(2019)

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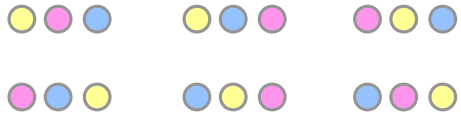
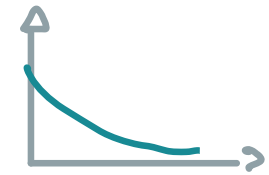
combinatorics ⟷ probability

permutations

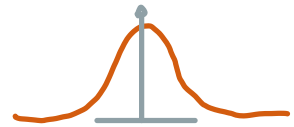


$$n! = \int_{-\infty}^{\infty} x^n e^{-x} dx$$



perfect matchings

$$(2n-1)!! = \int_{-\infty}^{\infty} x^{2n} \frac{e^{-x^2/2}}{\sqrt{2\pi}} dx$$



non-crossing perfect matchings

$$\frac{1}{n+1}\binom{2n}{n} = \int_{-2}^{2} x^{2n} \frac{\sqrt{4-x^2}}{2\pi} dx$$

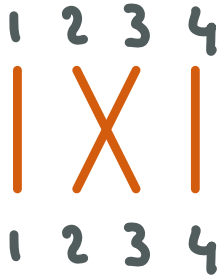
Set partitions

$$\text{Bell}(n) = \sum_{k \geq 0} k^n \frac{e^{-1}}{k!}$$

Current interests:

(1) Permutation patterns

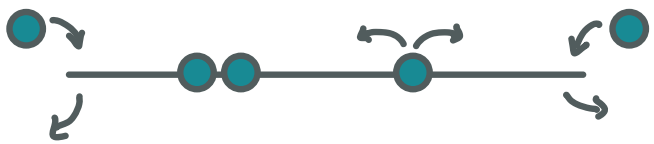
e.g. $\pi = 1324$



$\sigma = 3157246$ has an occurrence of π:

... as moment sequences (Rains '98, Elvey Price '18, Bostan-Elvey Price-Guttmann-Maillard '20, B-Steingrímsson '21)

(2) Noncommutative prob. perspective on statistical mechanics



$DE - qED = D + E$

(Uchiyama-Sasamoto-Wadati '04, Corteel-Williams '10 Bożejko-Speicher '91, B. '12, '14, '19 w/ Ejsmont)

In person @ MSRI:

Sept 20 - Oct 30