



PAPER DRAG RACER

ASSEMBLY INSTRUCTIONS

PURPOSE

- The purpose of these instructions is to instruct highschool students how to assemble a paper drag racer. The paper drag racer is part of a lab assignment intended to help students understand the principles of constant acceleration in a way that is interactive, fun, and hands-on. After the drag racers have been assembled, the students will be able to gain further understanding of these concepts by creatively modifying their designs and experimenting with their own ideas.



CONSTANT ACCELERATION

When an object's velocity changes by the same amount every second.

Constant acceleration is a result of different forces that we experience daily such as gravity.



MATERIALS AND WARNINGS



1. Metal Axles (2)
2. Straws (2)
3. Paper Clips (2)
4. 8.5x11 piece of paper (1)
5. Clear packing tape
6. Scissors
7. Glue stick
8. Wheels (4)
9. Bottle Cap
10. Paper Wheel Wells (2)
11. Sticky note
12. Rolling tube
13. Cutting board
14. Hot glue gun
15. Hammer



Warnings: The hot glue gun will be HOT. Use caution during the gluing steps to not burn yourself. Be careful using the hammer because it is heavy!

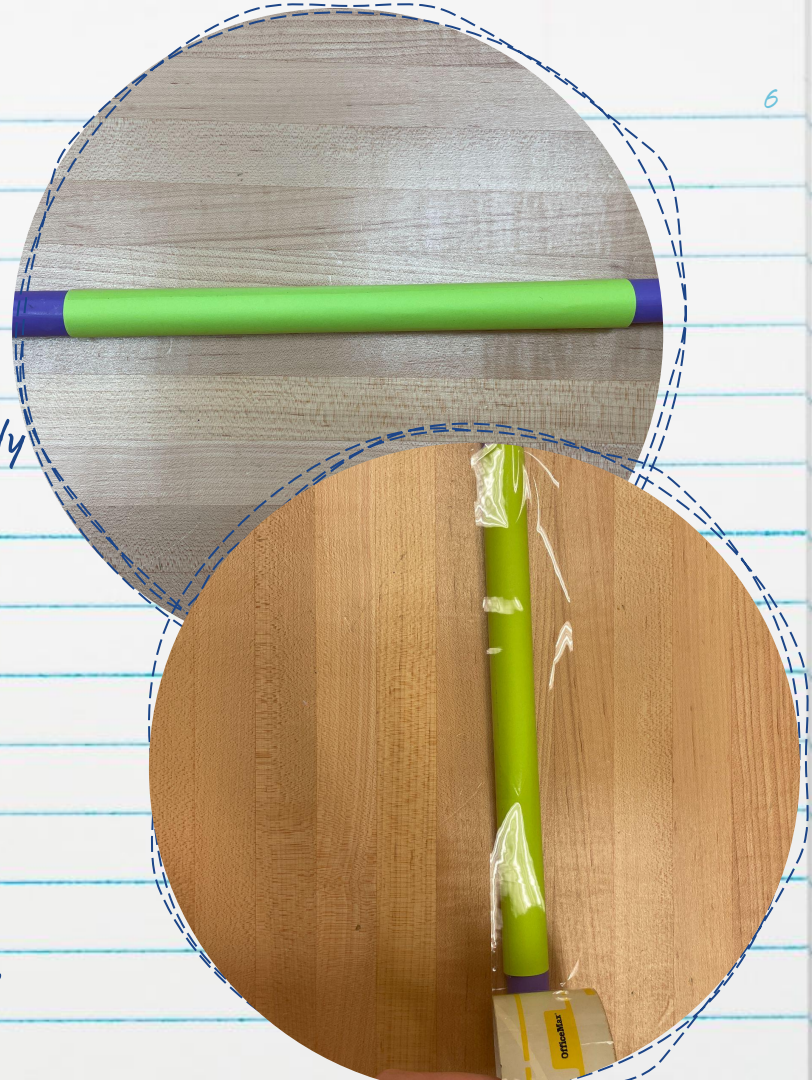
STEP 1: GATHER AND PREP MATERIALS

- *Gather all materials.*
- *Make sure your hot glue gun is plugged in and heating up. The light should glow red if the glue gun is heating.*



STEP 2: CONSTRUCT MAIN BODY OF CAR

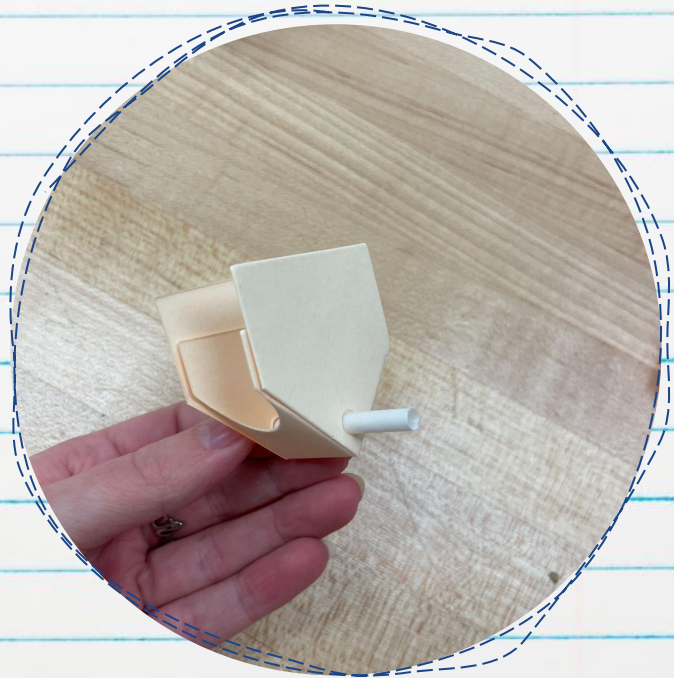
- Choose a piece of paper for main body of the car.
- Use a rolling tube to roll the piece of paper long-ways into a tight, long tube. Don't tape paper to the rolling tube.
- Tape the entire length of the car to secure the paper.
- Do not remove the tube in this step!



CONSTRUCTING TWO PAPER WHEEL WELLS

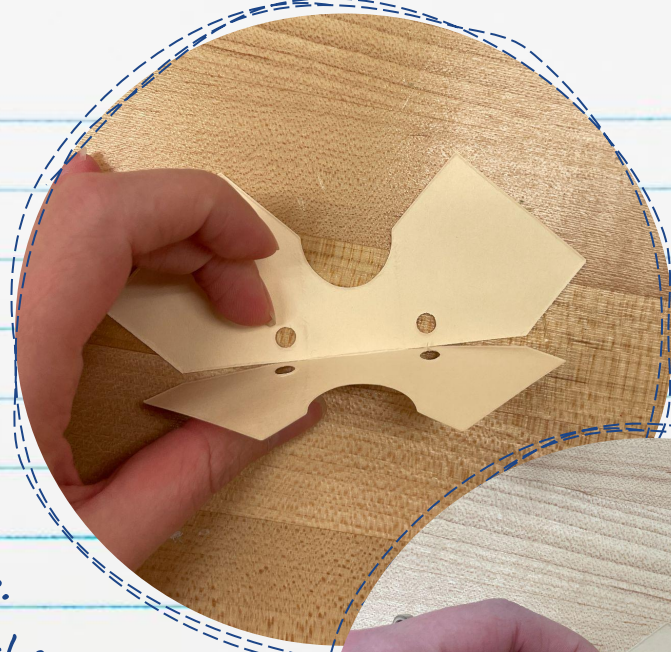
*The next few steps provide information on how to fold and glue both paper wheel wells. After step 7, you should have **two** assembled wheel wells.*

Wheel wells are the part of the car that connects the axle and wheels to the body of the car.



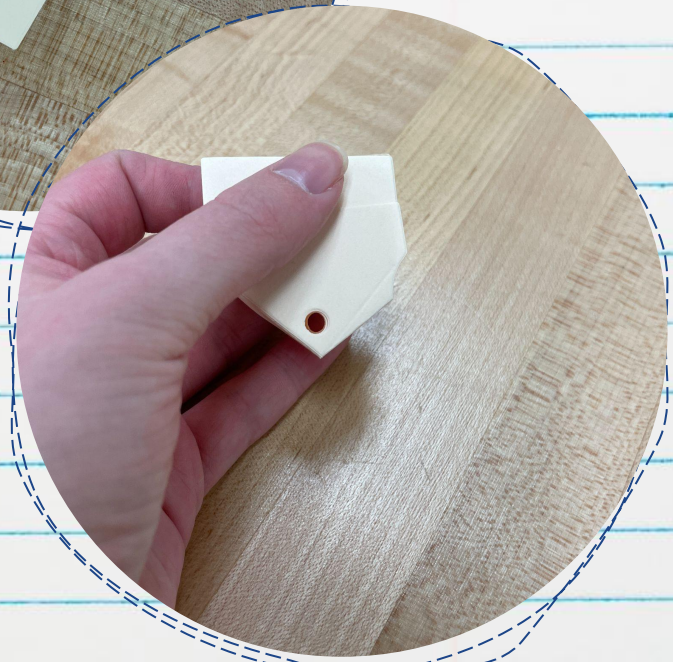
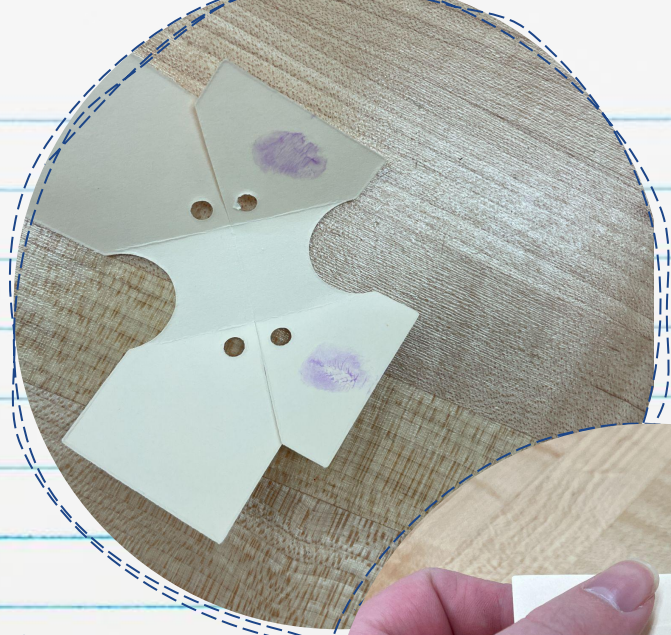
STEP 3: FOLD THE WHEEL WELLS

- *Fold wheel well in half longways along the creases.*
- *Fold each little flap along the crease lines.*
- *Repeat for the second wheel well.*



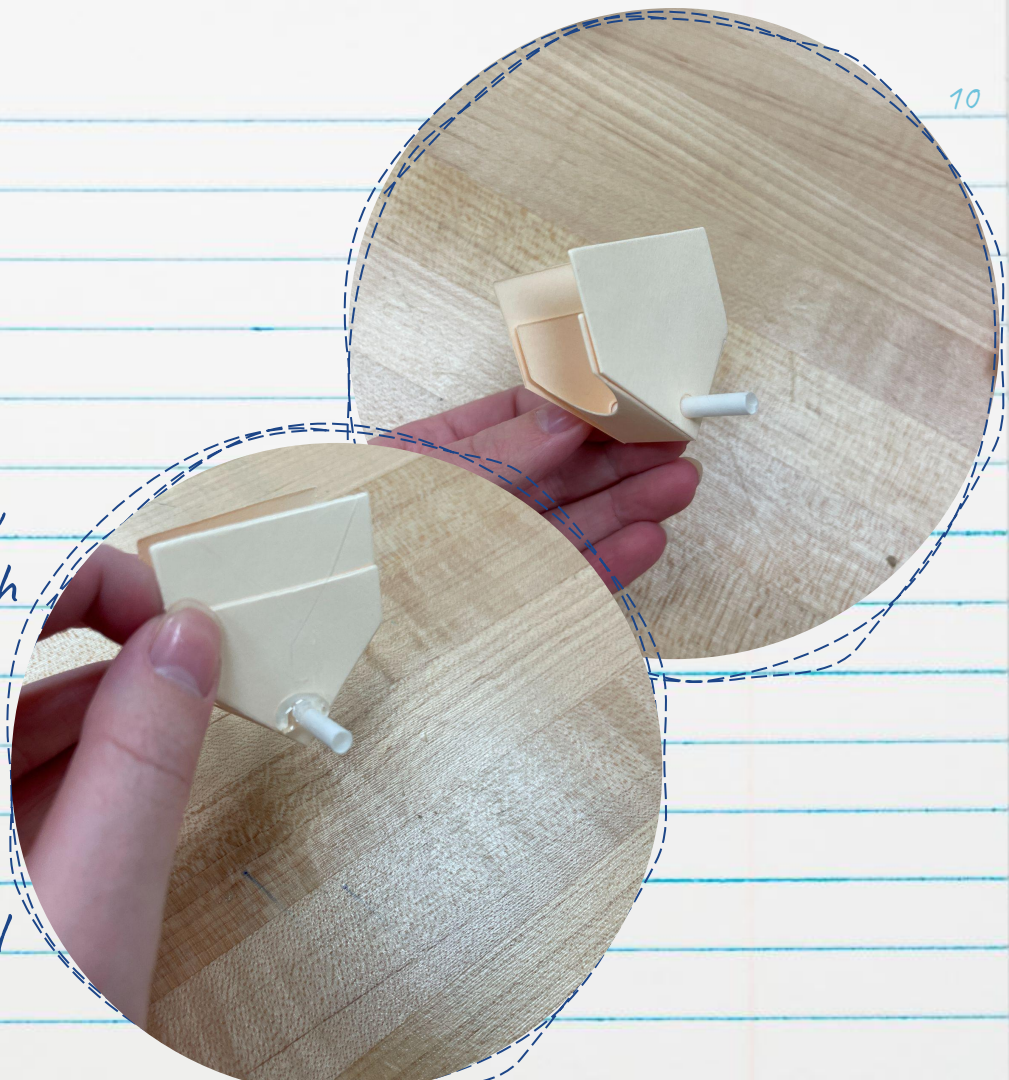
STEP 4: GLUE

- Add glue to the smaller "wings" of the wells.
- Adhere them to the outside of the big wings.
- Pinch them together until the glue dries.
- Repeat for the second wheel well.



STEP 5: ADD STRAW

- Take one of the white straw pieces and thread it through the holes on the well.
- Hot glue the straws to the well as shown in the pictures.
- Repeat for the second wheel well.



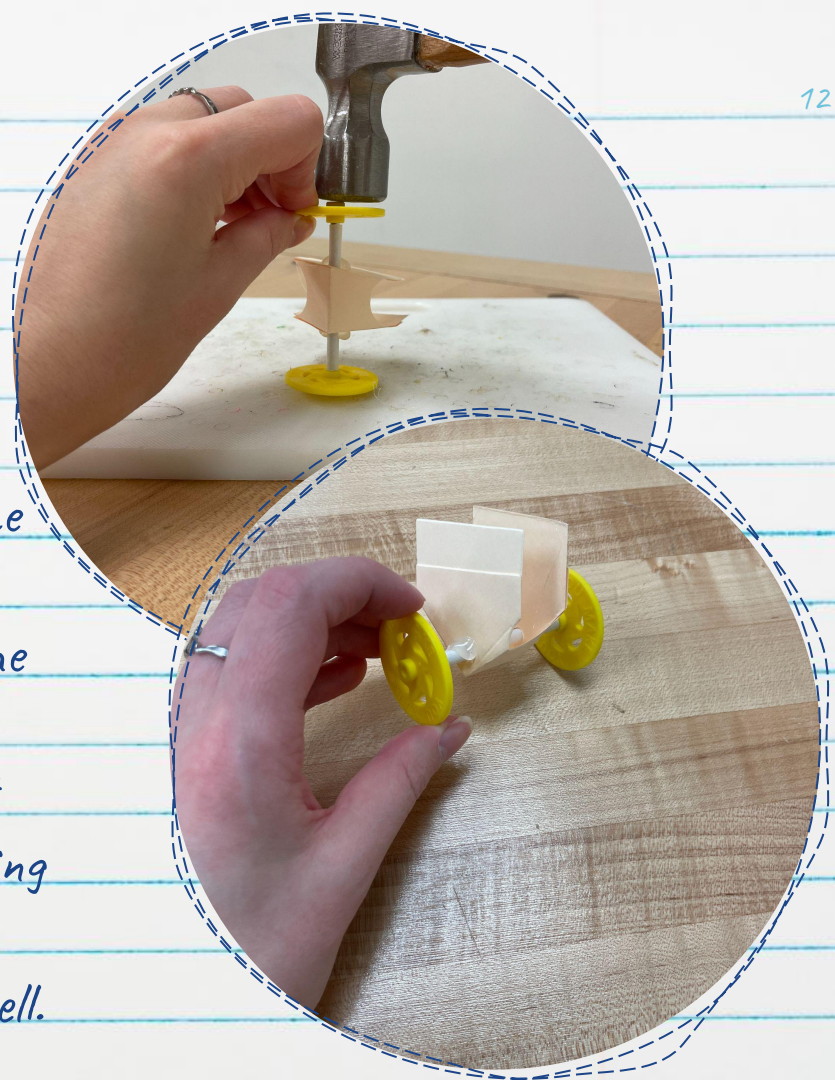
STEP 6: ATTACH FIRST WHEELS TO THE AXLES

- Take two of the metal axles and hammer **one** wheel onto each of them.
- Do this step on the cutting board to avoid damaging your work surface.
- You should now have two axles with only one wheel attached.



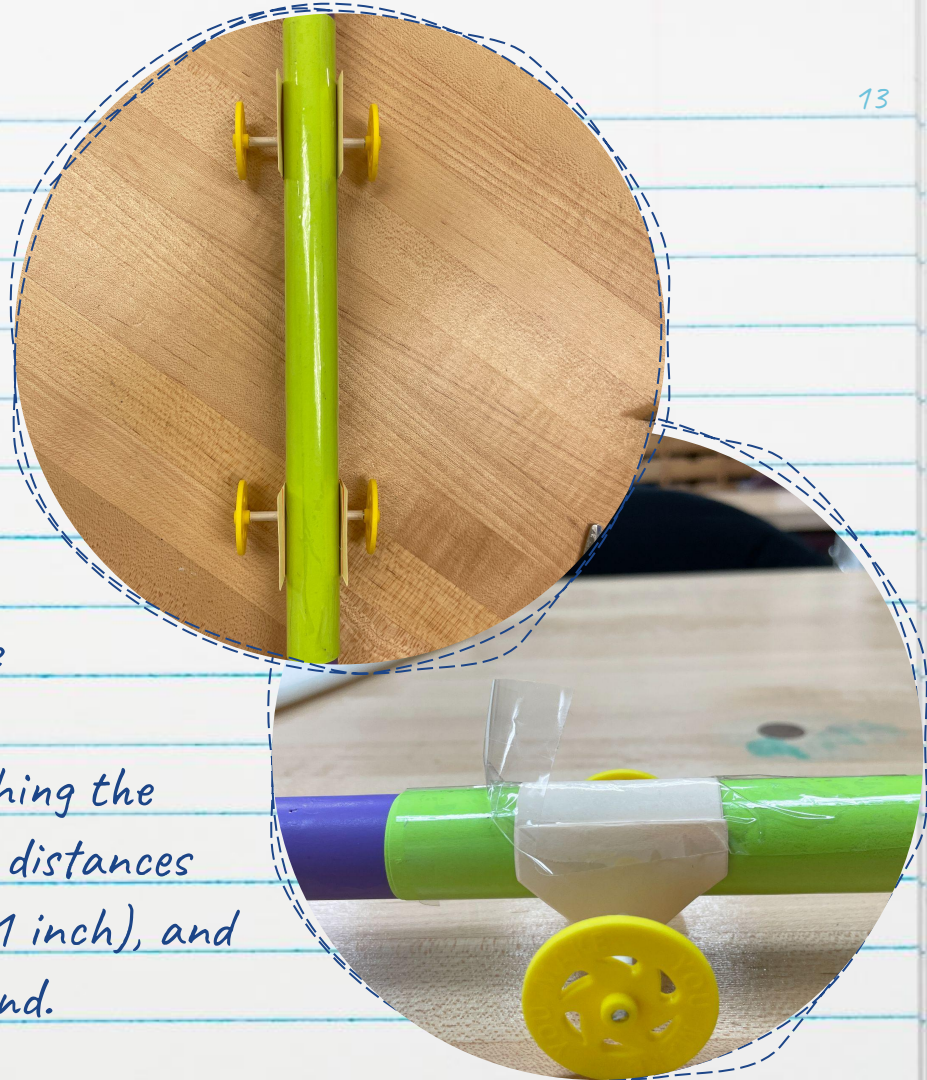
STEP 7: INSERT AXLES AND SECURE REMAINING WHEELS

- *Thread the metal axle through the straw in the wheel well.*
- *Hammer on the other wheel to the open side of the axle.*
- *Ensure that your wheels are not pinching the straw by gently pulling apart if necessary.*
- *Repeat for the second axle and well.*



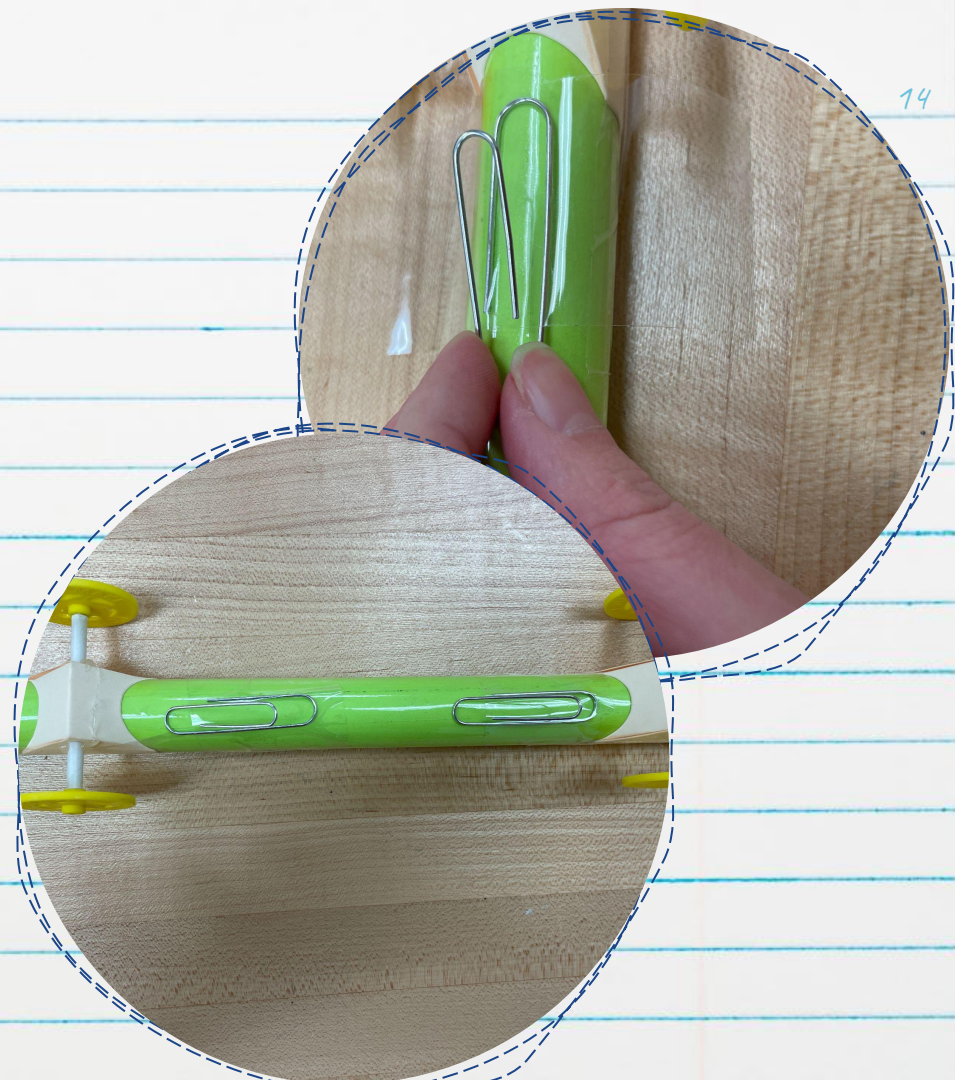
STEP 8: ATTACH THE WHEEL WELLS

- Tape the wheel wells onto the car by wrapping the loose ends around the top of the tube and taping it flush against the body of the car, making sure the tape adheres to the body of the car.
- Ensure that all wheels are touching the ground, that the wells are equal distances from each end of the car ($\frac{1}{2}$ - 1 inch), and that the wells cannot slide around.

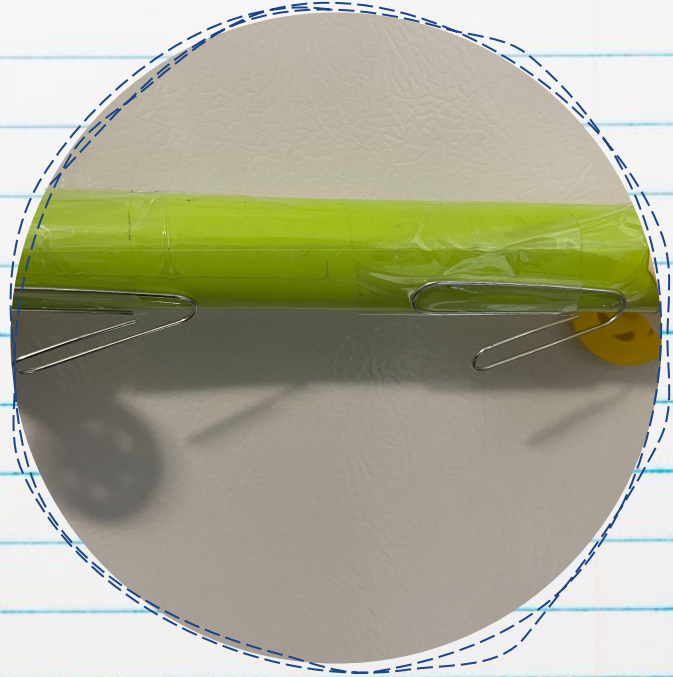


STEP 9: ADD THE PAPER CLIPS

- Flip the car over so that the wheel wells are facing upward.
- Take the paper clips and bend the middle portion up.
- Tape the larger loop of the paper clip to the bottom of the car.
- The paper clips should be oriented longways along with the tube and pointed towards the front of the car.

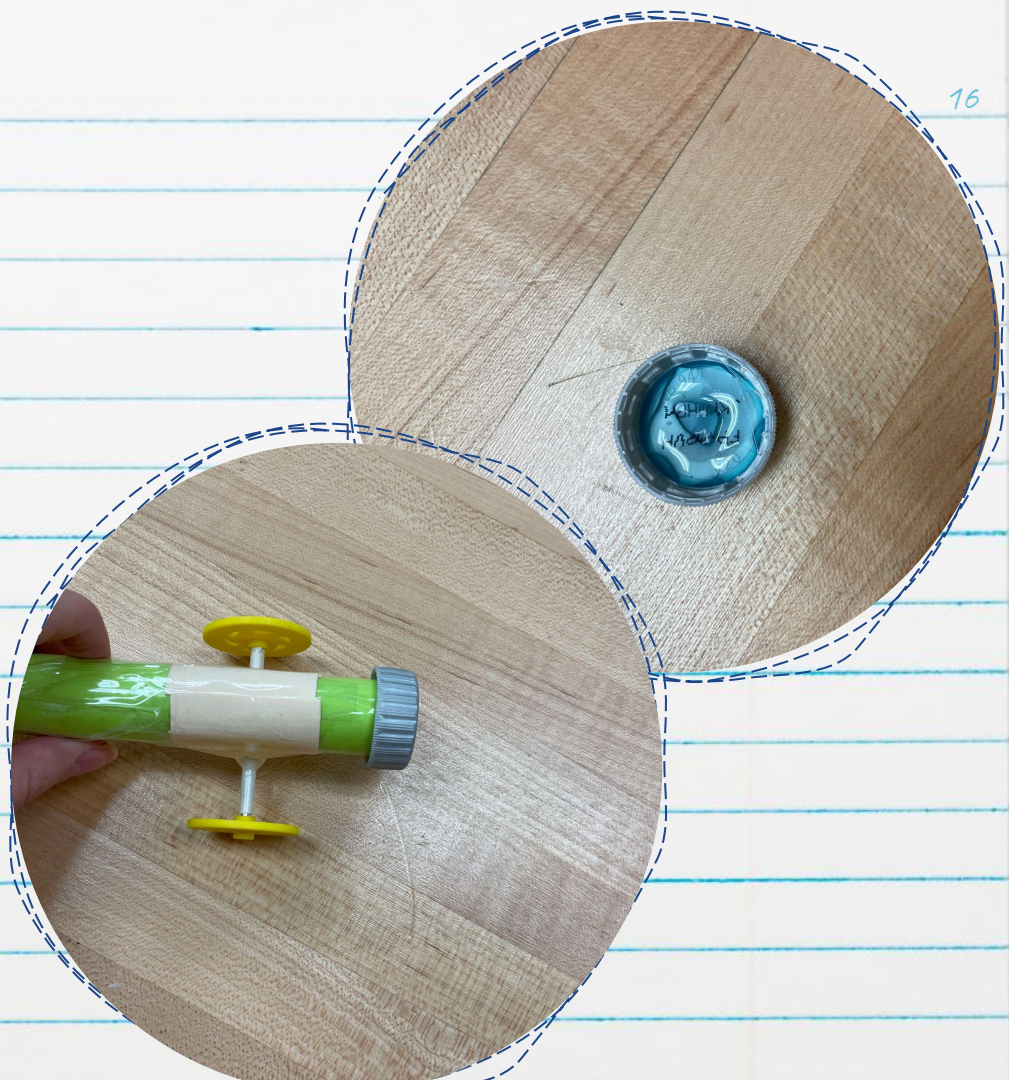


Note: Make sure there is an opening between through the middle of the paper clip so we can thread the car onto the launching assembly.



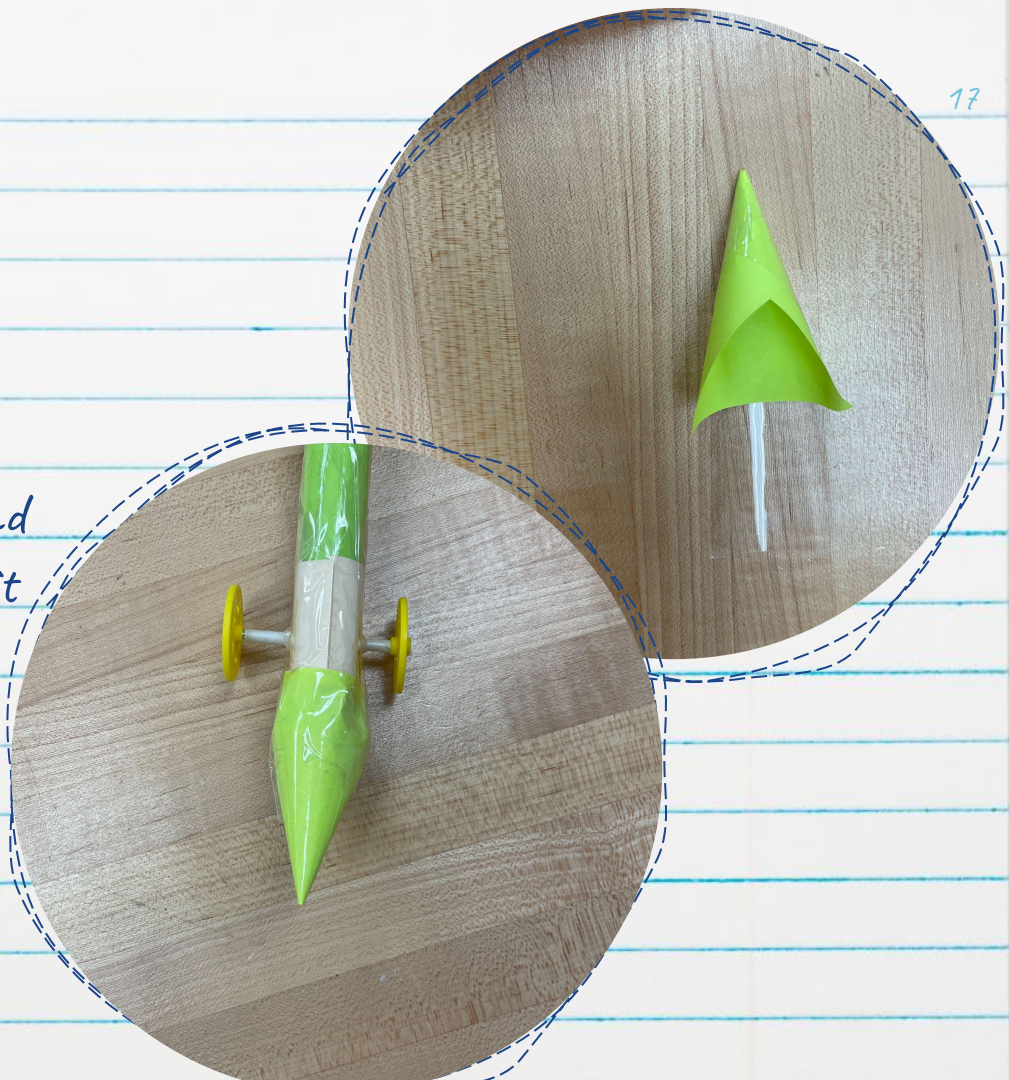
STEP 10: ADD THE BOTTLE CAP

- Remove the tube from the inside of the car.
- Liberally apply hot glue to the underside of the bottle cap.
- Fit the bottle cap onto the end of the car so that the top of the cap is pressed firmly against the opening.



STEP 10: CREATE A NOSE CONE

Optional: Take a sticky note and roll it into a cone shape. Tape it on top of the bottle cap.



CONGRATULATIONS!

This is what your completed paper drag racer should look like. Talk to your teacher to launch your drag racer.

