1.

a) Randy Goldberg is enrolled in the class CS 252.

b) There is a class in which Carol Sitea is enrolled.

c) There is a student who is enrolled in both Math 222 and CS 252.

d) There is a student that is not Mary Black that is enrolled in all the classes which Mary Black is enrolled in.

2. a)

Domain for x: all students in this class

Domain for y: all countries in the world

Predicate: V(x,y) : "x has visited y"

Statement A: **∃x∀yV(x,y)**

**Negation:**

¬(∃x∀yV(x,y))

≡ ¬∃x∀yV(x,y)

≡ ∀x¬∀yV(x,y)

≡ **∀x∃y ¬V(x,y)**

In English: Everyone in this class has not visited some country in the world.

b)

Domain for x: all people

Domain for y: all mountains in the Himalayas

Predicate: C(x,y) : "x climbed y"

Statement B: **∀x∃y¬C(x,y)**

Negation:

¬(∀x∃y¬C(x,y))

≡ ¬∀x∃y¬C(x,y)

≡ ∃x¬∃y¬C(x,y)

≡ ∃x∀y¬(¬C(x,y))

≡ **∃x∀yC(x,y)**

In English: There is someone that has climbed every mountain in the Himalayas.

c)

Domain for x: all faculty members at my school

Domain for y: all children from Berekuso Basic School

Predicate: M(x,y) : "x mentored y"

Statement C: **∀x∃yM(x,y)**

Negation:

¬(∀x∃yM(x,y))

≡ ¬∀x∃yM(x,y)

≡ ∃x¬∃yM(x,y)

≡ ∃x∀y¬(M(x,y))

≡ **∃x∀y¬M(x,y)**

In English: There is a faculty member who has not mentored all children from Berekuso Basic School.

3.

Let P: “Maria is cooking.”

Q: “Maria is hungry.”

R: “Maria will go jogging.”

**¬**P ∨ Q

Q → **¬**R

P ∨ **¬**R

**⸫ ¬**R

|  |  |  |
| --- | --- | --- |
|  | Step | Reason |
| **1.** | **¬**P ∨ Q | Premise |
| **2** | Q → **¬**R | Premise |
| **3.** | P ∨ **¬**R | Premise |
| **4.** | **¬**Q ∨ **¬**R | Conditional disjunction equivalence on 2 |
| **5.** | (P ∨ **¬**R) ∧ (**¬**P ∨ Q) | Conjunction on 3 and 1 |
| **6.** | (**¬**R ∨ Q) | Resolution on 5 |
| **7.** | (Q ∨ **¬**R) | 1st Associativity Law on 6 |
| **8.** | (Q ∨ **¬**R) ∧ (**¬**Q ∨ **¬**R) | Conjunction on 7 and 4 |
| **9.** | **¬**R ∨ **¬**R | Resolution on 8 |
| **10.** | **¬**R | 1st Idempotent Law on 9 |

**⸫** The premises imply the conclusion “Maria will not go jogging.”