Team 14
Lab 3 Post-lab

1. Describe the results of your testing. For parameters that you specifically altered during your experiments, use charts or graphs to present the results of the testing. For example, if you tested how the speed of a mechanism affected how often pizzas fell, you might make a bar graph of success rate as a function of speed.

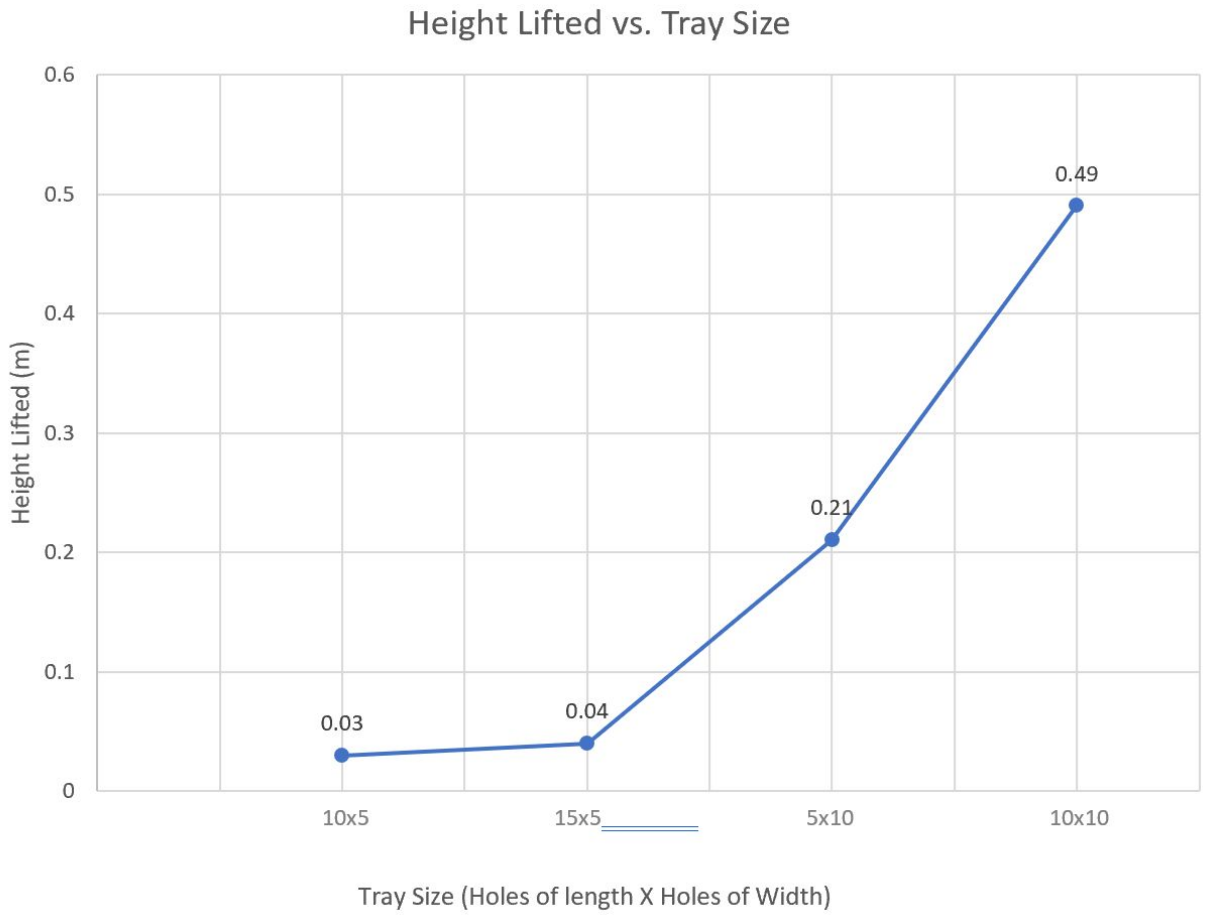
From our testing we have concluded that the pillars of the four bar needs to be redesigned, by adjusting the gearing, so that it is able to lift the load of the arms and claw. As a result we were unable to test the speed of the arm uptake, it's stability while lifting the pizza, and the efficiency of the mechanism. With that being said, we will make according adjustments to the four bar after we compute our gear calculations. We also tested the claw of the four bar to see whether it is the right size to pick up pizzas, whether it is able to handle the weight of the pizza, and the intake and output mechanism. Our preliminary tests revealed that the claw was not large enough nor was it stable enough to pick up the claw. After fixing these problems, our claw was able to take in the pizzas, hold them without dropping the pizzas, and release them without any issue. The claw was able to hold the pizzas without dropping it once. We also tested different intake speeds for the motor of the claw (by % of motor speed) as shown by the graph below.

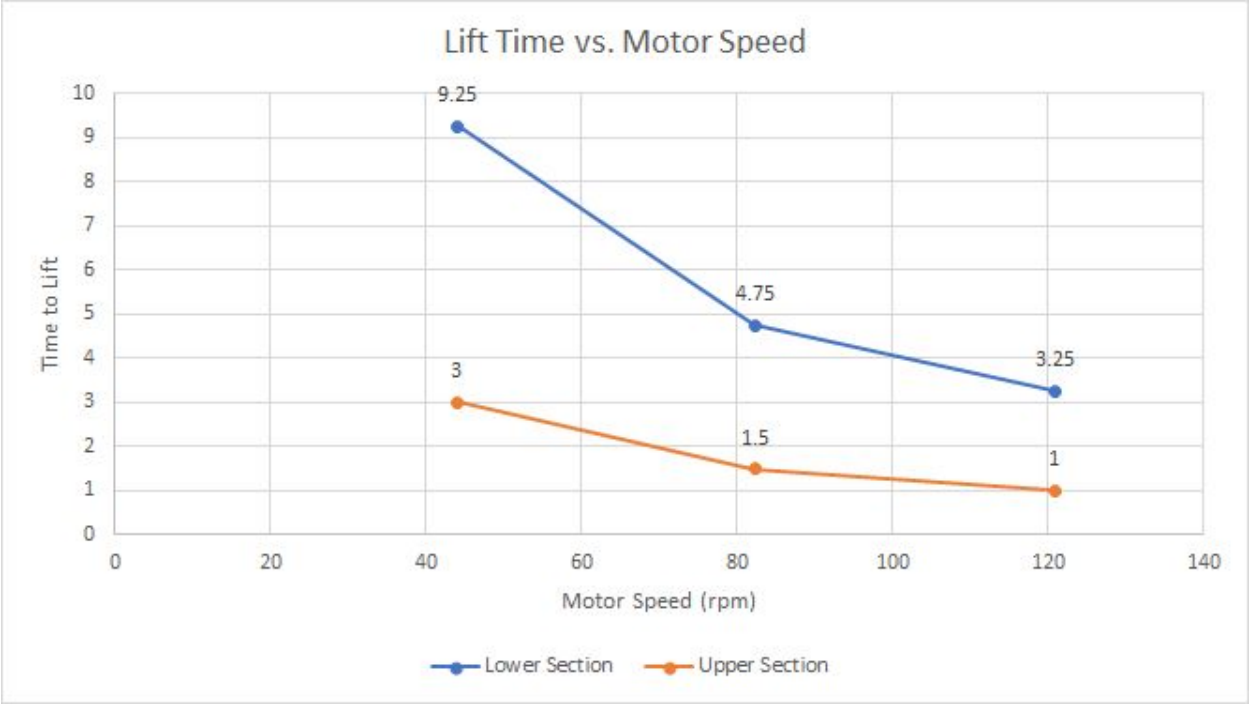
Four Bar Data:

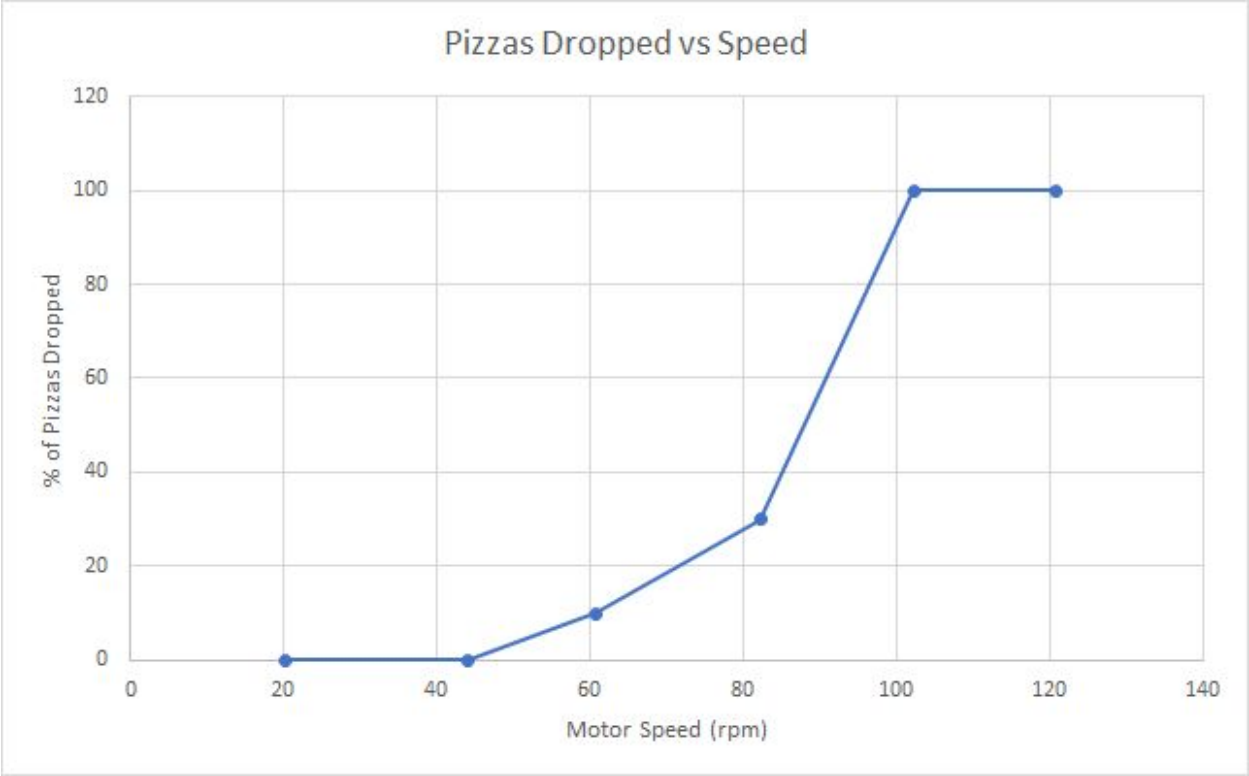
Intake Speed (%)	Did it take in the Pizza?	Output Speed (%)	Did it output the Pizza?
10	No	10	No
20	No	20	No
30	No	30	No
40	No	40	No
50	yes	50	yes
60	yes	60	yes
70	yes	70	yes
80	yes	80	yes
90	yes	90	yes
100	yes	100	yes

From our testing we concluded that the cascade lift is unable to perform ground pickup of the pizza, as the tray design is unable to reach the ground. In initial testing based on my original design of the tray, which used a 10x5 aluminum plate, the pizza was barely able to lift without falling off, so I had to test various tray sizes to find which was most capable of lifting pizzas as high as possible without dropping them. We also discovered that the gearing of the cascade must be altered so that the upper and lower sections can raise at the same time, lifting the pizza as quickly as possible. I was able to test the size of the tray needed to lift the pizza as high as possible. I also tested how long it took to raise the upper and lower sections of the lift at the current gearing, as well as the likelihood of a pizza to fall at these speeds.

Cascade Data:







2. Synthesize the lessons learned from your testing. Describe both objectively and subjectively which of your mechanisms is better suited to the problem at hand. Draw from the results in the previous step to identify the best set of parameters for operating your mechanism.

One lesson we learnt from testing both components was that gearing is a major part of building the robot. The gearing for the intake mechanism and the four bars were constantly being taken apart, switched out, and rearranged. The gearing gives the motors the ability to lift the arm and take in/epell the pizzas, so the ratios should be calculated appropriately. We found the ideal intake and output speed for the claw to be 60% speed, as it was able to take in the pizza without too much force or torque that the robot couldn't handle. Based on the results of our testing, we found that the ideal speed for the cascade lift was between 30 and 40%, or approximately 60 to 80 rpm, as at this speed the lift was able to raise in a very short amount of time while being being unlikely to drop the pizza. Objectively the intake mechanism with the rubber grippers work better for the problem at hand, as it is able to grab pizzas from the ground with ease and speed, a task the holding plate on the cascade lift is unable to do.

3. Make a clear recommendation for the next phase of your design. You might recommend the "clear winner" from your tests; you might continue to pursue both options; or it could be that you are not pleased with either mechanism and plan on pursuing another option. Explain your reasoning, including things you learned and questions that still need to be answered to be confident your mechanism will work.

The next phase of the four bar design would be to add more gears to be able to lift both the four bars and the claw. The motors are not able to lift the weight of the arm and the claw the way it is right now. We would also need to restructure the claw to grab the pizza, as the claw is not large enough. We also need to add a sensor, such a bump switch to make sure the pizza intake doesn't rotate too much so that the pizza falls out. Based on our tests, we are leaning towards the for bar, as it is able to pick up pizzas from the ground and the pickup slot, whereas the cascade lift is not able to pick up pizzas from the ground. In addition the four bar is able to easily expel the pizza by reversing the intake mechanism, where as the cascade lift does not have any way of expelling the pizza.

4. Describe what needs to be done to integrate your mechanism with your BaseBot. Be specific about mechanical and electrical connections (the electrical connections themselves are trivial – VEX is plug and play – but identify what sensors will be incorporated). Describe the control methods you will need to integrate the two.

The chassis needs to be made larger with the center of gravity at its center. The pillars for the four bar need to be screwed onto either side of the chassis, aligned with the center of gravity. This way the robot will be stabilized/balanced while moving and lifting the pizzas. The intake system will be in front of the base of the robot. The brain will be placed on the center of gravity. The motors on the intake system will be connected to ports 19 and 20 on the brain. The motors on the four bar pilar are connected to ports 1 and 2. A limit or bump switch would be useful for the intake system and be placed in the back of the claw. After the robot grabs the pizza, the pizza will hit the bump/limit switch and the intake system will stop rotating and hold the system. This makes sure the claw is able to hold/release the pizzas as intended.