**Prateek Bhat and Sanjana Agarwal**

**Mini Programming Assignment**

**1) Converting to logic form:**

1) Professor Adams, who lives in Bloomington, USA, advises multiple students.

Prof(Adams)Lives(Adams, Bloomington)Student(s)Advisor(Adams,s)

2) Students publish papers with their advisor.

[Prof(p)Student(s)Advisor(p,s)]Publish(s,p)

3) If a professor is in the committee of a student, he/she is the advisor.

[Prof(p)Student(s)Committee(p,s)]Advisor(p,s)

4) Micheal has published 6 papers with Professor Adams.

Student(Micheal)Prof(Adams)Publish(Micheal,Adams)PapersCount(Micheal,Adams, 6)

5) Professor Adams is in the advising committee of Micheal and Brian.

Prof(Adams)Student(Micheal)Student(Brian)Committee(Adams,Micheal)Committee(Adams,Brian)

**Converting it to CNF form:**

1) Prof(Adams)Lives(Adams, Bloomington)Student(F(s))Advisor(Adams,F(s))

2) [Prof(F(p))Student(s)Advisor(F(p),s)]Publish(s,F(p))

Prof(F(p))Student(s)Advisor(F(p),s)Publish(s,F(p))

3) [Prof(p)Student(s)Committee(p,s)]Advisor(p,s)

Prof(p)Student(s)Committee(p,s)Advisor(p,s)

4) Student(Micheal)Prof(Adams)Publish(Micheal,Adams)PapersCount(Micheal,Adams, 6)

5) Professor Adams is in the advising committee of Micheal and Brian.

Prof(Adams)Student(Micheal)Student(Brian)Committee(Adams,Micheal)Committee(Adams,Brian)

**To prove:**

1) Micheal is advised by Professor Adams.

Contradiction: Advisor(Adams, Micheal) - (6)

2) Brian is advised by Professor Adams.

Contradiction: Advisor(Adams, Brian) - (7)

Applying general unifier and using Prof(Adams), Student(Micheal) and Committee(Adams,Micheal) in statement (3), (Prof(p)Student(s)Committee(p,s)Advisor(p,s)), we get,

Advisor(Adams,Micheal)

Using it with (6), **We get a null set.**

Thus, proved by resolution.

Thus, Micheal is advised by Adams.

Likewise, to prove Brian is advised by Professor Adams, we use a similar approach.

Applying general unifier and using Prof(Adams), Student(Brian) and Committee(Adams,Brian) in statement (3), (Prof(p)Student(s)Committee(p,s)Advisor(p,s)), we get,

Advisor(Adams,Brian)

Using it with (7),

We get a null set.

Thus, proved by resolution.

Thus, Brian is advised by Adams.

**2) Find the murderer:**

1) There are only three suspects, A, B, and C, and it is certain that one of them committed the crime.

Murderer(A) Murderer(B) Murderer(C)

Murderer(B) Murderer(C) Murderer(A)

Murderer(C) Murderer(A) Murderer(B)

2) A says that B was V’s friend but that C hated V.

Murderer(A)Friend(B,V) Friend(C,V)

3) B says he was out of town the day of the murder, and he didn’t even know V.

Murderer(B)OutTown(B)Friend(B,V)

4) C says that he saw A and B with V just before the murder.

Murderer(C)OutTown(A)OutTown(B)

**Converting it to CNF form:**

1) (Murderer(A) Murderer(B))(Murderer(A) Murderer(C)) -- Eqns 1 and 2 respectively

2) (Murderer(B) Murderer(C))(Murderer(B) Murderer(A)) -- Eqns 3 and 4 respectively

3) (Murderer(C) Murderer(A))(Murderer(C) Murderer(B)) -- Eqns 5 and 6 respectively

4) (Murderer(A)Friend(B,V))(Murderer(A)Friend(C,V)) -- Eqns 7 and 8 respectively

5) (Murderer(B)OutTown(B))(Murderer(B)Friend(B,V)) -- Eqns 9 and 10 respectively

6) (Murderer(C)OutTown(A))(Murderer(C)OutTown(B)) -- Eqns 11 and 12 respectively

**To find out the murderer:**

Let the contradiction be that either of the three is the murderer. And we resolve it as follows:

Using eqn 7 and 10, we get,

Murderer(A)Murderer(B) -- Eqn 13

Using eqn 9 and 12, we get,

Murderer(B)Murderer(C) -- Eqn 14

Using eqn 2 and 13, we get,

Murderer(B)Murderer(C) -- Eqn 15

Using 14 and 15, we get,

Murderer(B) -- Eqn 16

Thus, using eqn 16 with contradiction that Murderer(B) (B is not the murderer)

We get a null set.

Thus proved that **B is the murderer.**