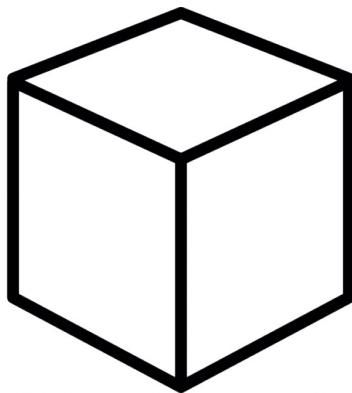
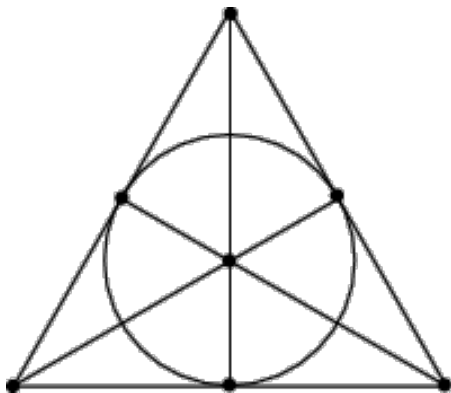


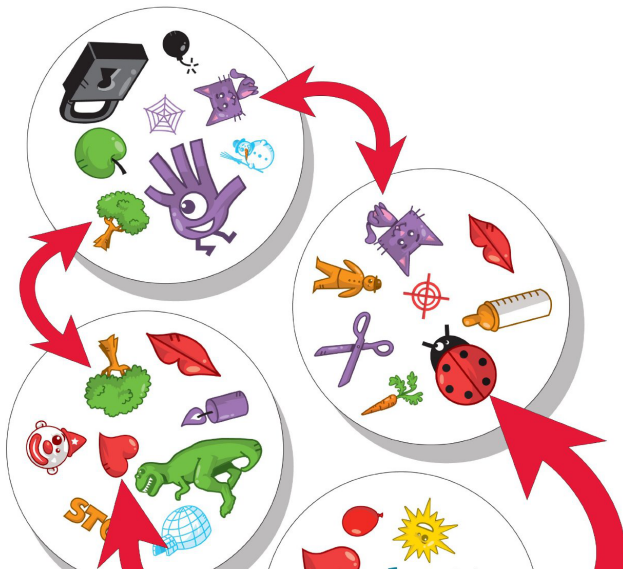
Finite Projective Planes and Applications

Martin J. Strauss
University of Michigan

The Triangle and the Cube



SpotIt!



Flash cards: Atlanta Landmarks

Aquarium



CNN



Coca Cola



GA Tech



MLK



Olympic Park



Varsity



Cyclic View

A	B	C	D	E	F	G
B	C	D	E	F	G	A
D	E	F	G	A	B	C

Any pair of columns has unique match. How hard to check?

Finite Field

$x + y + z = 0$ if x, y, z are distinct and share an object or $x = y$ and $z = 0$.

t^0	t^1	t^2	t^3	t^4	t^5	t^6
A	B	C	D	E	F	G
B	C	D	E	F	G	A
D	E	F	G	A	B	C

Associativity of addition is the only non-trivial thing to check.

Hamming Error-Correcting Code

A	B	C	D	E	F	G
B	C	D	E	F	G	A
D	E	F	G	A	B	C

- Codeword: Any subset of columns that sums to zero.
- Encode four bits: Toggle all D's or not, then all C's or not, then B's, then A's. (Why?)

Hamming Error-Correcting Code

A	B	C	D	E	F	G
B	C	D	E	F	G	A
D	E	F	G	A	B	C

- Codeword: Any subset of columns that sums to zero.
- Encode four bits: Toggle all D's or not, then all C's or not, then B's, then A's. (Why?)
- Correct one error: Sum. Get zero or the error.

A	B	C
B	C	D
D	E	F

Hamming Error-Correcting Code

A	B	C	D	E	F	G
B	C	D	E	F	G	A
D	E	F	G	A	B	C

- Codeword: Any subset of columns that sums to zero.
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- Correct one error: Sum. Get zero or the error.

A	B	C
B	C	D
D	E	F

 $\overset{C}{\rightsquigarrow}$

A	G
B	A
D	C

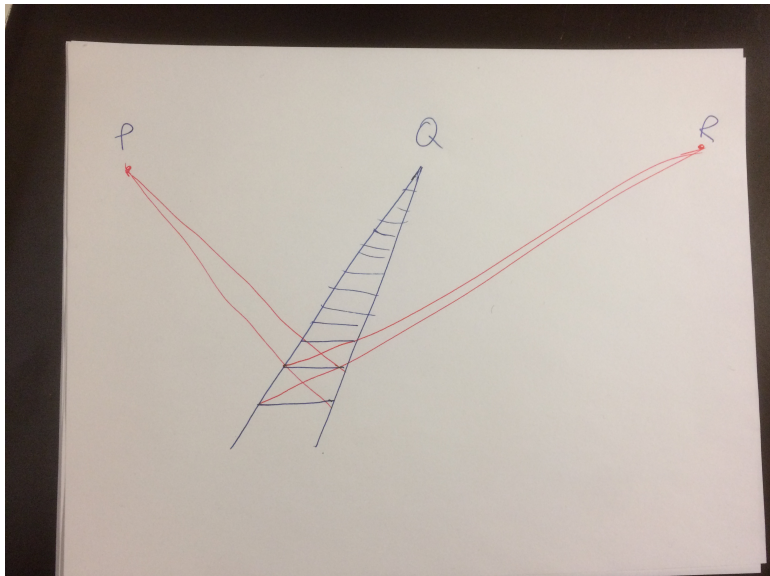
 $\overset{A}{\rightsquigarrow}$

E
F
A

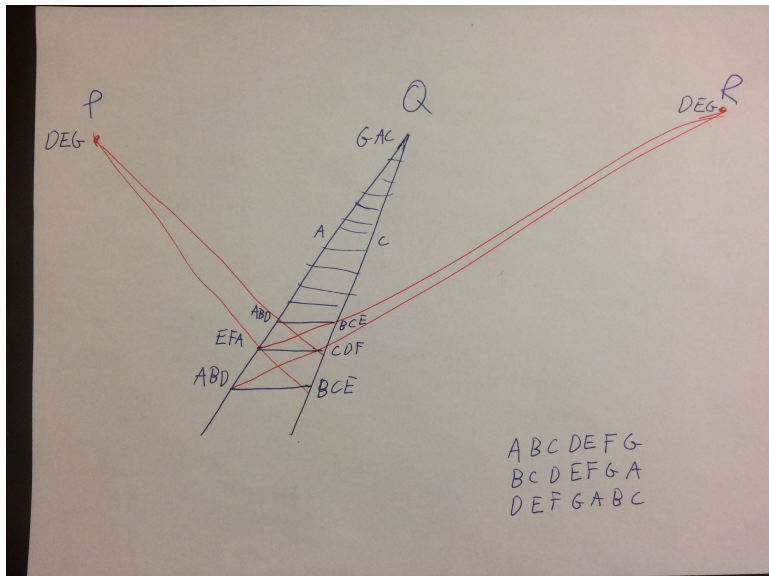
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A	B	C	E
B	C	D	F
D	E	F	A

P, Q, R Colinear?



P, Q, R Colinear? Cards lead the Way



Linear Perspective



Linear Perspective



Linear Perspective

