Artificial Intelligence Tutorial Following Lecture on 2.11.20

1) This question is about the whole numbers from 1 to 10. A possible world is an integer.

i) Determine the possible worlds for the sentence “x is odd”.

ii) Prove or disprove the following:

$$x \text{ is even AND } x \text{ is prime} \models x \text{ is equal to } 2$$

iii) Prove or disprove the following:

$$x \text{ is odd OR } x \text{ is prime} \models x \text{ is less than } 7$$

2) The game of “battleships” involves trying to work out where ships are on a grid by asking about the status of specific squares on the grid and recording this. Consider the following simple version of battleships. There is only one ship of length 3 squares. The squares marked X contain no ship.

	x		
			x
x			

Construct the set of possible worlds for this knowledge base.

Hence demonstrate the entailment:

KB $\models$ [4,3] contains no boat. ([4,3] is the square four across and three up)

3) download and play “minesweeper” on a computer or phone

4) Consider the following Minesweeper board containing exactly 3 mines. This uses a simplified version of the game where the number counts the mines above below and to the left and right of a square – but not diagonally. Determine the possible worlds for this board. Where there is a number it denotes the number of mines adjacent to that square.

	2	
		1
1		

Hence, prove or disprove the following:

(i) There is a mine at [1,3] (top left) ⊨ There is a mine at [3,1] (bottom right)

(ii) There is a mine at [1,2] ⊨ there is not a mine at [2,1]

5) Consider the following simplified Minesweeper board containing exactly 3 mines. Determine the possible worlds for this board.

	2	
	2	

Hence, prove or disprove the following:

(i) There is a mine in the top left square ⊨ There is a mine in the bottom right square

(ii) KB ⊨ [2,2] contains a mine

(iii) KB ⊨ [1,2] does not contain a mine

6) **Consider the following values of variables:**

P= FALSE

Q= TRUE

R= FALSE

What is the value of each of the following statements?

a) $(\neg P \wedge \neg Q) \wedge R$

b) $(P \wedge Q) \vee \neg R$.

c) $(P \wedge \neg Q) \wedge \neg R$

d) $(\neg P \vee Q) \wedge \neg R$

e) $(\neg P \wedge Q) \wedge R$