

## 1.1 Written

1. Imagine that you are designing such an arm using two motors (one to control each link). Where would you place the motors and how would you transfer the rotation from the motor to the link? Explain your answer in two to three sentences. You could suggest mechanisms not found in the LEGO kits.

If we were building such an arm, we would place the first motor directly attached to the base joint and the first link (possibly with a gear reduction). For the second motor, we would consider placing it also in the base and connecting it to a tread / pulley system which would connect it through the arm to the second joint axle which would directly control the second link's rotation. This would be especially beneficial in this case because then the weight of the second motor would not be moving around with the movement of the arm (less inertial mass for the arm). There are LEGO compatible gear and chain (like a bike chain) components available for this.

2. Would you want a high or low gear ratio for each link? Explain your answer in one to two sentences.

We would want a low gear ratio (small driving gear, big driven gear) for each link to increase precision / accuracy of the arm position in sacrificing speed which is less important here.

3. Explain 2 design priorities for your robot that would be beneficial for doing this lab in the real world.

In the real world, a top design priority would be ensuring that the robot links are as lightweight as possible, so that gravity is not a major hindrance to performance and reduces the necessity for the motors to be as strong. Another design priority would be to minimize slippage between gears, as well as with the gears within the tread/pulley system, so that energy is not wasted as much during energy transfers.

Here is a nice picture of our generated configuration space:

