# Notes

13 mars, 2015

## the happy ending problem

**task:**

draw 5 points in a plane with no 3 colinear points.
this is called general position.

**question**

are there 4 points that form a convex quadrilateral?

**answer**

yes

### proof

only way to have a non convex quadrilateral is to have a triangle with a dot in the middle. the options for where to put the fifth dot are: in the concave bit, which forms one, or in the pennisula in the quad, next to the concave bit, and so on

at nine points you can always find a convex pentagon

what is the minimum number of points in general required to guarantee a convex n-gon?

3 for 3, 4 requires 5, 5 requires 9, $C(6) = 17$ the general answer is unknown, but $C(n) \geq 1 + 2^{n-2}$ where $C(n)$ is the number of points and $n$ is the order of the convex n-gon. this theorem is from forties or fifties.

**thrm**

$C(n) \leq \binom{2n-5}{n-2} < \infty$
above 6 the problem is open.

## ramsey theory

what is the minimum number of widgets with proposition required to guarantee another proposition?

### modification

require no points inside convex polygon
then $C'(3) = 3, C'(4) = 5, C'(5) =?$

**thrm**

if only empty n-gons are allowed, then $C(7) \not< \infty$