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# Modeling Problem: Written Model

Problem statement:

Given the access to the different modes of transportation, if they live on or off campus (which residence hall), distance, if they own a car, bike, if their vehicles are registered, the lease fee, and if they own a board. The program will decide what mode of transportation the student will use.

## Decipher problem statement:

List of inputs:

1. On or off campus?
2. Do they own a vehicle?
3. Do they have a parking pass?
4. Would they pay for the parking pass?
5. Distance from campus (if off campus)?
6. Do they own a bike?
7. Do they own a bike lock?
8. If not, would they pay the bike lock lease fee?
9. Is the bike registered?
10. Do they own a skate/long board?

List of Outputs:

1. Walk
2. Bike
3. Drive
4. Skateboard
5. Carpool
6. Public Transportation

## Flowchart:

See last page.

**Identify relevant theory:**

- For students not living on campus, we decided it was safe to assume that the students will not walk, bike, or skateboard. We decided this because if a student is more than five miles away from campus, it would be unrealistic to walk, bike, or skateboard to campus.
- In the unlikely event that a student lives five or more miles from campus, we decided that it would be safe to assume that the student would use public transportation, carpool, or use uber to get to campus since the other options are unrealistic.
- For walking, skateboarding, or biking, it was a pretty simple decision to make. If a student has a bike, they will most likely use it, if a student has a board, they will most likely use it as well, and if they have neither, they will walk. These are all safe assumptions to make because the students have limited choices.

**Assumptions:**

1. We can assume that students who live on campus will not drive to school since they are living at the school.
2. We can assume that students who live off campus within a five mile radius will not drive to school since they live close enough that driving is considered unnecessary.
3. We can assume that students who live further than five miles away from campus use some form of motor vehicle to get to school.
4. We can assume that if a person owns a bike or skateboard, that they utilize their skateboard to get around school.
5. We can also assume that if a person who lives more than five miles off campus has a friend who owns a car, that they will carpool with that person to get to school.
6. We can assume that if a person lives more than five miles from campus and does not own a car or have a friend who has a car that they use some mode of public transportation.
7. We can assume that uber and lyft are forms of public transportation since they are accessible to the public and serve the same purpose as either a bus or taxi service.
8. We can assume that if a person lives on campus and does not own a bike or skateboard will walk to school.
9. We can assume that if a student does not own a bike lock and does not want to lease-a-lock, that they will not bike to campus.
10. We can assume that if a person does not own a parking pass and does not want to purchase a parking pass, they do not drive to campus.
11. We can assume that if a bike is not registered, they do not bike to campus. Since the registration is free, a student should have no issue with purchasing a bike registration.

**Solution Steps:**

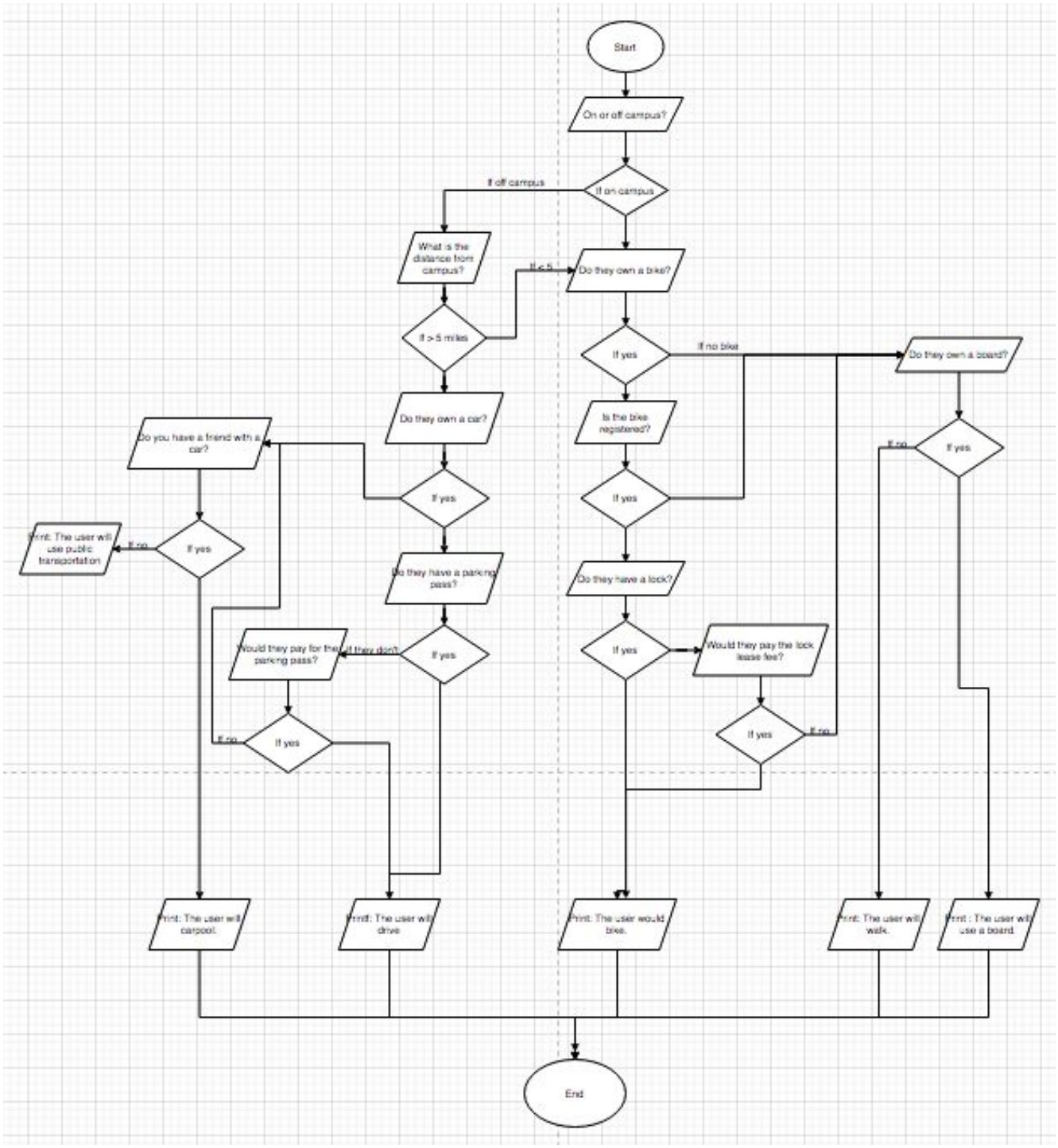
1. If a person lives on campus, then they do not drive to school. It is not logical to drive to campus if they already live on campus.
2. If a person lives off campus, then they will either drive, carpool, uber, or use public transportation. Since none of the other options make sense.
3. If a student lives on campus, then they will walk, bike, or skateboard. Everyone I know who lives on campus either walks, bikes, or skateboards, so everyone must do one of the three choices.

**Identify results and verifying accuracy:**

Prediction Results:
Student #1: Walk
Student #2: Walk
Student #3: Walk
Student #4: Bike
Student #5: Walk
Student #6: Walk
Student #7: Walk
Students 8-15: Need more information

- If we take student #1 from the data set, then we see that our model is correct in this case, since the student does not own a car, owns a bike but does not own a bike lock, does not want to pay the $35 fee, and does not own a skateboard. Our model would show the correct answer in this case.
- Out of the 15 students in the data set, we can correctly confirm 5 out of 7 students on campus. However, the off campus students require more information, most importantly how far away the students are from campus. We do believe that the distance from campus is a vital input to determine what type of transportation a student will use. With the information we can confirm, our accuracy is 71%.

Flowchart:


Start
On or off campus?
If off campus
If on campus
What is the distance from campus?
If < 5
Do they own a bike?
If > 5 miles
If yes
If no bike
Do they own a board?
Do they own a car?
Is the bike registered?
If no
If yes
Do you have a friend with a car?
If yes
If yes
Print: The user will use public transportation
If no
If yes
Do they have a parking pass?
Do they have a lock?
Would they pay for the if they don't parking pass?
If yes
If yes
Would they pay the lock lease fee?
If no
If yes
If no
If yes
Print: The user will carpool.
Print: The user will drive
Print: The user would bike.
Print: The user will walk.
Print : The user will use a board.
End