

Tutorial 4 – Resolution method in Propositional logic

Exercise 1: Decide the validity of the following arguments using the resolution method.

- a) If I am good, I'll get an iPhone.
I am be good.

I get an iPhone.

- b) He has a lecture or is wandering around school.
If he has a lecture, then he is an exemplary student.

If he is not an exemplary student, then he is wandering
around school.

- c) If Pavel has a car, then Quido has a car.
Pavel does not have a car.

If Pavel does not have a car, then Quido does not have a car.

- d) It is not true that the student knows Java and C++.
The student does not know Java.

Student does not know C++.

- e) If the program does not work, there is an error in the program or the system is not working
properly.
If there is an error in the program, I need to consult my exercises.
The program is OK.

If the program does not work, I have to consult my exercises.

- f) If I address the problem, I will solve the problem.
If I do not deal with the problem, then I have something else to do.

I will solve the problem or I have something else to do.

- g) If the engine is not running, there is a fault in the engine or there is no electricity.
If there is a fault in the engine, a repairman must be called.
There is electricity.

If the engine is not running, a repairman must be called.

- h) I watch football and drink beer.
I do not drink beer.

It is raining outside.

- i) If I am not sick, then I am at work.
I am not at work.

I am tired or sick.

- j) If it is sunny in Prague, Sparta will win.
It is not sunny in Prague.

If Sparta and Liberec do not win, but Sparta wins, then Liberec will not.

Exercise 2: Use the resolution method to deduce what follows from the following assumptions.

- a) Karel will travel by bus or train.
If Karel goes by bus or his car, then he will be late.
Karel was not late.
- b) If it's Tuesday, it's a lecture and not a tutorial.
Today is a lecture and tutorial.
If it is a tutorial, then we do not need a projector.
- c) If I have a lecture and a tutorial, I have to learn.
If I have to learn, I have tutorial or I want to transfer to another school.
I do not want to transfer to another school, nor do I have a tutorial.
- d) When I am not tired, I can not concentrate on tutorial of logic.
If I stay up long in the evening, I am tired.
I can concentrate well on tutorial of logic.

Exercise 3: Fill in the missing assumption so that the argument is valid.

- a) If Karel is in Prague, Helena is in Brno.
If it is Tuesday, Helena is not in Brno.
???

Helena is in Brno or it is not Tuesday.

Exercise 4: Use the resolution method to verify that the following formulas are tautologies.

a) $[(p \supset q) \wedge p] \supset q$

b) $(p \vee q) \wedge (p \supset \neg q)$

c) $[(p \supset q) \wedge (q \vee p)] \supset (\neg p \vee q)$