Formal Proof

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Statements given to us in the problem are as follows:

a. I am a human being
b. I am good
c. Good graders study well
d. Humans love graders
e. Every human does not study well

Given claim to validate: *Is every human good grader?*

Algorithm that need to be followed in order to validate the claim via **statement proving via resolution**.

1. Convert to first order predicate logic
2. Convert to conjunctive normal form
3. Resolution proof procedure

(i) First order predicate logic form

Natural Language form	**First order predicate logic**
I am a human being	Human(x)
I am good	Good(x)
Good graders study well	Good(graders) $\Rightarrow$ Study(x)
Humans love graders	Love(human,graders)
Every human does not study well	$\forall$(x) Human(x) $\Rightarrow$ ¬Study(x)

(ii) Conjunctive normal form

To convert to conjunctive normal form negate the FOPL and replace 'implies with' (->) with 'v'(conjunction).

First order predicate logic	**Conjunctive Normal Form**
Human(x)	Human(x)
Good(x)	Good(x)
Good(graders) $\Rightarrow$ Study(x)	¬Good(graders)vStudy(x)
Love(human,graders)	Love(human,graders)
∀(x) Human(x) $\Rightarrow$ ¬Study(x)	¬Human(x) v ¬Study(x)

(iii) Resolution proof procedure

Statement to validate: *Is every human good grader?* or ∀(x) Human(x) -> Good(grader) or ¬Human(x) v Good(grader) (in CNF form)

We can use the method of **proof by contradiction** to arrive to the result.

Goal statement (negation of statement to validate): Human(x) ^ ¬Good(grader)

(¬Good(graders)vStudy(x)) + (¬Human(x) v ¬Study(x))

=

¬Good(graders) v ¬Human(x) (Negating terms are cancelled)

When we combine this statement with our goal statement we find that the resulting statement is **TRUE.**

This means that if the negation of a statement has truth value TRUE or 1, its original (non-negated statement) will have truth value FALSE

Thus we can safely assume that the given statement given to validate is *FALSE*