EECS759P Coursework 2 Report

# Crystal Clear (Logic Problem)

## Irma’s Six Statements

1. You have a dog.
2. The person you are looking for buys carrots by the bushel.
3. Anyone who owns a rabbit hates anything that chases any rabbit.
4. Every dog chases some rabbit.
5. Anyone who buys carrots by the bushel owns either a rabbit or a grocery store.
6. Someone who hates something owned by another person will not date that person.

## Expressing Irma’s Statements in First Order Logic (FOL)

## Translating FOL Expressions to Conjunctive Normal Form (CNF)

* 1. **Removing implications**: nothing to do.
  2. **Minimising negations**: nothing to do.
  3. **Standardising variables**: nothing to do.
  4. **Skolemising existentials**: replaced existential variable with object D
  5. **Drop universals:** nothing to do.
  6. **Conversion to CNF:**
  7. **Removing implications:** nothing to do.
  8. **Minimising negations:** nothing to do.
  9. **Standardising variables:** nothing to do.
  10. **Skolemising existentials:** nothing to do.
  11. **Drop universals:** nothing to do.
  12. **Conversion to CNF:**
  13. **Removing implications:**
  14. **Minimising negations:**
  15. **Standardising variables:**
  16. **Skolemising existentials:** nothing to do.
  17. **Drop universals:**
  18. **Conversion to CNF:**
  19. **Removing implications:**
  20. **Minimising negations:** nothing to do.
  21. **Standardising variables:**
  22. **Skolemising existentials:**
  23. **Drop universals:**
  24. **Conversion to CNF:**
  25. **Removing implications:**
  26. **Minimising negations:** nothing to do.
  27. **Standardising variables:**
  28. **Skolemising existentials:**
  29. **Drop universals:**
  30. **Conversion to CNF:**
  31. **Removing implications:**
  32. **Minimising negations:**
  33. **Standardising variables:**
  34. **Skolemising existentials:** nothing to do.
  35. **Drop universals:**
  36. **Conversion to CNF:**

### Irma’s Statements in First Order Logic (FOL) Conjunctive Normal Form (CNF)

## Irma’s Conclusion in First Order Logic

Statement: If the person you are looking for does not own a grocery store, she will not date you.

FOL expression:

Negation of FOL expression:

Negations of FOL expression in CNF:

1. **Removing implications:**
2. **Minimising negatiions:**
3. **Standardising variables:**
4. **Skolemising existentials:** nothing to do.
5. **Drop universals:**
6. **Conversion to CNF:**

## Proof that Madame Irma is Right

### All Disjunctive Clauses

### Resolution Proof

1. —> resolve (13) and (11), unifier = {ROBIN/x8, YOU/y2}
2. —> resolve (2) and (14), unifier = {D/z2}
3. —> resolve (15) and (11), unifier = {ROBIN/x8, D/z2}
4. —> resolve (2) and (16), unifier = {YOU/y2}
5. —> resolve (13) and (17)

Therefore, because we have managed to reach the empty clause, we have proven Madame Irma’s conclusion to be correct.

# Lost in the Closet (Classification Problem)