

Ping Pong Pickup Challenge

Name: _____

Instructions

Date: _____

Overview: In this contest, you will try to build a tool that can retrieve a ping pong ball from as far away as possible. Your final score depends on how far away the ball is and the amount of materials you use. Watch this video to learn about the project:

<https://sbgo.org/sciencebuddies-engineering-challenge-2023-video>

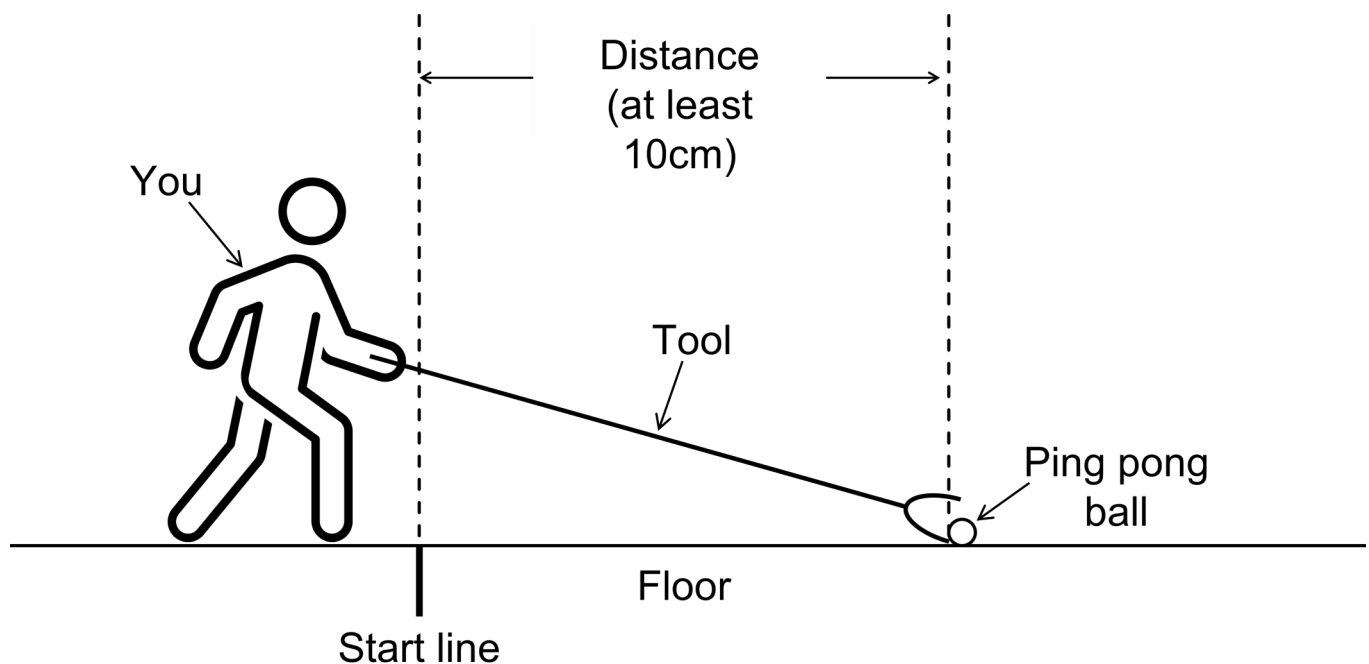
Materials

You can only use the materials described in the video to build your tool. You can use scissors, a ruler, a tape measure or meterstick, and a pencil as you build and test your tool.

Scoring

Your score is calculated using this equation:

$$\text{Score} = (\text{distance in centimeters}) - (\text{material points cost})$$



Rules

1. The ball and the start line must both be on the floor.
2. The ball must start a minimum of 10 cm from the start line. After that, you can increase the distance for subsequent trials.
3. The ball must be placed directly on the floor. You can place a small square of tape around the ball to prevent it from rolling away and make it easier to know where to place the ball during trials.
4. The ball cannot be modified in any way.
5. The device must be portable. It cannot be taped or otherwise anchored to the ground or another surface like a piece of furniture.
6. Only one person can operate the device during a trial. It does not have to be the same team member for each trial.
7. No part of your body can cross the start line at any point.
8. The ball cannot touch any surfaces or objects other than the floor and your device.
9. After the ball has been picked up, no part of the device or the ball can touch the ground or any other surface (walls, furniture, etc.) *in front of* the start line. The device and/or ball may touch the ground *behind* the start line.
10. The ball must remain in contact with your device and cannot become airborne at any point while it is still in front of the start line.
11. You cannot touch the ball directly at any point once the trial has started, even after you have brought it back behind the start line.
12. For a successful trial, the ball must be picked up, brought back behind the start line, and placed on the floor.
13. Nothing can remain stuck or attached to the ball after it has been deposited behind the start line.

Directions: Fill out this worksheet as you work on your project.

1. **Design.** Use this page to draw design ideas for two different tools. Use the back of the page if you need more space.

2. **Compare.** Compare your two designs. Which one do you think will score higher in the contest? Why? Write down your answer.

3. **Share.** If you are working in a group, share your ideas with others. Talk about which tools will do the best in the contest. Decide as a group what kind of tool you will build. You can combine ideas from different people to make a single tool.
4. **Build.** Once you have decided on a design, build your tool. You might need to make some changes as you build. That is OK.
5. **Test.** Test your tool by trying to pick up the ping pong ball from a distance. Write your answers to these questions after you test it.
 - a. Did your tool work like you thought it would?

 - b. Did you have any problems when testing your tool, like dropping the ball or accidentally touching the floor? If so, why do you think this happened?

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6. **Iterate.** Your tool probably did not work perfectly on the first try. That's OK! You might need to repair or improve it and try again. Based on your observations in step 5, what changes could you make to your tool to improve it?
7. **Test again.** Once you have repaired or improved your tool, test it again. You can keep improving it as much as you want (as long as you have time).
8. **Final design.**
 - a. What works well about your final design?
 - b. What could you improve if you had more time to work on your tool?

9. Find your score.

- a. Write down the longest distance from which you could retrieve the ping pong ball. This distance is measured from the start line to the closest side of the ball in centimeters.

_____ cm

- b. Calculate your material points cost.

- Write down the quantity of each material used in your final design in the Quantity column.
- For each material, multiply the quantity by the number in the Point Value column. Write the result in the Subtotal column.
- Add up the numbers in the Subtotal column and write down your total material points cost.

Material	Quantity	× Point Value (each)	= Subtotal
Paper (number of sheets, rounded up to nearest whole sheet)		× 5	
Paper clips		× 1	
String (length, rounded up to the nearest 50 centimeters)		× 1	
Total material points cost			

- c. Use this equation to find your final score.

$$\underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

distance in centimeters material points cost final score