



# PHYSICAL MODELS

## Why

We want to talk about physical phenomena using mathematical objects. In these sheets, the objects are sets.<sup>1</sup>

## Models

We call the mathematical objects which we use to reason (by analogy) about the physical phenomenon the *model* of the phenomenon. One often has a choice of model.

## Two broad areas

There are roughly two broad approaches to selecting a mathematical model for physical phenomena.

The first is *deterministic*. One constructs differential equations using physical principles and experiments. This is the method of Galileo and Newton for modeling moving rigid bodies. For example planets (i.e., balls).

The second is *probabilistic*. One specifies the probability of events using physical principles (e.g. the symmetry of noise) and experiments (e.g. the observed frequency of particular events).

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<sup>1</sup>At present, this sheet deviates from the analytical nature of the Bourbaki project. This may change in future editions. In particular, we may use physical models as *motivation* for much of the mathematics. This sheet borrows from the notes of S. Lall.



