**Alloy Cheat Sheet (from Charles Wallace)**

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| *MATH* | *ALLOY* |

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| ***Set operators: Build sets from sets*** | |
| Empty set: ∅ | none |
| Universal set: U | univ |
| Union: A ∪ B | A + B |
| Intersection: A ∩ B | A & B |
| Difference: A - B | A - B |
| Complement: | univ - A |

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| ***Cardinality operator: Compute integer value from set*** | |
| Cardinality: |A| | #A |

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| ***Set relations: Build propositions from sets*** | |
| Subset: A ⊆ B | A in B |
| Inclusion: a ∈ B | a in B |
| Equality: A = B | A = B |
| Emptiness: A = ∅ | no A |
| Nonemptiness: A ≠ ∅ | some A |
| Uniqueness: |A| = 1 | one A |
| Non-multiplicity: |A| ≤ 1 | lone A |

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| ***Relational operators: Build relations from relations*** | |
| Identity relation: {(x,x)|x ∈ U} | iden |
| Product: A × B | A -> B |
| Ordered pair: (a, b) | a -> b |
| Composition: B ° A | A.B |
| Transpose: A-1 | ~A |
| Transitive closure: A+ | ^A |
| Reflexive, transitive closure: A\* | \*A |

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| ***Propositional connectives: Build propositions from propositions*** | |
| Conjunction: A ∧ B | A and B |
| Disjunction: A ∨ B | A or B |
| Negation: ¬ A | not A |
| Implication: A ⇒ B | A implies B |
| Equivalence: A ⇔ B | A iff B |

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| ***Quantifiers: Build formulas from formulas*** | |
| Universal quantification: (∀x: A) B | all x: A | B |
| Existential quantification: (∃x: A) Bx | some x: A | B |
| Nonexistence: ¬ (∃x: A) Bx | no x: A | B |
| Unique existence: (∃x: A) (Bx and (∀y: A) By ⇒ x=y) | one x: A | B |
| Non-multiple existence: (∀x: A) (∀y: A ) Bx ∧ By ⇒ x=y | lone x: A | B |