Tutorial No. 1: Propositional Logic

A1) Alice is tall AND slim.

Let p = "Alice is tall", q = "Alice is slim".
Truth table for p ∧ q:

p	q	p ∧ q	
T	T	T	(Alice is tall and slim.)
T	F	F	(Alice is tall but not slim.)
F	T	F	(Alice is slim but not tall.)
F	F	F	(Alice is neither tall nor slim.)

A2) Alice is smart OR honest.

Let p = "Alice is smart", q = "Alice is honest".
Truth table for p ∨ q:

p	q	p ∨ q	English
T	T	T	Alice is smart and honest (so the disjunction is true).
T	F	T	Alice is smart (so the disjunction is true).
F	T	T	Alice is honest (so the disjunction is true).
F	F	F	Alice is neither smart nor honest (disjunction false).

A3) If this car costs less than $10000, then John will buy it.

Let p = "This car costs < $10000", q = "John will buy the car".
Truth table for p → q:

p	q	p → q	
T	T	T	Car is cheap and John buys it — implication true.
T	F	F	Car is cheap but John doesn't buy it — implication false.
F	T	T	Car is not cheap (so implication true regardless of q).
F	F	T	Car is not cheap (implication still true).

A4) A student gets A in CSE 191 iff his weighted total ≥ 95%

Let p = "student gets A in CSE 191", q = "weighted total ≥ 95%".
p ↔ q truth table:

p	q	p ↔ q	
T	T	T	(Has A and total ≥95% — biconditional true.)
T	F	F	(Has A but total <95% — biconditional false.)
F	T	F	(No A but total ≥95% — biconditional false.)
F	F	T	(No A and total <95% — biconditional true.)

B. Statement with p → q where p: x^3 = 8, q: x = 2

P : x3 = 8 ,q : x = 2.

Statement: *If x3=8x^3 = 8x3=8 then x=2x = 2x=2.*

Truth table:

xxx	p:x3=8p: x^3=8p:x3=8	q:x=2q: x=2q:x=2	p→qp \to qp→q
222	T	T	T
any other real	F	F	T

∴The implication is **true for all real xxx**.