



---

---

---

---

---



## Session 4

### Exercise 1: Blume - Capel model

The Blume - Capel model is a generalization of the Ising model

$$H = -J \sum_{\langle i,j \rangle} s_i s_j + D \sum_i s_i^2$$

with  $s_i = +1, 0, -1 \quad \forall i$

Find the solution of the model in 1D using

the transfer matrix (no need to find the eigenvalues)

Exercise 2: Solve the Blume - Capel model in mean-field in presence of a field  $h$

$$H = -J \sum_{\langle i,j \rangle} s_i s_j + D \sum_i s_i^2 - h \sum_i s_i$$

find the self-consistent equation for  $m$

Use  $s_i s_j = (s_i - m)(s_j - m) + m(s_i + s_j) - m^2$

Discuss the nature of the transitions.