

KIBO Bin Ball

KIBO needs to make a basket to win the game! What is the right combination of movement and Free Throw options to land the ball in the basket?

Materials:

- KIBO-10 kit (or greater) per group, with wheels and motors inserted
- KIBO Free Throw Extension per group
 - Provide 3 rubber bands and one ball to each group
- KIBO bin (or recycle bin, basket, etc) positioned centrally
- Masking tape
- Data Collection Sheet per group



Preparation:

- Set up the throwing target. You could use your KIBO bin, a recycle bin, laundry basket, or similar. For each group, mark a different spot about 10 feet away from the basket (the starting point), and another spot about halfway in (the throwing line).
- Consider setting up roles for this activity: Programmer/Scanner, Free Throw Manager, and Data Recorder. Students can change roles during the activity.

Introduction:

- Demonstrate the operation of the Free Throw extension in a group setting. Engage the students in a discussion about the impact of the different settings they can change in this activity: the number of rubber bands, which affects the **power**; and the stopper position, which affects the **trajectory**.

Power: the amount of energy the system uses over time.

Trajectory: the path of travel of the ball.



Activity (individual or group work):

- The students’ goal will be to create a program to move their KIBO from the starting line to the throwing line, then throw their ball into the basket.
- They’ll record their choices on their data collection sheet. If their throw doesn’t go in, they’ll modify options and try again!

Note: You may wish to have the groups take turns rather than work simultaneously.

1. Each group chooses options for their throw attempt.
 - Create a program with a chosen number of Forward commands (optionally using Repeat), followed by the Throw command.
 - Choose Free Throw settings (number of bands, stopper position)
2. Record the choices on the data collection sheet.
3. Load the ball into the Free Throw and run the program.
4. Observe whether the ball landed in the basket, or went too far or too short. Record the results on the data collection sheet.
5. Repeat from Step 1, changing the options to improve the throw.

Discussion / Technology Circle:


- Have students share their findings in a Technology Circle. Ask the students: What did you change when KIBO threw too far or too short? What changed when you added or removed rubber bands, or when you changed the arm stopper position? How does KIBO’s movement (and starting position) affect the throw?

Standards Addressed:

NGSS (Engineering Design)	K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
NGSS (Forces and Interactions)	K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. 3-PS2-2. Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion.
NGSS (Energy)	4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
Common Core Math Standards	CCSS.MATH.CONTENT.K.MD.A.1: Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
CSTA K-12 CS Standards	1A-AP-11 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3.2)

KIBO Bin-Ball Data Collection Sheet



How many rubber bands?	Which arm Stopper?	How many 	Was you throw too far, too short, or in the basket?
1 2 3	1 2		Short IN! Long
1 2 3	1 2		Short IN! Long
1 2 3	1 2		Short IN! Long
1 2 3	1 2		Short IN! Long