Rules:

- Rule (R1): HighGrades(x) ∧ StudentLeader(x) ∧ Applied(x) → Eligible(x)
- Rule (R2): Eligible(x) → Scholarship(x)
- Rule (R3): Scholarship(x) → FinancialSupport(x)

Facts:

- HighGrades(Juan), Applied(Juan)
- HighGrades(Maria), ¬Applied(Maria)
- StudentLeader(Carlos), ¬HighGrades(Carlos)
- HighGrades(Ana), StudentLeader(Ana), Applied(Ana)

Part 1 – Unification

- Unify: Eligible(x) → Scholarship(x)
- Eligible(x) / Eligible(Ana)
- Substitution: { x / Ana }
- Eligible(Anna) → Scholarship(Anna)
- Scholarship(Anna)

Part 2 – Forward Chaining

Applying rules:

Anna -

- HighGrades(Ana) ∧ StudentLeader(Ana) ∧ Applied(Ana) → R1: Eligible(Ana)
- From Eligible(Ana) and R2 infer Scholarship(Ana)
- From Scholarship(Ana) and R3 infer FinancialSupport(Ana)
- Eligible(Ana), Scholarship(Ana), FinancialSupport(Ana)

Juan -

- HighGrades(Juan) and Applied(Juan), missing StudentLeader(Juan)
- Cannot infer Eligible(Juan) therefore Juan cannot infer Scholarship(Juan) and FinancialSupport(Juan)

Part 3 – Backward Chaining

Goal 1: Scholarship(Maria)

- Check rules that produce Scholarship(x) → R2: Eligible(x) → Scholarship(x). Subgoal = Eligible(Maria).
- To prove Eligible(Maria), look at R1: HighGrades(x) ∧ StudentLeader(x) ∧ Applied(x) → Eligible(x). Subgoals: HighGrades(Maria), StudentLeader(Maria), Applied(Maria).
- Check facts: HighGrades(Maria) is true, Applied(Maria) is false, StudentLeader(Maria) is not given = assume false. Cannot prove Eligible(Maria).
- Since Eligible(Maria) fails, Scholarship(Maria) fails.

Conclusion: Scholarship(Maria) cannot be proved.

Goal 2:FinancialSupport(Ana)

- Use R3: Scholarship(x) → FinancialSupport(x). Subgoal: Scholarship(Ana).
- To prove Scholarship(Ana), use R2: subgoal Eligible(Ana).
- To prove Eligible(Ana), use R1: need HighGrades(Ana) ∧ StudentLeader(Ana) ∧ Applied(Ana). All facts are present.
- Therefore we derive Eligible(Ana) → Scholarship(Ana) → FinancialSupport(Ana).

Conclusion: FinancialSupport(Ana) is provable.

Part 4 – Validity Check

Student	High Grades	Student Leader	Applied	A (HG ∧ SL ∧ Ap)	Eligible	(A→Eligible)
Juan	T	F	T	F	(Not derived) F	T
Maria	T	F	F	F	F	T
Carlos	F	T	?	F	F	T
Ana	T	T	T	T	(Derived) T	T

Part 5 – Reflection

Logical reasoning makes decisions explicit, reproducible, and verifiable. By having clear logical rules, any inconsistencies in conclusions and decision making are eliminated while systematic updates to beliefs are enabled when new facts are presented. AI and real-life scenarios rely on Logical reasoning to make sound decisions or reach logical conclusions.