

Terminology To Know

These are important terms and notations for this section.

Definition 1 (Mathematical Reasoning). *A technique of problem solving that relies on deductive reasoning and symbolic manipulation.*

Definition 2 (Deductive Reasoning). *A form of inference that uses a set of given information, and extracts new information that must be true as a result. For example (eg): Given the information:*

- *It has rained*
- *There is no cover for the ground*

Then we can deduce that the ground is wet. This would be a logical deduction, or “deductive reasoning”.

Definition 3 (Information). *A collection of knowledge or observations used to problem solve.*

Definition 4 (Data). *Quantified versions of information.*

Definition 5 (Model). *A (collection of) mathematical expressions used to represent a specific situation.*

Definition 6 (Generalize). *A process of going from a (somewhat) specific problem (eg a numeric model) to a methodology or (Generalized) Model to attain answers to (less specific) variations of the original problem.*

Definition 7 ((Mathematical) Symbol). *A mathematical symbol (usually referred to simply as ‘symbol’ when context is clear) is a non-numeric piece of writing (typically a letter) that holds the place of some (typically numeric) value, to be decided (or deduced) later.*

The conceptual definition (Not to be used as the actual definition): A symbol is a letter, in some alphabet, that is a temporary stand-in for a piece of information. It is typically either a variable or replaced by a concrete value when one forms a model.

Author’s Note: *This is included as we use the term ‘symbol’ many times throughout this section and thus it should have a formal definition. **However this term will not be tested on in discussion quizzes or on exams.** It is necessarily abstract given it’s usage, but the abstraction is so deep as to be beyond the scope of this course.*

Learning outcomes:

Definition 8 (Variable). *A symbol used to represent an unknown piece of data.*

Definition 9 (Independant Variable). *A variable whose value is unspecified, but will be provided by the statement of the problem.*

Definition 10 (Dependent Variable). *A variable whose value is unknown and is generated by the Model. In most cases dependent variables are determined (solved for) by the Model (See Arbitrary Constant Below).*

Definition 11 (Arbitrary Constant). *A symbol that is unaffected by independent variables, and whose value is determined by the model and initial conditions of the system.*