**Unit 3 formative activities**

**Activity 1**

*Attempt the following questions from the module core text:*

* *Chapter 2 Question 4 - The barber's paradox.*
* *Chapter 3 Question 4 - A Canadian variant of an old puzzle.*

**Answer:** Not possible to execute as these pages are not included in the access provided to the core text.

**Activity 2**

*Read the paper by Palomino et al (2005) and review the ‘crossing problem’ diagram provided in the Lecturecast.*

* *Create a set of statements in first order logic (FOL) that represent the states shown – for example you may define two functions left and right and therefore the first state could be represented as: Left(F) and left(W) and Left(G) and left(C). Define your own set of FOL statements for the entire diagram.*

**Answer:**

To represent the crossing problem using First Order Logic (FOL), we need to define some predicates and functions. For this problem, we can define the following predicates:

* Left(X): Indicates that the entity X is on the left side of the river.
* Right(X): Indicates that the entity X is on the right side of the river.

Additionally, we define constants for the entities:

* F: The farmer
* W: The wolf
* G: The goat
* C: The cabbage

Let’s represent the different states using these predicates:

**Initial State:**  
Everyone is on the left side.

* Left(F) ∧ Left(W) ∧ Left(G) ∧ Left(C)

**State 1:**  
Farmer takes the goat across the river.

* Right(F) ∧ Right(G) ∧ Left(W) ∧ Left(C)

**State 2:**  
Farmer goes back alone.

* Left(F) ∧ Right(G) ∧ Left(W) ∧ Left(C)

**State 3:**Farmer takes the wolf across the river.

* Right(F) ∧ Right(W) ∧ Right(G) ∧ Left(C)

**State 4:**  
Farmer takes the goat back.

* Left(F) ∧ Right(W) ∧ Left(G) ∧ Left(C)

**State 5:**  
Farmer takes the cabbage across.

* Right(F) ∧ Right(W) ∧ Right(C) ∧ Left(G)

**State 6:**  
Farmer goes back alone.

* Left(F) ∧ Right(W) ∧ Right(C) ∧ Left(G)

**State 7:**  
Farmer takes the goat across.

* Right(F) ∧ Right(W) ∧ Right(G) ∧ Right(C)

This sequence represents a safe crossing without the goat being left alone with the wolf or the cabbage. Each state follows the constraints given in the problem statement.

* *You have been provided with solutions to the ‘crossing problem’ written in Lisp (here), Prolog (here) and Maude (here). Compare your FOL clauses with the various implementations – which of the implementations provides the closest match to your FOL version?*

**Answer:** Prolog