Task 1: (Exercise 7.2 from the textbook) Suppose in the Wumpus world the agent has progressed to the point shown in the following figure, having perceived nothing in [1,1], a breeze in [2,1], and a stench in [1,2], and is now concerned with the contents of [1,3], [2,2], and [3,1]. **Each of these can contain a pit and at most one can contain a wumpus.** Following the example in the lecture, construct the set of possible worlds. (You should find 32 of them.) Mark the worlds in which the KB is true and those in which each of the following sentences is true:

a_2 = "There is no pit in [2,2]."
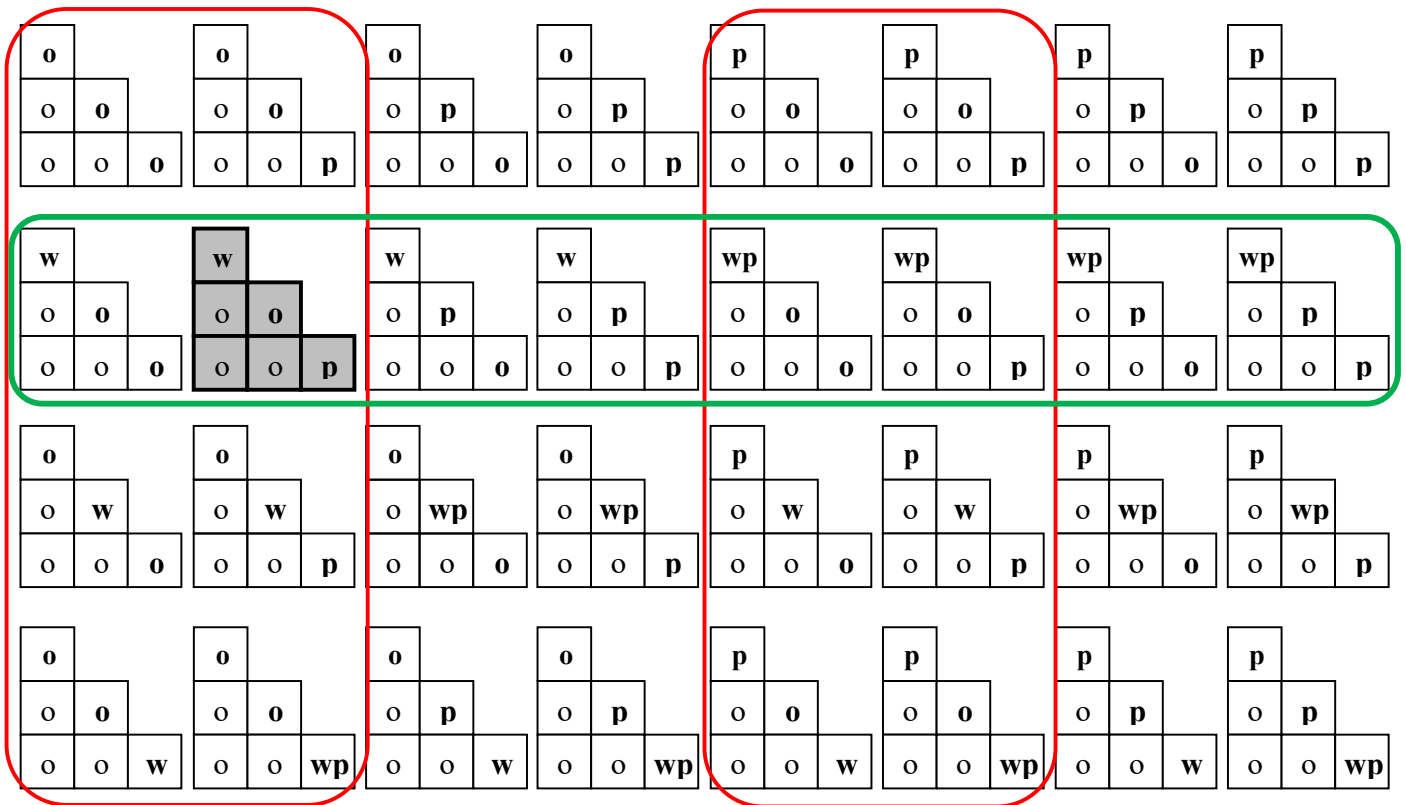a_3 = "There is a wumpus in [1,3]."
Hence show that KB $\models a_2$ and KB $\models a_3$.

1,4	2,4	3,4	4,4
1,3 W!	2,3	3,3	4,3
1,2 A S OK	2,2	3,2	4,2
1,1 V OK	2,1 B V OK	3,1 P!	4,1

A = Agent
B = Breeze
G = Glitter, Gold
OK = Safe square
P = Pit
S = Stench
V = Visited
W = Wumpus

?		
o	?	
o	o	?

M(*a*) – set of all models of *a* (worlds where *a* is true)

We extract the models of the world from the features of the world: pits and wumpus.

Worlds in which KB is true:
KB tells us which one of all the possible world models should be.
KB = Wumpus world rules + observations:
- As 1,2=Stench, there may be a Wumpus in either 2,2 or 1,3.
- As 2,1=Breeze, there may be a Pit in either 2,2 or 3,1.
There is only one world in which the KB is true (grey with bold lines).

Instead of drawing the above, an alternative is to use s Truth Table with the following sentences representing the states of the squares [1, 3], [2,2] and [3,1] (i.e. the squares marked by the question marks in the figure:

?		
o	?	
o	o	?

P13={T/F} (there is/isn't a pit in cell [1,3])
P22={T/F} (there is/isn't a pit in cell [2,2])
P31={T/F} (there is/isn't a pit in cell [3,1])

W13={T/F} (there is/isn't a Wumpus in cell [1,3])
W22={T/F} (there is/isn't a Wumpus in cell [2,2])
W31={T/F} (there is/isn't a Wumpus in cell [3,1])

	P13	P22	P31	W13	W22	W31
Model 1	F	F	F	F	F	F
Model 2	F	F	T	F	F	F
Model 3	F	T	F	F	F	F
Model 4	F	T	T	F	F	F
Model 5	T	F	F	F	F	F
Model 6	T	F	T	F	F	F
Model 7	T	T	F	F	F	F
Model 8	T	T	T	F	F	F
Model 9	F	F	F	F	F	T
Model 10	F	F	T	F	F	T
Model 11	F	T	F	F	F	T
Model 12	F	T	T	F	F	T
Model 13	T	F	F	F	F	T
Model 14	T	F	T	F	F	T
Model 15	T	T	F	F	F	T
Model 16	T	T	T	F	F	T
Model 17	F	F	F	F	T	F
Model 18	F	F	T	F	T	F
Model 19	F	T	F	F	T	F
Model 20	F	T	T	F	T	F
Model 21	T	F	F	F	T	F
Model 22	T	F	T	F	T	F
Model 23	T	T	F	F	T	F
Model 24	T	T	T	F	T	F
Model 25	F	F	F	T	F	F
Model 26	F	F	T	T	F	F
Model 27	F	T	F	T	F	F
Model 28	F	T	T	T	F	F
Model 29	T	F	F	T	F	F
Model 30	T	F	T	T	F	F
Model 31	T	T	F	T	F	F
Model 32	T	T	T	T	F	F

Agent senses stench in square [1,2]

Agent senses no stench in square [2,1]

Agent senses breeze in square [2, 1]

Agent senses no breeze in square [1,2]

Looking at the above Truth Table, it's easy to see that the only world/model that is possible according to KB (Wumpus world rules + observations) is **Model 26.**

We can view a_2 and a_3 as queries. For example, we may wish to know if there is a pit in [2,2] which is stored in a_2. Formally, we need to answer the question whether KB|= a_2 (knowledge base entails the query in a_2).

a_2 = "There is no pit in [2,2]." (result is selected by ⬜)

a_3 = "There is a wumpus in [1,3]." (result is selected by ⬜)

We can see that **M(KB) ⊆ M(a_2)**, thus **KB|= a_2**

We can see that **M(KB) ⊆ M(a_3)**, thus **KB|= a_3**

Task 2:
[KB1] *If I am rich, then I am happy. I am happy.*

*We will use the symbol **R** for the sentence "I am rich" and the symbol **H** for the sentence "I am happy."*

We can then draw the truth table for the knowledge base:

	R	H
Model 1	F	F
Model 2	F	T
Model 3	T	F
Model 4	T	T

Can you tell which models are made IMPOSSIBLE by KB1???

[KB2] *If I study hard, then I pass COS30019. If I am clever and I am lucky, then I pass COS30019. I do not pass COS30019*

*We will use the symbol **S** for the sentence "I study hard" and the symbol **P** for the sentence "I pass COS30019" and the symbol **C** for the sentence "I am clever" and the symbol **L** for the sentence "I am lucky."*

We can then draw the truth table for the knowledge base:

	S	P	C	L
Model 1	F	F	F	F
Model 2	F	F	F	T
Model 3	F	F	T	F
Model 4	F	F	T	T
Model 5	F	T	F	F
Model 6	F	T	F	T
Model 7	F	T	T	F
Model 8	F	T	T	T
Model 9	T	F	F	F
Model 10	T	F	F	T
Model 11	T	F	T	F
Model 12	T	F	T	T
Model 13	T	T	F	F
Model 14	T	T	F	T
Model 15	T	T	T	F
Model 16	T	T	T	T

Can you tell which models are made IMPOSSIBLE by KB2 ???