

[4th Ph.D. summer School on “Mathematical Modeling of Complex Systems”, Cultural Foundation “Kritiki Estia”, Athens](https://nlsconf.physics.uoc.gr/)

**An Introduction to Hypernetworks**

**Lesson 3 Hypernetworks**

**Homework to be submitted by 23:00 Sunday 20th July 2014**

a b c d e

A B C D E F

G H I J K L M N

**Figure 1. The blocks Y = {a, b, c, d, e, f} and shapes X = {A, B, … , M}.**

Each question carries 20 marks.

( 1 ) Explain why hypergraphs cannot unambiguously represent the shapes A to F in Figure 1.

(2) Explain why simplicial complexes cannot unambiguously represent the shapes G to N.

(3) Consider the following IQ question:

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( a) What is the 3-ary relation that binds the parts into the whole?

(b) Which of the following configurations completes the third row in this diagram.

(A) (B) (C)

(4) Consider the drink made by mixing coffee, milk, and sugar. How could this be represented as a hypersimplex?

(5) Give an example of a hypersimplex, σ with | σ | > 2 in a system that interests you.