b, c, e, h\}, \{a, b, g, h\}, \{c, d, e, f\}$
How many further blocks are there and which are they?
- 5.) There are 36 officers, six officers of six different ranks in each of 6 regiments Find an arrangement of the 36 officers in a 6×6 square formation such that each each row and each column contains one and only one officer from each regiment of each rank. (from Euler) (translate it into the Latin square language, 2 points)
- 6.) In the Hungarian TOTO (Italian Calcio) game one may bet on the outcome of the soccer games: 1 for the win of the first team, 2 for the win of the second team, x for a draw. How many tickets do you have to fill if there are three matches to bet on and you surely want to have a ticket which misses all the final results? (pigeonhole principle type problem, 2 points)

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