UNIVERSITY OF WESTERN ONTARIO

Computer Science 2214a, Fall 2013 - 2014
Discrete Structures for Computing

ASSIGNMENT 1
Given: Wed. Sept. 18, Due: Wed. Sept. 25, 6:00pm

1. Identify all atomic propositions in the following sentences, and abbreviate them with symbols such as P, Q, R. Then convert the sentences into the language of propositional logic.

(a) If Jim is in the barn, then Jack must be in the barn as well.
(b) The getaway car was red or brown.
(c) You will be on time only if you hurry.
(e) To get a good grade it is necessary that you come to class and study.
(f) Studying is sufficient for passing.

2. A set of propositions is *consistent* if there is an assignment of truth values to each of the propositional variables, that makes all propositions true. Is the following set of propositions consistent? If yes, what are the truth value assignments that make it so?

The system is in multiuser state if and only if it is operating normally.
If the system is operating normally, the kernel is functioning.
The kernel is not functioning or the system is in interrupt mode.
If the system is not in multiuser state, then it is in interrupt mode.
The system is in interrupt mode.

3. Show that

$$(A \to C) \wedge (B \to C) \equiv (A \vee B) \to C$$

by

(a) Using truth tables;
(b) Using logical equivalences.

4. In the domain of animals, how would you translate the following expressions in the language of predicate logic?

(a) All lions are predators.
(b) Some lions live in Africa.
(c) Only lions roar.
(d) Not every cat has a tail.
(e) All birds have wings, but some birds cannot fly.

5. Formulate the following statements in the language of predicate logic. To do this, you will need the applicable domain (universe of discourse). These domains are given in parantheses at the beginning of each statement.

(a) (Natural numbers) A number is between a and b iff it is greater than a but less than b.
(b) (Humans, Days) You can fool all people on some days, and you can fool some people on all days, but you can't fool all people on all days.
(c) (Meals) There is no such thing as a free lunch.