

Abstraction is the process of identifying and extracting relevant information to define main idea(s) in order to create a generic representation of a problem.

Pattern Generalization is the process of creating models, rules, principles or theories of observed patterns to test predicted outcomes and determining the correct relationship between the variables to accurately represent the problem.

Examples of Abstraction & Pattern Generalization

Science

- Models of natural processes such as the water cycle, nitrogen cycle and rock cycle
- Classification of living organisms (e.g. mammals, marine organisms)
- Periodic table

Mathematics

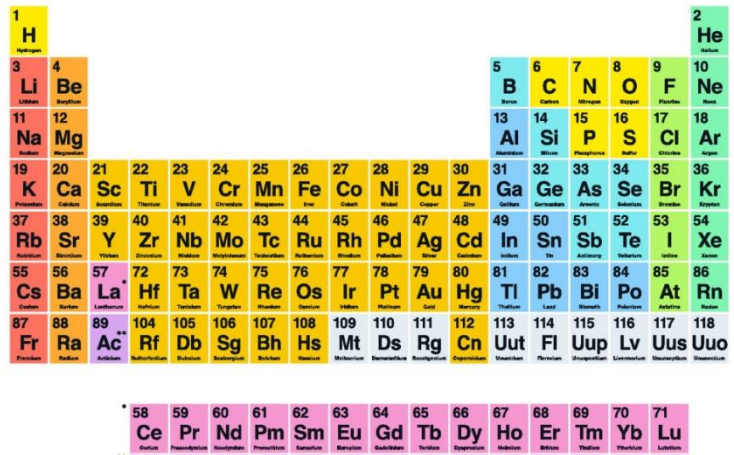
- Equations
- Geometric representations
- Graphing

Art

- Picasso

English Language Arts

- Sentence structure
- Parts of speech
- Mad Libs™



1 H Hydrogen																	2 He Helium
3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Cesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89 Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Uut Ununtrium	114 Fl Flerovium	115 Uup Ununpentium	116 Lv Livermorium	117 Uus Ununseptium	118 Uuo Oganesson
		58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium		

Abstraction helps create models related to a problem that can work for large quantities and ranges of data.

Other Examples of Abstraction (modelling)

- Children learning about physics using a ball and ramp
- Older students conducting experiments and graphing results in an acceleration lab
- Engineers designing roller coasters

Practicing Abstraction & Pattern Generalization

- *Computational Thinking* (Make a Monster—studio.code.org)
- Candy Dichotomous Key
- Mad Libs™
- *Mad Glibs* (studio.code.org)
- Mad Takes (www.madtakes.com)
- *Describing an Everyday Object* (Google)
- Tangrams
- *GeoShapes* (National Geographic Kids)

The key to **abstraction** is to be able to identify and filter out or ignore the details not necessary to solve the problem. From there, a **model** (equation, image, word, simulation, etc.) can be developed to represent all the important variables.

Access the Course: [Problem Solving through Computational Thinking for Educators](#)

Access this Module: [Abstraction & Pattern Generalization](#)