Assignment_1_Logical_Thinking_Fall_2018_Notebook

November 9, 2018

1 FA Assignment 1: Logical Thinking

This assignment has two distinct sections, each with multiple parts, which allow you to apply the skills learned in the logical thinking unit in a variety of ways. This is an individual assignment: please do not work with other students on any part of this assignment. Both the logic puzzle that you generate and the speech that you select should be unique.

2 Section A: Logical Puzzle

In this section of the assignment, you will apply formal logic to solve a puzzle. Read all instructions before beginning. In Part 1, you will generate a complex logic puzzle. In Part 2, the clues of the puzzle will be thoroughly analyzed using formal deductive logic, truth tables, and Python code. After your analysis in part 2, you will actually solve the puzzle in part 3. It's important that you start with a puzzle that allows you to successfully complete parts 2 and 3. If you generate a puzzle that has inadequate clues to complete part 2, or is too difficult to solve in part 3, please start again with a different puzzle. Do not spend too much time solving the logic puzzle itself; focus on HOW you are applying deductive logic to solve the puzzle.

2.1 Part A1: Setup

Go to the following website: http://www.logic-puzzles.org/init.php. Select any grid size or difficulty setting. Click "Create Puzzle" to generate a custom logic puzzle. Click "Start this puzzle" to start solving it. It is important that the "Active Clues" listed on the right are suitable for successful completion of part 2. There should be at least two clues containing conjunctions, disjunctions, or conditionals. Later, in part 3, you will actually solve the logic puzzle, so if you are unfamiliar with this type of puzzle, you may want to try solving some small puzzles first to warm up.

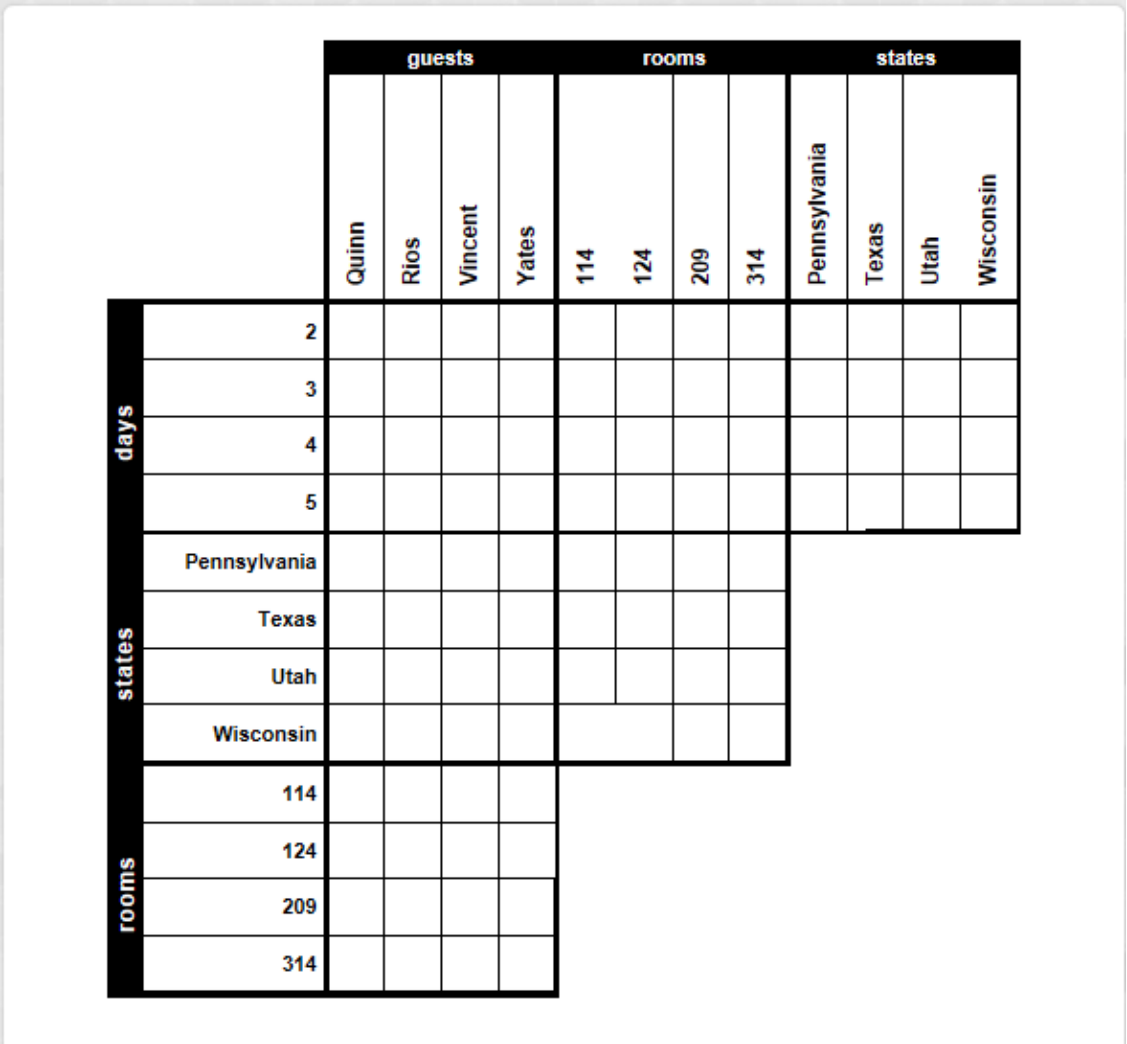
A1.1. Before moving on, put a screenshot of your custom puzzle into your notebook.

To do so, follow these steps: 1. Take a screenshot and save as a .jpeg or .png file. A. mac: command + shift + 4 - saves to desktop B. Windows + Shift + S (Windows 10 only) 2. Upload the file into your Cocalc file folder A. Drag the file from Finder into your files in Cocalc OR B. Use the Cocalc Upload button 3. Copy the file name of the image 4. Paste file name into the Image command: Image("FILE_NAME_HERE") (replace the call for the image in the box below) 5. Run the cell. Your image should print.

```
In [1]: from IPython.display import Image

        Image("logic puzzle.png")
```

Out[1]:



A1.2. Copy-Paste the clues into your notebook.

Clues:

1. The customer from Wisconsin is in room 209.
2. Quinn is staying for 4 days.
3. Of the client in room 314 and the person who is staying for 3 days, one is from Pennsylvania and the other is Yates.
4. The guest in room 114 is staying 1 day longer than the customer from Texas.
5. Vincent isn't staying for exactly 3 days.
6. The guest in room 209 is either the person from Utah or the customer who is staying for 5 days.
7. Yates is staying 2 fewer days than the guest from Utah.

2.2 Part A2: Formal Logic and Algorithms [#deduction, #algorithms]

A2.1. Select 2 of the clues from part 1 that contain conjunctions, disjunctions, or conditionals, and translate them into symbolic logic. Be sure to include a symbolization key.

Note: you may need to select high difficulty levels or sizes to obtain clues that are not simple atomic sentences. You also may need to reword the sentence into a logically equivalent form before translating it into symbolic logic; in any case, explain what you are doing.

1. Of the client in room 314 and the person who is staying for 3 days, one is from Pennsylvania and the other is Yates.
2. The guest in room 209 is either the person from Utah or the customer who is staying for 5 days.

1st clue: Rewording:

Either it is true that the client in room 314 is from Pennsylvania and the person who is staying for 3 days is Yates or it is true that the client in room 314 is Yates and the person who is staying for 3 days is from Pennsylvania but they both cannot be truth.

Symbolization key:

- A: The client in room 314 is from Pennsylvania.
- B: The person who is staying for 3 days is Yates.
- C: The client in room 314 is Yates.
- D: The person who is staying for 3 days is from Pennsylvania.

$$[(A \wedge B) \vee (C \wedge D)] \wedge \neg[(A \wedge B) \wedge (C \wedge D)]$$

2nd clue: Rewording:

Either the guest in room 209 is from Utah or the guest in room 209 is staying for 5 days but they both cannot be true.

Symbolization key:

- P: The guest in room 209 is from Utah.
- Q: The guest in room 209 is staying for 5 days.

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

A2.2. Negate the two clues you used in part 2 using DeMorgan's Laws. Then translate them back into English.

Negetion of the 1st clue:

$$\neg[((A \wedge B) \vee (C \wedge D)) \wedge \neg((A \wedge B) \wedge (C \wedge D))]$$

$$\neg[(A \wedge B) \vee (C \wedge D)] \vee \neg\neg[(A \wedge B) \wedge (C \wedge D)]$$

$$[\neg(A \wedge B) \wedge \neg(C \wedge D)] \vee [(A \wedge B) \wedge (C \wedge D)]$$

$$[(\neg A \vee \neg B) \wedge (\neg C \vee \neg D)] \vee [(A \wedge B) \wedge (C \wedge D)]$$

Translation:

The client in room 314 is Yates, staying for 3 days and from Pennsylvania or the following both statements are true that, the client in room 314 is not from Pennsylvania or Yates is not staying for 3 days and the client in 314 is not Yates or the person who is staying for 3 days is not from Pennsylvania.

Negetion of the 2nd clue:

$$\neg[(P \vee Q) \wedge \neg(P \wedge Q)]$$

$$\neg(p \vee Q) \vee \neg\neg(P \wedge Q)$$

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

Translation:

It is true that the guest in room 209 is from Utah and staying for 5 days or it is true that the guest in room 209 is not from Utah and he is not staying for 5 days.

A2.3. Use truth tables to evaluate both of your two clues from A2.1. Briefly explain whether the two clues form a consistent set based on your truth tables. Format your table neatly in google docs or google sheets, then paste in the image(s).

In [2]:
```
#replace this filler image with your truth tables

Image("truth table 1.png")
```

Out[2]:

FIRST SENTENCE: [(A ∧ B) ∨ (C ∧ D)] ∧ ¬[(A ∧ B) ∧ (C ∧ D)]

Symbolization key:	
A: The client in room 314 is from Pennsylvania.	T = True
B: The person who is staying for 3 days is Yates.	F = False
C: The client in room 314 is Yates.	
D: The person who is staying for 3 days is from Pennsylvania.	

TRUTH TABLE

A	B	C	D	A and B	C and D	(A and B) or (C and D)	not[(A and B) and (C and D)]	[(A and B) or (C and D)] and not[(A and B) and (C and D)]
T	T	T	T	T	T	T	F	F
T	T	T	F	T	F	T	T	T
T	T	F	T	T	F	T	T	T
T	T	F	F	T	F	T	T	T
T	F	T	T	F	T	T	T	T
T	F	T	F	F	F	F	T	F
T	F	F	T	F	F	F	T	F
T	F	F	F	F	F	F	T	F
F	T	T	T	F	T	T	T	T
F	T	T	F	F	F	F	T	F
F	T	F	T	F	F	F	T	F
F	T	F	F	F	F	F	T	F
F	F	T	T	F	T	T	T	T
F	F	T	F	F	F	F	T	F
F	F	F	T	F	F	F	T	F
F	F	F	F	F	F	F	T	F

In [3]:
```
Image("truth table 2.png")
```

Out[3]:

SECOND SENTENCE: (P ∨ Q) ∧ ¬(P ∧ Q)				
Symbolization Key:				
P: The guest in room 209 is from Utah.				T =True
Q: The guest in room 209 is staying for 5 days.				F = False
TRUTH TABLE				
P	Q	P or Q	not(P and Q)	(P or Q) and not(P and Q)
T	T	T	F	F
T	F	T	T	T
F	T	T	T	T
F	F	F	T	F

```
In [4]: Image("truth table 3.png")
```

Out[4]:

TRUTH TABLE FOR CONSISTENCY CHECK							
A	B	C	D	P	Q	[(A and B) or (C and D)] and not[(A and B) and (C and D)]	(P or Q) and not(P and Q)
T	T	F	F	T	F	T	T

Two sentences can be *consistent* if they both are true *at the same time* for *at least* one combination of their atomic sentences.

In our case, the atomic sentences of the both sentences are different and do not influence the other sentence. In the truth table 3, we can see, a row of the truth table where both statements are true for a given combination of atomic sentences.

Therefore, they are **consistent**.

A2.4. Write a function in Python that checks the truth value of one of your clues from 2.1 using "if", "and", "or", "not". You may refer to the code in lesson 2.1 and 2.2 for inspiration. The function should:

a. input the truth values of the atomic sentences that make up the statement, represented by boolean variables, and**

b. output the truth value of the full statement (clue).

c. include clearly annotated comments to explain what the code is doing and how it is using logic (read this resource about the importance of comments and this one for further guidance).

```
In [5]: # This code will check the truth value of my 2nd clue.
        def truth_value_2nd_clue(P,Q):
            #taking input the truth value of the atomic sentences: P and Q.
```

```
        return (P or Q) and not(P and Q)
        #Returning the truth value of the sentence
        #Here, we replaced the logical connective symbols of the sentences with python ope

    #cheking the outputs
    #for P in [True, False]:
    #    for Q in [True, False]:
    #        print(truth_value_2nd_clue(P,Q))
```

A2.5. ***Optional*****: Write another function in Python to print a truth table for your statement.**

```
In [6]: # Edit this cell to answer part A2.5
        def truth_table():
            print("  TRUTH TABLE  \n")
            print (" P     Q      (PQ)ŭ(PQ)")
            for P in [True, False]:
                for Q in [True, False]:
                    print(P," ",Q," ",truth_value_2nd_clue(P,Q))

        truth_table()
```

```
  TRUTH TABLE

 P     Q      (PQ)ŭ(PQ)
True   True   False
True   False   True
False   True   True
False   False   False
```

A2.6. ***Optional challenge*****: Write a Python code that will create a truth table for any logical statement involving any number of atomic sentences and connectives.**

```
In [7]: # Edit this cell to answer part A2.6
```

A2.7. ***Optional super challenge*****: Write a Python code that will check the validity for any set of logical sentences that form an argument.**

```
In [8]: # Edit this cell to answer part A2.7
```

2.3 Part A3: Logic Puzzle [#deduction]

A3.1. Work through the puzzle. It will be helpful to write notes for yourself explaining what each clue implies. Describe how you used the rules of deductive logic to evaluate the clues by giving at least one example of an implication that you derived using the common rules of deductive logic.

Working through the puzzle Throughout the process, we will use some of the atomic sentences. But for our better understanding, we will symbolize them in a special way. For example:

Quinn is staying for 4 days $\implies$ Q-4 The customer from Wisconsin is in room 209 $\implies$ Wc-209

Symbolization Key: - Q -- Quinn - V -- Vincent - R -- Rios - Y -- Yates - Pn -- Pennsylvania - Tx -- Texus - Ut -- Utah - Wc -- Wisconsin

Steps:

- Clue 2: Q-4 (We will put a green circle on respective box, which will eventually create some crosses in other boxes)
- Clue 1: Wc-209
- Clue 3: ~V-3 (we will put a red cross on respective box)
- Clue 6: either Ut-209 or 5-209 (exclusive or)
  - (Ut-209 or 5-209) and ~(Ut-209 and 5-209)
  - Wc-209
  - ~Ut-209
  - Therefore, 5-209
- Wc-5 (as Wc-209 and 5-209)
- Clue 7: (Y-3 and Ut-5) or (Y-2 and Ut-4)
  - Wc-5
  - ~Ut-5
  - ~(Y-3 and Ut-5)
  - Therefore, Y-2 and Ut-4
- Q-Ut (as Q-4 and Ut-4)
- V-5 (only available box without a cross in a full line)
- R-3 (only available box without a cross in a full line)
- Clue 3: either (Pn-314 and Y-3) or (Pn-3 and Y-314)
  - ~Y-3
  - ~(Pn-314 and Y-3)
  - Therefore, Pn-3 and Y-314
- Tx-2 (only available box without a cross in a full line)
- Clue 4: (2-114 and Tx-1) or (3-114 and Tx-2) or (4-114 and Tx-3)
  - Tx-2
  - ~Tx-1 and ~Tx-3
  - Therefore, 3-114

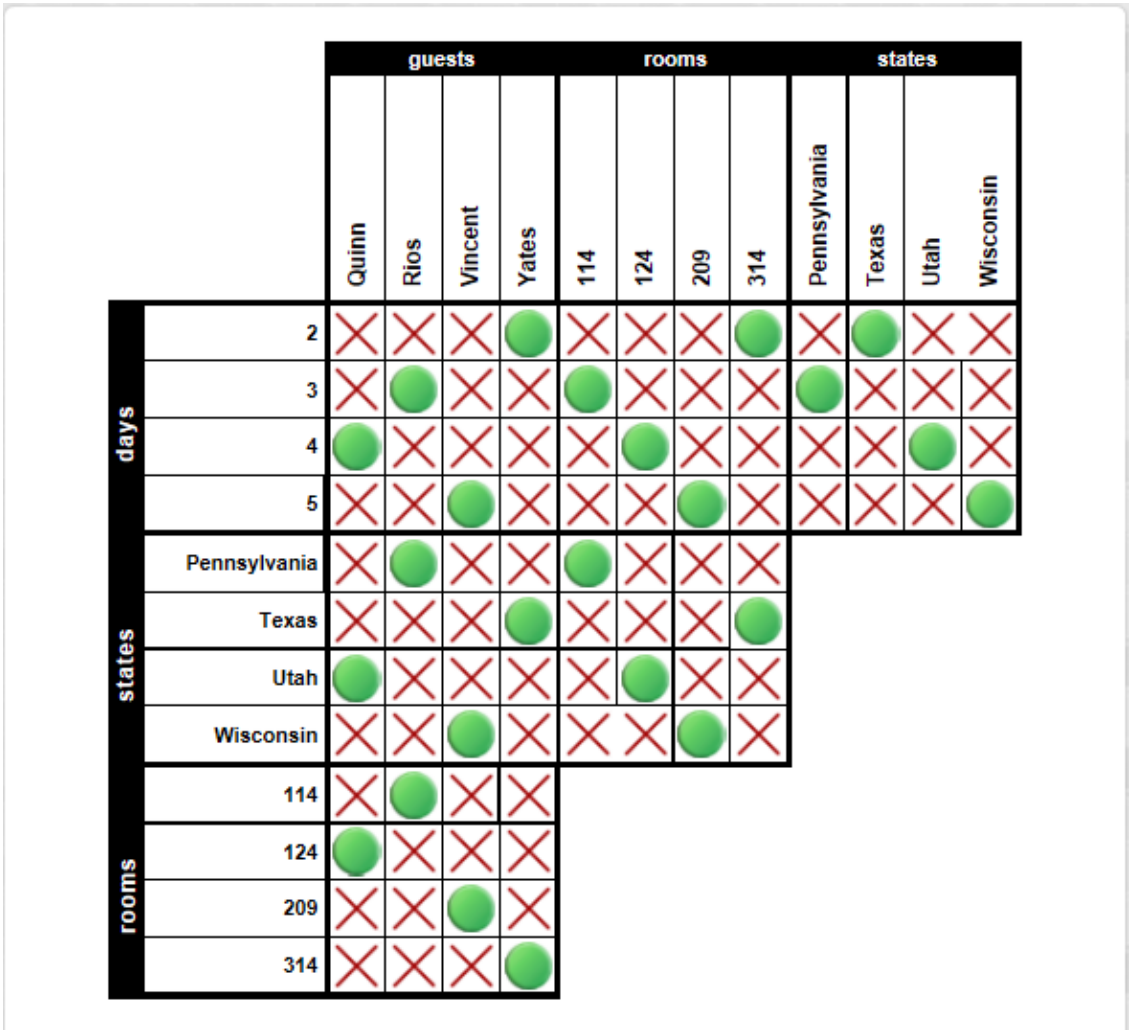
WOW! Puzzle Solved!

A3.2. Put a screenshot of the answer grid into your notebook before hitting submit. Do this before the next step, because once you hit submit, you lose access to the original puzzle and clues, so be sure that you took the necessary screenshots in parts A1 and A3.

In [9]:
```
#replace this filler image with your answer grid

    Image("logic puzzle answer.png")
```

Out[9]:

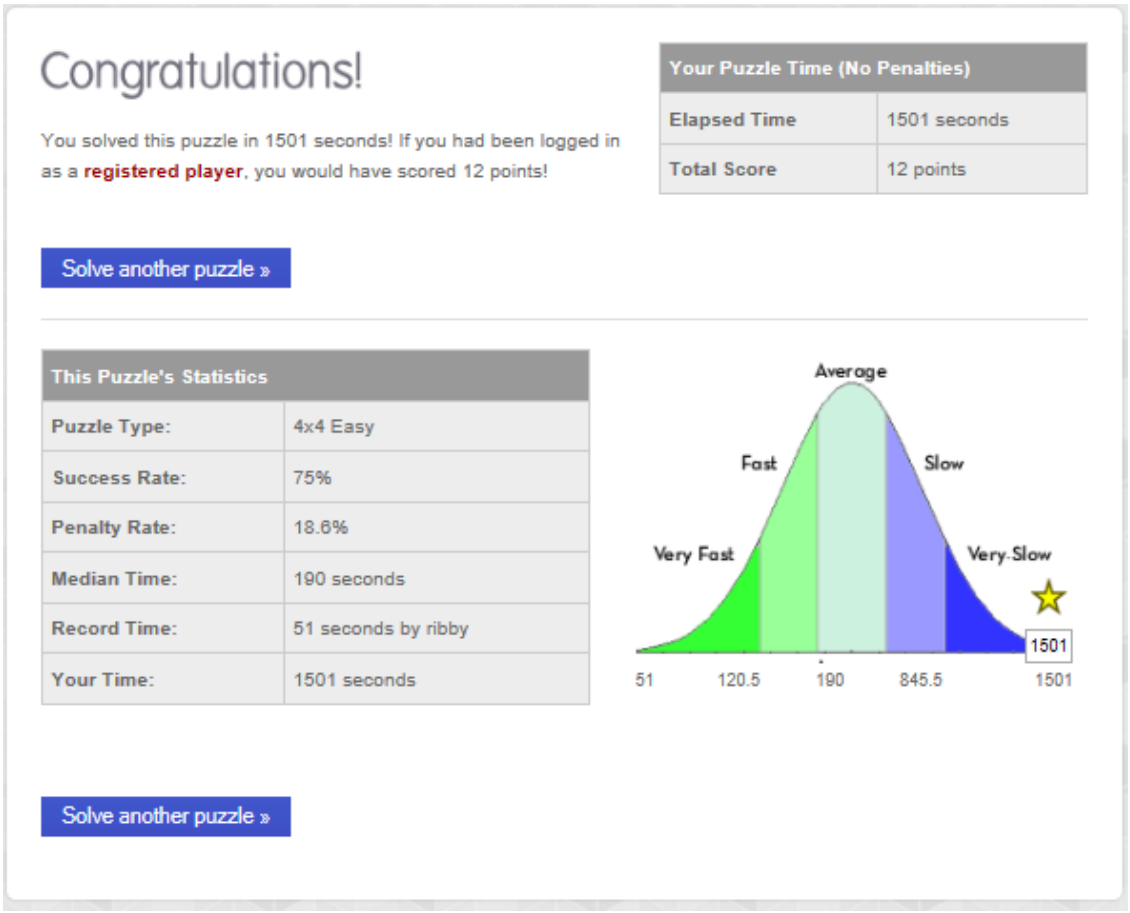


A3.3. Now you can hit submit. Paste your score into your notebook (don't worry about how long you took).

```
In [10]: #replace this filler image with your logic puzzle score

         Image("logic puzzle score.png")
```

Out[10]:

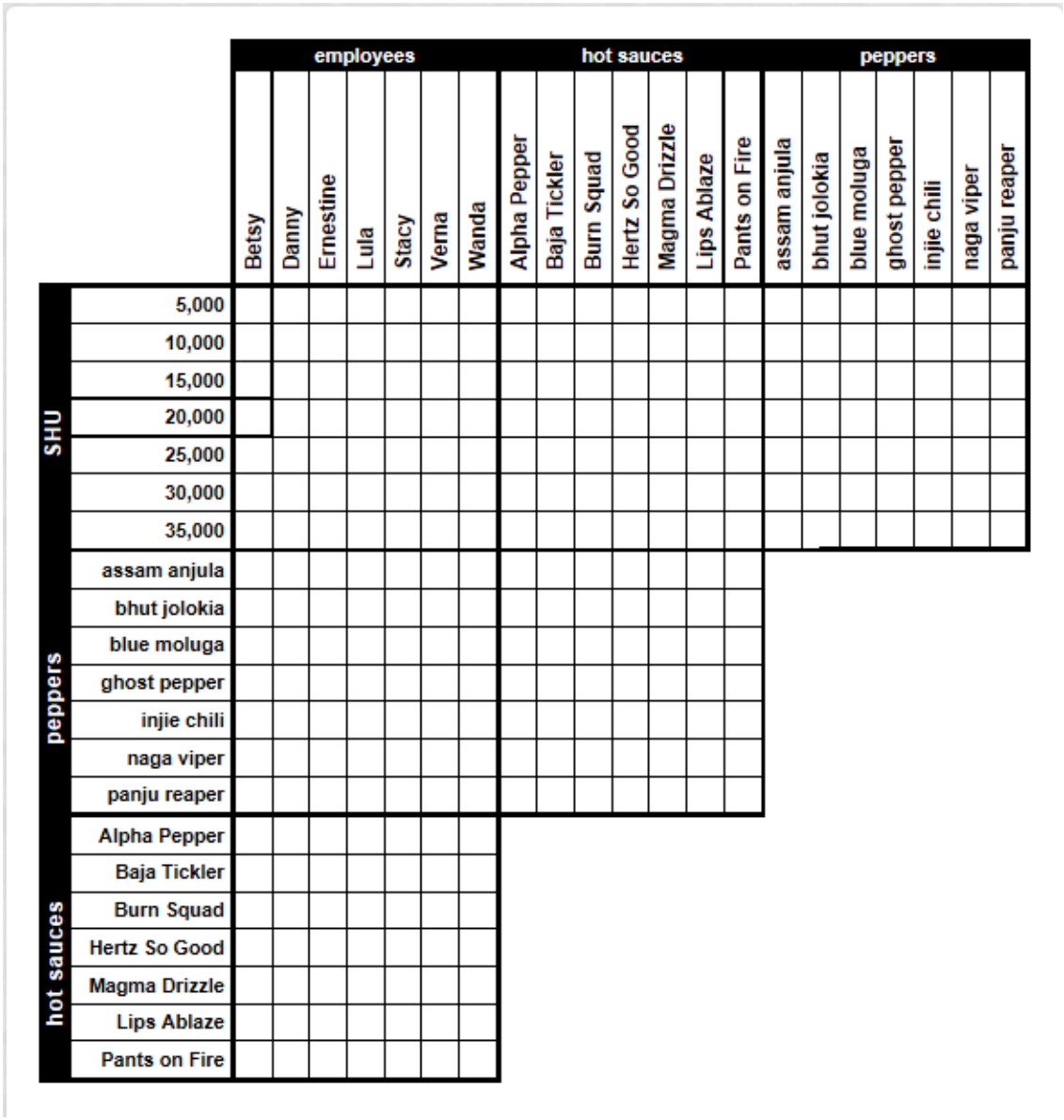


A3.4. ***Optional challenge*: Complete the above for a 4x7 logic puzzle on the hardest difficulty.**

Logic Puzzle 4x7

```
In [11]: Image('logic puzzle 4x7.png')
```

```
Out[11]:
```



Clues:

1. "Pants on Fire" is 10,000 SHU spicier than "Alpha Pepper".
2. "Hertz So Good" is 5,000 SHU spicier than "Alpha Pepper".
3. The sauce that uses the bhut jolokia is somewhat spicier than the product that uses the ghost pepper.
4. Danny's product is 25,000 SHU spicier than Lula's sauce.
5. Ernestine's hot sauce is either the sauce rated at 10,000 SHU or the product that uses the blue moluga.
6. "Baja Tickler" is either the hot sauce that uses the ghost pepper or the product rated at 20,000 SHU.

7. Of the product that uses the naga viper and Verna's sauce, one is "Magma Drizzle" and the other is rated at 25,000 Scoville Heat Units.
8. "Baja Tickler" is somewhat spicier than Lula's hot sauce.
9. Stacy's product isn't rated at exactly 10,000 SHU.
10. The hot sauce that uses the blue moluga is 5,000 SHU less spicy than "Lips Ablaze".
11. The sauce that uses the injie chili is either "Lips Ablaze" or the sauce rated at 5,000 SHU.
12. Ernestine's sauce is rated at 20,000 Scoville Heat Units.
13. Of "Magma Drizzle" and the product that uses the bhut jolokia, one is rated at 10,000 Scoville Heat Units and the other is Betsy's.
14. The sauce that uses the bhut jolokia is 5,000 SHU less spicy than the product that uses the panju reaper.
15. The product that uses the naga viper, the product rated at 30,000 SHU, and Lula's sauce are three different products.

Working through the puzzle Throughout the process, we will use some of the atomic sentences. But for our better understanding, we will symbolize them in a special way. For example:

- Ernestine's sauce is rated at 20,000 Scoville Heat Units $\implies$ E-20
- Ernestine's sauce uses blue moluga $\implies$ E-bm
- The sauce that uses the injie chili is either "Lips Ablaze" $\implies$ LA-ic

Also, 'LA-ic' and 'ic-LA' will be considered the same.

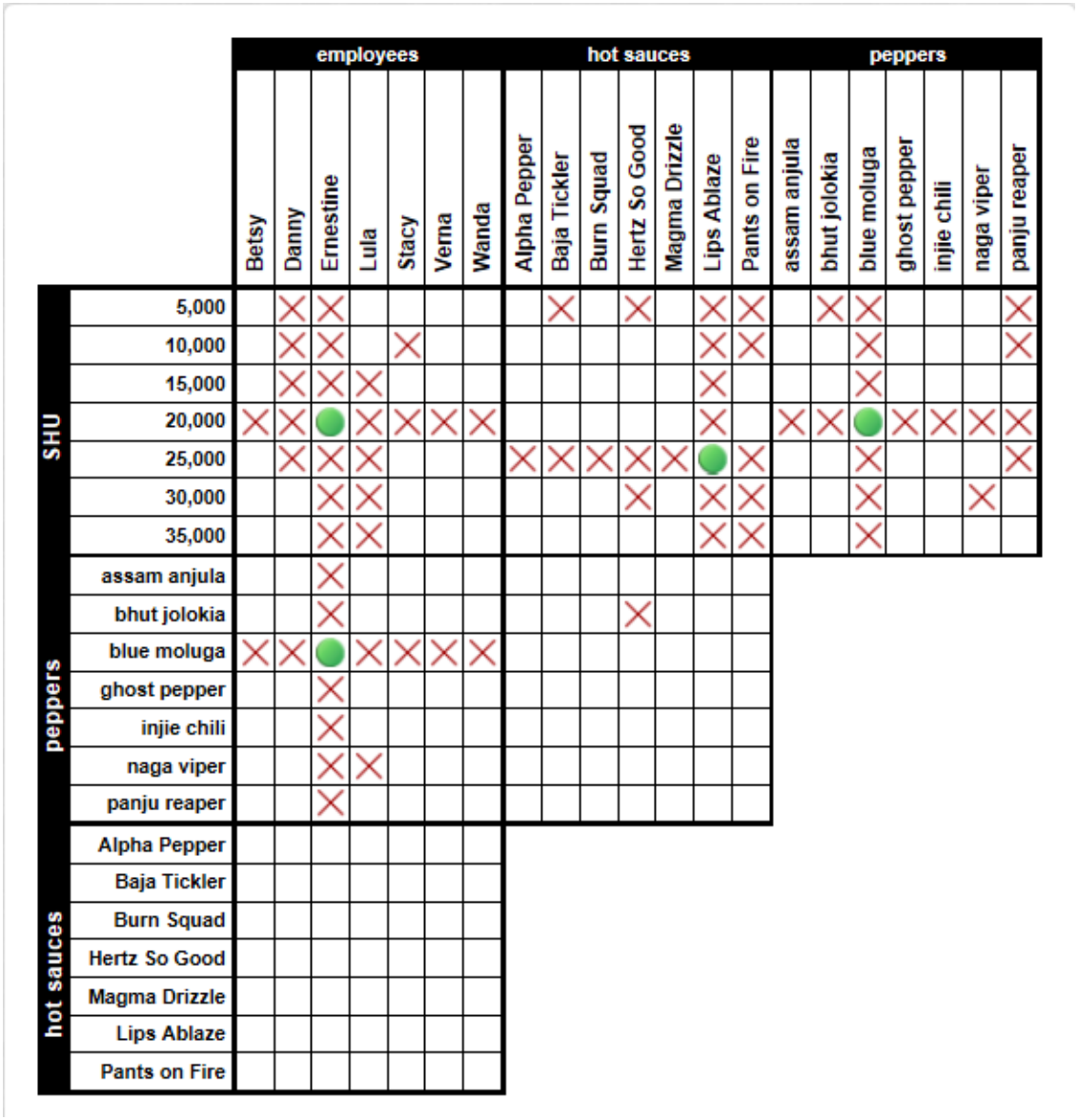
Steps: - Clue 9: ~ S-10 (we will give a cross in the respective box) - Clue 12: E-20 (we will put a green circle there, which will eventually create some more cross boxes) - Clue 5: either E-10 or E-bm (an exclusive disjunction) - ~E-10 (it is crossed due to 2nd step) - E-bm (either A or B. not A. Therefore, A) [Exclusive or] - Clue 10: bm is 5000 SHU less than LA - E-bm - E-20 - Therefore, LA-25 - Clue 15: ~np-30 and ~L-np and ~L-np

Now it's become more difficult. Nothing can be say true from the avaiable clues. So, we will try to see if we can make anything false.

- Clue 1: PoF is 10000 SHU than AP.
  - That means, (AP-5 and PoF-15) or (AP-10 and PoF-20) or (AP-15 and PoF-25) or (AP-20 and PoF-30) or (AP-25 and PoF-35)
  - Therefore, ~PoF-5 and ~PoF-10 and ~AP-30 and ~AP-35
- Clue 2: ~HG-5
- Clue 3: ~bj-5
- Clue 4: ~D-5 and ~D-10 and ~D-15 and ~D-20 and ~D-52
- Clue 8: ~BT-5
- Clue 14: ~pr-5
  - ~bj-5
  - ~pr-10

```
In [12]: Image('logic puzzle 4x7 stuck.png')
```

Out[12]:



Everything is now at stuck. No single clue can be used for a single mark on the grid. We must take a **leap of faith** -- a random guess. We need to choose a clue, which is *'inclusive or'* or *'exclusive or'*. Then we need to make a guess and take the necessary following steps based on that. If our guess is wrong, we will find an inconsistency later. And if our guess is right, we can get the puzzle solved without any problem.

- **Clue 13: either (B-MD and bj-10) or (B-10 and MD-bj)**
  - **Guess: B-MD and bj-10**
- Clue 3: gp-5
- Clue 14: pr-15
- Clue 6: either BT-gp or BT-20

  - ~BT-5
  - ~BT-gp
  - Therefore, BT-20

- Clue 11: either LA-ic or ic-5
  - ~ic-5
  - Therefore, LA-ic

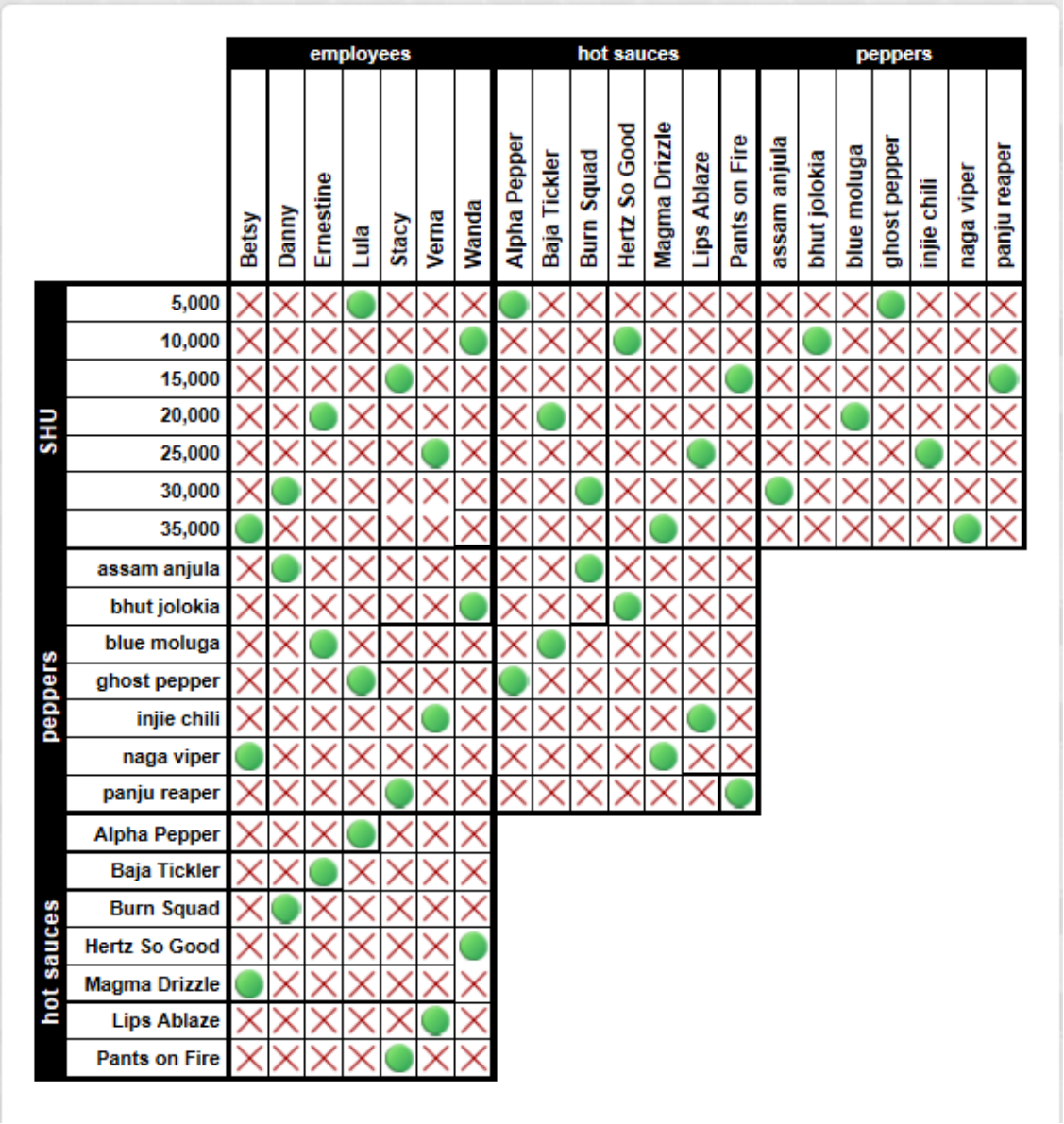
- ic-25 (only available grid without cross in a full line)
- nv-35
- aa-30
- Clue 7: either (nv-25 and V-MD) or (V-25 and MD-nv)
  - ~nv-25
  - Therefore, V-25 and MD-nv
  - B-nv (as B-MD)
  - B-35

- PoF-15 (only available grid without cross in a full line)
- Clue 1: AP-5
- Clue 2: HsG-10
- D-30 (only available grid without cross in a full line)
- Clue 4: L-5
- S-15 (only available grid without cross in a full line)
- W-10

WOW! Puzzle Solved!!

```
In [13]: Image('logic puzzle 4x7 answer.png')
```

Out[13]:



In [14]: `Image('logic puzzle 4x7 score.png')`

Out[14]:

3 SECTION B: SPEECH ANALYSIS

For this section of the assignment, select part of a historical speech by a world leader in order to analyze and evaluate its logic. You will translate the part of the speech you select into symbolic logic, and determine where the leader makes inductive arguments, deductive arguments, and fallacies.

3.1 Part B1: Speech Selection

B1.1. Find a speech with an argument that is at least ten years old. It may be written by, for example, an elected official, dissident, political leader, or religious leader.

B1.2. Cite the speech in APA format and include a hyperlink to the source of the speech.

Bush, G. (May 15, 2006). ADDRESS TO THE NATION ON IMMIGRATION. In *Selected Speeches George W Bush (pp. 369-375).* Retrieved from https://georgewbush-whitehouse.archives.gov/infocus/bushrecord/documents/Selected_Speeches_George_W_Bush.pdf

B1.3. Write a short synopsis of the speech in your own words (<100 words). You should not provide a transcript of the speech in full, but should quote the specific parts that you use in the analysis (see below).

George W. Bush provided the main ideas of the bill regarding the reform of America's immigration system in this speech. He specified the problems of illegal immigration and briefly explained five objectives of his reforming bill. He prioritized to ensure border control more efficiently. > "First, the United States must secure its borders."

> "For many years, the government did not have enough space in our detention facilities to hold them while the legal process unfolded. So most were released back into our society and asked to return for a court date. When the date arrived, the vast majority did not show up. This practice, called "catch and release," is unacceptable, and we will end it."

He also proposed a temporary working program for foreigners and a biometric card for every legal worker. > "The reality is that there are many people on the other side of our border who will do anything to come to America to work and build a better life. They walk across miles of desert in the summer heat, or hide in the back of 18-wheelers to reach our country. This creates enormous pressure on our border that walls and patrols alone will not stop. To secure the border effectively, we must reduce the numbers of people trying to sneak across. Therefore, I support a temporary worker program that would create a legal path for foreign workers to enter our country"

Regarding the illegal immigrants, who have already rooted here, Bush offered a middle ground plan, in between amnesty and mass deportation. Lastly, he expressed the importance of a quick and comprehensive bill and ended the speech with a personal experience. > "An immigration reform bill needs to be comprehensive, because all elements of this problem must be addressed together, or none of them will be solved at all"

3.2 Part B2: Argument Analysis [#deduction, #induction, #fallacies]

B2.1. Identify a deductive argument from the speech. Include a copy of this part of the speech with proper citation. Analyze this argument:

a. Rewrite the argument in natural language in simple terms with clear use of logical connectives and atomic sentences so that it is amenable for analysis with the next steps. Do your best not to change the meaning of the argument. You may add premises that you believe to be implied but please justify your interpretation.

b. Translate the argument into symbolic logic. You should not be translating the whole speech - just the statements that comprise the argument.

c. Why is this argument deductive? Is the argument valid? Support your answer with a truth table and/or a proof.

d. Is the argument sound? Why or why not? (<300 words for the valid/sound analysis)

Deductive argument:

> "First, the United States must secure its borders."

> "The reality is that there are many people on the other side of our border who will do anything to come to America to work and build a better life. They walk across miles of desert in the summer heat, or hide in the back of 18-wheelers to reach our country. This creates enormous pressure on our border that walls and patrols alone will not

stop. To secure the border effectively, we must reduce the numbers of people trying to sneak across. Therefore, I support a temporary worker program that would create a legal path for foreign workers to enter our country"

(Bush, 2006)

a. Rewriting:

We must secure our borders.

If we want to secure our borders, then the number of people crossing the border illegally must be reduced.

If people continue to come to America illegally to work and build a better life, then the number of people crossing the border illegally cannot be reduced. *(In the speech, it is said that "it creates enormous pressure on our border", which indicates that the number of people sneaking illegally increases.)*

If there is not a legal temporary worker program, then people will continue to come to America illegally to work and build a better life. *(In the speech, he said, they will do anything to come to America. From that line, it can be easily understood that if there is no legal way, they will then choose the illegal one)*

Therefore, there must be a legal temporary worker program.

b. Translating: Symbolization key: - A: We want to secure our borders. - B: The number of people crossing the border illegally must be reduced. - C: People will continue to come to America illegally to work and build a better life. - D: There must be a legal temporary worker program.

1. A
2. $A \implies B$
3. $C \implies \neg B$
4. $\neg D \implies C$
5. $Therefore, D$

c. The argument is **deductive** because the *conclusion directly follows the premises.* The premises gives a guarantee about the truth value of the conclusion.

This is a **valid** deductive argument. We can support this claim by the following direct proof:

1. A
2. $A \implies B$
3. $C \implies \neg B$
4. **3.3** $\neg D \implies C$
5. B ----- modus ponens, 1, 2
6. $\neg(\neg B)$ ----- double negetion, 5
7. $\neg C$ ----- modus tollens, 6, 3
8. $\neg(\neg D)$ ----- modus tollens, 7, 4
9. D ----- doble negetion, 8

d. This argument is **sound**, as the promises are true. These premises do not contain any fallacious characteristics, and their truth value can be easily understood by common sense and mere knowledge of border control.

And as the argument is valid, the conclusion is also true and convincing.

B2.2. Identify an inductive argument from the speech. Include a copy of this part of the speech with proper citation. Analyze this argument:

a. Why is this argument inductive? Can you identify which type/form of induction it is?

b. Is the inductive reasoning weak or strong, and why?

c. Write another inductive conclusion based on the premises you've identified. Compare this conclusion to the one offered in the speech and comment on which argument is stronger. (<250 words for the induction analysis)

> "So most were released back into our society and asked to return for a court date. When the date arrived, the vast majority did not show up. This practice, called "catch and release," is unacceptable."

(Bush, 2006)

a.

The argument is inductive for three reasons: 1. In the 1st premise, the word *'when'* means it has observed in the past. But *'when'* does not guarantee about the future events. So the induction is a type of **'prediction'**. 2. The common definition of the word *'unacceptable'* does not provide any specific range. Sometimes it may mean 0% efficiency, while other time maybe less than 50% efficiency. So as the author did not give a specific definition, the argument cannot be deductive. 3. The conclusion is very general, whereas the evidence is only for the United States. We cannot guarantee that this practice will not be more effective in other countries too. So it has also some flavor of **'hasty generalization'**.

b.

I might consider it strong as it is not any *coincidencial* event; it happened in the **'vast majority'** of cases. Also the *cause and effect relationship* behind the events is understandable, though not explicitly declared, and this relationship should not change considerably in the future. So it is **'very likely'** that this practice will mostly fail to do the job in the future too *in the United States*.

But the fact that it is not inclusive for the United States weakens its strength largely and makes it a **weak induction**. As mentioned above this statement is actually a *fallacy* of *hasty generalization*.

c.

Another conclusion would be, **Hopefully, the practice will be more effective in the future for us.**

The past evidence directly opposed this conclusion. It's a much *weaker induction* and also can be included to **'inconsistency'** type *fallacy*.

B2.3. Find two fallacies in the speech. Copy the parts of the speech in which the fallacies appear, with proper citation.

a. Name the fallacies and explain why they are fallacies.

b. Explain how one of the fallacies could be corrected. Would correcting the fallacy change the conclusion of the argument, or one or more of the premises? Why or why not? (<400 words for the fallacies analysis)

> "So most were released back into our society and asked to return for a court date. When the date arrived, the vast majority did not show up. This practice, called "catch and release," is unacceptable."

"An immigration reform bill needs to be comprehensive, because all elements of this problem must be addressed together, or none of them will be solved at all"

(Bush, 2006)

a. The first argument is an example of **'hasty generalization'**. Here, from the premises, we only get evidence that the practice was mostly inefficient in past cases, and in the United States. It does not guarantee that it will not work anywhere in the world in the future. But the conclusion is a general claim that it is unacceptable in all time and all places. From observation of a sample area, it concludes a decision about the whole world. That is why it is a fallacy.

The second argument is an example of **'false dichotomy**. Here the speaker gave us only two option to choose between, whereas there are some other choices available. He told that we must address all the aspects at a time or nothing will be resolved. But it is possible to implement the temporary working program firstly; then maybe later we can deal with the illegal immigrants who have been rooted here. Thus it is really a fallacious argument.

b. The first fallacy can be corrected if we changed the conclusion in following way: **This practice may not work in the future in our country.**

Then, the conclusion will be more convincing based on the evidence. As we have only evidence of the United States and it mostly failed to work in the past, we can certainly say that, it is *very likely* that it will not work effectively in this country in the future too.

And as the evidence says that in *vast majority* cases it was ineffective, so with the new conclusion, it becomes a **strong inductive** argument.

So, to correct the fallacy of *hasty generalization*, we need to modify the conclusion of the argument. We narrowed down the range of the conclusion, but it still fulfills for the speaker's purpose as the speaker was really try to consider the border control of the United States.

4 Section C: REFLECTION

Reflect on what you learned in this assignment. Address the following points: (<200 words) [#scienceoflearning + other HCs per use]

C.1. How did the principles from the science of learning deepen your knowledge of #induction, #deduction, #algorithms, and #fallacies while working on this assignment?

I used different strategies to identify the different components of deductive arguments, and how the premises and conclusions can work together to make an idea convincing and comprehensive. The deep processig and deliberate practice helped me a lot to apply these knowledges.

In the puzzle it was interesting how taking a gap to do some other stuffs later helped to find a next movement.

Also, identifying deductive and inductive arguments, and fallacies in a speech proved to be quite challenging because we must also critique the author on their intentions and purpose and principal knowledge about them helped me a lot to overcome these challanges.

2. Throughout both sections, what did you learn about the connection between formal logic, language, computer code, and the use of logical thinking in the real world?

I would say that sometimes it may seem easier to understand the implications of logic in natural language but the tools that formal logic and computer code provide us with, help make the process a little bit easier. In the real world, we do not often worry about how logical we are in our day to day speech, but it is important to understand that people may try to use this against us. We

could also use them to improve our accuracy when speaking about topics that might be sensible to false information. Therefore, we must be informed and educated to be prepared for anything.

3. *Optional*: Do you think one should believe the selected speech even though it contains errors in reasoning (such as fallacies or errors in deductive or inductive reasoning)? Why or why not? (<200 words)

Edit this cell to answer part C.3

4. *Optional*: Create a new practice problem for future classes that you think is a good test of the skills covered by one or more of these HCs. Provide the complete step-by-step solution, and a justification for why this is a good example. It should not include a logic puzzle or speech analysis like the above. It should be an entirely different kind of thing.

Edit this cell to answer part C.4

5 You're ready to submit your assignment!

To submit, you need to save this file in two ways.

1. As an .ipynb Notebook
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6 Congrats! You've completed your first FA assignment!