Robot Arm

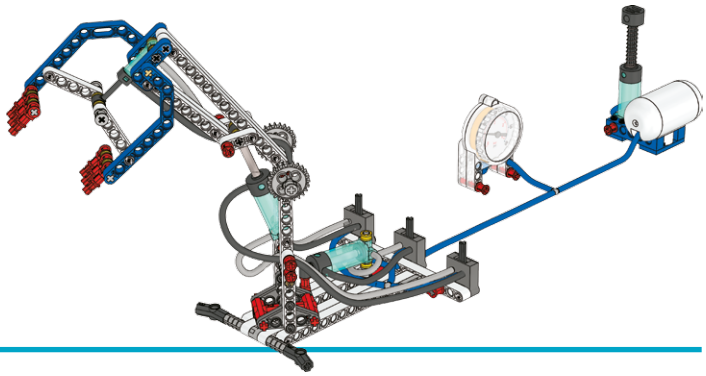
Name(s):

Build the robot arm and investigate how to make the most energy efficient sequence of strokes.

Build the Robot Arm

(All of book 4A and book 4B to page 19, step 19)

- Pump air into the system and use the manometer to detect whether there is an air leak.
- Try all valve settings and check all moving parts to ensure that they move freely.
- Turn the arm to its resting position: turned to the far right, arm up, and grippers open. Then, empty the air tank.



What is the most energy efficient sequence?

Find out which sequence is the most energy efficient for picking and placing objects.

First, predict which sequence of strokes is the most energy efficient at picking and placing a piece of paper. Your sequence must start in the resting position, use all six movements at least once, and then return to the resting position.

Then, test your sequence of strokes and note the loss of pressure after each stroke.
Start with about 36 PSI (or 2.5 bars of pressure).

Test several times to make sure your results are consistent.
Record your findings on graph paper.
Change the sequence of strokes. Test your new sequence to determine if it is more or less efficient.

Stroke	My Sequence
A	
B	
C	
D	
E	
F	
G	
H	

Explain your findings:

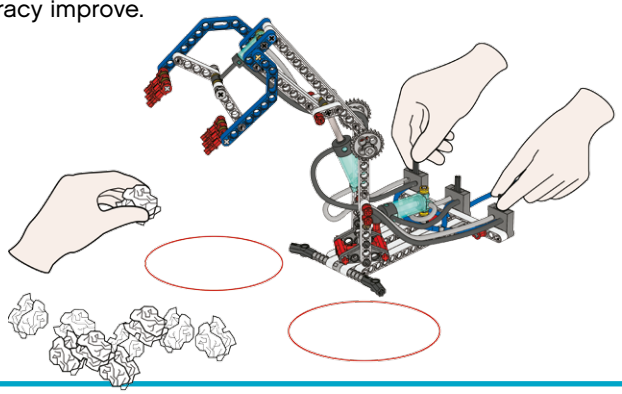
How good are you at operating the robot?

Find out how quickly and accurately you can pick and place pieces of paper from one circle to another circle.

First, predict how many pieces of paper you can accurately place inside the circle within 30 seconds.

Then, test how many pieces of paper you can accurately place inside the circle within 30 seconds.

Repeat the test three times to see if your speed and accuracy improve.



	My Prediction	My Findings
Test 1		
Test 2		
Test 3		

Optional: My Amazing Pneumatic !

Invent a new and useful machine that uses the same mechanisms as the robot arm but does a different job. Sketch it and explain the three most important features.

Optional: Further Research

Describe some of the industries and jobs for which the robot arm can be used and what some of its limitations may be.

Robot Arm

Name(s): _____ **Date:** _____

NGSS GOALS	 BRONZE	 SILVER	 GOLD	 PLATINUM
1. Student work related to this Crosscutting Concept: In this project, we tried different movement patterns for our robot arm in order to find the most energy efficient sequence.				
Patterns: Observed patterns in events guide organization and classification.	• We wrote down our sequence of steps to pick up and place an object with our robot arm. ☐	• We met Bronze. • We recorded our findings on graph paper. • We looked for patterns on our graph to help us find the parts of our sequence that lost the most pressure. ☐	• We created a graph of a new sequence. • We looked for patterns in our graph to find where most of the pressure was lost. • We determined which sequence was best. ☐	• We met Gold. • We used patterns in both graphs to propose a different sequence that even more efficient. ☐
2. Student work related to this Practice: In this project, we invented a sequence of steps to move our robot arm efficiently.				
Using mathematics and computational thinking: series of ordered steps) to solve a problem.	• We created a sequence of steps to pick up and place objects. ☐	• We met Bronze. • We tested our sequence several times to make sure the results are consistent. ☐	• We met Silver. • We created a second sequence to test. ☐	• We met Gold. • We identified which sequence was best and explained our findings on page one of our student worksheet. ☐
3. Student work related to this Practice: In this project, we developed a sequence of steps to move our robot arm quickly. We evaluated our idea and compared it with our classmates.				
Engaging in argument from evidence: Evaluate competing design solutions based on agreed-upon design criteria.	• We developed a sequence of steps to pick and place pieces of paper quickly from one circle to another. ☐	• We met Bronze. • We predicted how many pieces of paper our robot arm could pick and place in 30 seconds. ☐	• We met Silver. • We tested our prediction three times and recorded the results. ☐	• We met Gold. • We compared our results with our classmates and proposed a new sequence of steps to improve our own work. ☐
Notes:				