

REVIEW EXERCISE 06

Question 1. Convert the following English sentences into FOL sentences, using only the predicates given inside the square brackets.

1. All green apples are sour. [Green¹, Apple¹, Sour¹]

.....

2. All babies love some green apples. [Baby¹, Loves², Apple¹, Green¹]

.....

3. Some babies do not love any sour apple. [Baby¹, Loves², Apple¹, Sour¹]

.....

4. Mary eats only one apple. [Apple¹, Eat²]

.....

Question 2. Find (if it were possible) the Most General Unifier (MGU) of

- | | | |
|-----------------------------------|-----|--------------------------------|
| a) $P(g(h(x)), f(g(h(b))), f(x))$ | and | $P(y, f(y), z)$ |
| b) $P(g(h(x)), f(h(y)), y)$ | and | $P(g(z), f(z), h(a))$ |
| c) $P(x, h(b), h(x))$ | and | $P(f(g(y)), y, h(f(g(h(a)))))$ |
| d) $P(x, g(x), z)$ | and | $P(f(y), g(f(b)), h(y))$ |
| e) $P(f(g(x)), g(b), h(x))$ | and | $P(f(y), y, h(c))$ |
| f) $P(x, h(x), h(y))$ | and | $P(f(g(z)), h(f(g(b))), h(z))$ |

Question 3. Consider the following text. *“Anyone passing his history exams and winning the lottery is happy. But anyone who studies or is lucky can pass all his exams. John did not study but John is lucky. Anyone who is lucky wins the lottery.”*

- a) For each of the axiom above, write the FOL sentence that best expresses its intended meaning, using only the following predicates

PASS(x, y): “x passes the y exam” HAPPY(x): “x is happy” LUCKY(x): “x is lucky”
STUDY(x): “x studies” WINLOT(x): “x wins the lottery”

1)

2)

3)

4)

b) Convert the above FOL clauses to clausal form

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

c) Use resolution to answer the question "Is John happy?"

- 7) Negation of conclusion
- 8) from and $\theta = \{ \dots \}$
- 9) from and $\theta = \{ \dots \}$
- 10) from and $\theta = \{ \dots \}$
- 11) from and $\theta = \{ \dots \}$
- 12) • from and $\theta = \{ \dots \}$

Conclusion:

Question 4. Consider the following KB.

1. $\text{Buffalo}(x) \wedge \text{Pig}(y) \rightarrow \text{Faster}(x,y)$	4. $\text{Buffalo}(\text{Bob})$
2. $\text{Pig}(y) \wedge \text{Slug}(z) \rightarrow \text{Faster}(y,z)$	5. $\text{Pig}(\text{Pat})$
3. $\text{Faster}(x,y) \wedge \text{Faster}(y,z) \rightarrow \text{Faster}(x,z)$	6. $\text{Slug}(\text{Steve})$

Use forward chaining in first-order logic to prove **Faster(Bob, Steve)**. If several rules apply, use the one with the smallest number. Do not forget to indicate the unification at every step.