Discrete Mathematics
Drill-6

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1 Drill

1.1 Characteristic vectors

1. Ask the students whether anyone can repeat any of the three card tricks they saw in class?

2. The class has not seen yet finite projective spaces. We did discuss finite fields and it will be nice to drill them. Just have them build $GF(2^2)$ and $GF(3^2)$.

I introduced the concept of caracteristic vector of a set. Have the class do the following drill:

Build the 7 characteristic vectors of dimension 7 of the sets:
$\{1, 2, 3\}, \{1, 4, 5\}, \{1, 6, 7\}, \{2, 4, 6\}, \{2, 5, 7\}, \{3, 5, 6\}, \{3, 4, 7\}$
. (This is the fano plane).

Prove that they are linearly independent. (There are some nice elegant ways to do it, but Gaussian elimination or any other method the studenst are familiar with will do).

Time permitting add two 1's to each vector to make it a 9-dimensional vector. They will stil be linearly independent. Now add the vector $(1, 1, 1, 1, 1, 1, 1, 1, 1)$ to obtain 8 vectors. Are they still linearly independent? If so, can they add a ninth $\{0, 1\}$ vector that will form a basis? Will it have an odd number of 1's? What will be the "intersection" with all other vectors?