

CSci 1302 Assignment 6

Due Wedn, March 3rd

Problem 1 (6 points) For exercise 6.10 p. 94 parts 7, 8, 9 write short programs that satisfy the specifications. You may try to stay close to Java conventions that we used in class or use notations in the book (see p. 92 for an example). Recall that x_0 stands for the original value of x (before the computation).

Problem 2 (24 points: 1,2,3 are 2 points each, the rest are 3 points each). Assume the following:

1. A chess team A consists of Adam, Alice, and Ann. $A(x)$ means that the person x is on the team A.
2. A chess team B consists of Bob and Beth. $B(x)$ means that the person x is on the team B.
3. The relation $\text{better}(x,y)$ means that x plays better than y (meaning that when x and y play against each other, x usually wins). Some people never played against each other or play about even, so no comparison is given for such pairs. The following are true statements:
 - (a) Adam plays better than Ann and Alice.
 - (b) Alice plays better than Ann.
 - (c) Beth plays better than Adam and Bob.
 - (d) Bob plays better than Alice.

Based on the information above, are the following true or false statements? Prove your answers by using tables. You may show only a part of the table if it is sufficient to prove or disprove the statement.

1. $\exists x.A(x) \Rightarrow \text{better}(x, \text{Beth})$
2. $\forall x.\text{better}(\text{Adam}, x) \vee \text{better}(\text{Beth}, x)$
3. $\forall x.B(x) \vee \neg \text{better}(x, \text{Beth})$
4. $\forall x.\exists y.A(x) \Rightarrow \text{better}(y, x)$
5. $\forall x.\exists y.A(x) \wedge \text{better}(y, x)$
6. $\exists x.\forall y.\text{better}(x, y) \vee \text{better}(y, x)$
7. $\exists x.\exists y.\text{better}(x, y) \wedge \text{better}(\text{Adam}, x)$
8. $\forall x.\forall y.A(x) \vee B(y)$
9. $\forall x.\exists y.\neg \text{better}(x, y)$

Problem 3 (5 points) Use the system in Problem 2 (without adding any new relations) and give an example of $p(x, y)$ such that $\forall x.\exists y.p(x, y)$ is true, but $\exists y.\forall x.p(x, y)$ is not.