Mrs. Summers WIND CAR CHALLENGE!

Goal: Design and build a wind car propelled by a fan will move at least 10 feet forward in a fairly straight direction with all wheels on the ground in 3 competition trials. Wheels MUST turn- they cannot drag and they must remain in contact with the ground at all times. Car cannot "fly". The wind car that moves the farthest distance is the winner.
Racetrack must be flat, clear. Place car one foot in front of box fan. Use medium setting for fan.

Build & Test! Official Wind Car Challenge will be held on May 20, 2026. The winner from each class will compete for the grand prize of $10 for each final winning team member. The playoff will be May 21.
First prototype EVERYONE uses the same materials. The 2nd prototype can have parts replaced with approval from the teacher.

Constraints:

- You may use any approved materials for body of car, axles, wheels, mast and sail. ALL Cars must be assembled by YOU in class- NOTHING store-bought.
- Overall car must be 12 inches long or under and 12 inches wide or under. **No less than 6 inches.**
- Mast cannot be over 18 inches tall from ground to top.
- Body/car platform can be made of cardboard or a box like a toothpaste or cereal box.
- Wheels can be made of cardboard, or approved material from home that wasn't originally a wheel to begin with.
- Axles: I suggest 2 straws, and wooden sticks (like bamboo barbecue skewers) to cut into two axles.
- Mast (for sail support) Use another wooden stick to use to assemble the mast, or other materials.
- Sail: I suggest a Wal-Mart bag or provide your own sail- whatever approved material you choose.

Background information: Newton's Laws

1st Law of Motion: An object at rest will remain at rest and an object in motion will remain in motion at the same speed and in the same direction UNLESS an unbalanced force acts upon it.
The air moving forward from the fan is an unbalanced force pushing against the sail. The friction of the wheels against the floor creates drag- a force in the opposite direction that slows and eventually stops the car. Wheels need traction- the resistance caused by the mass of the car pushing against the floor in order to turn on the floor. Wheels that can't push against the floor and turn will not have traction. Misaligned axles, uneven wheels and uneven friction will change the speed and/or direction of the motion of the car.

2nd Law of Motion: Force in newtons = Mass in kg x Acceleration in m/s^2
The more mass an object has, the more force is needed to accelerate it.
The less mass, the greater the acceleration of the car. It takes less force to move a lighter car.
However, too little mass will not keep the car's wheels on the ground when moving air hits the sail. More mass can add traction to your wheels and momentum to your car's motion. Momentum is the force that keeps an object moving after it has started.

3rd Law of Motion: For every action, there is an equal but opposite reaction.
The fan blades move the air forward, pushing it against the sail. The sail pushes backward on the air with equal force, transferring the energy forward to the wheels in the opposite direction. Friction and traction involves opposite forces that change the direction and/or motion of the car.

Engineering Design Process

Researching and answering questions will help you create the design plan created on diagrams showing how parts will be assembled.

ASK: Does the size or shape of the car make a difference?
What size and shape would work best?
Does the size of the wheels make a difference?
How large should the wheels be?
What will affect the traction of the wheels?
How far from the car frame should the wheels be placed?
Does the position of the axles on the car frame make a difference?
What shape and size should the sail be?
How can the mast be assembled and attached to the car so that it supports the sail sturdily?

IMAGINE: Research Notes and brainstorming ideas for designs.

PLAN: Diagrams showing size, shape, and placement of wind car parts.

CREATE: Use your design plan to build the car. Test the car at least three times and record your data. Did the wheels turn? Did your sail work? Is your car design sturdy and stable? Did your car move in a fairly straight line? How far did it move?

IMPROVE: If your design isn't working, analyze the problems to come up with new solutions. Add your new ideas to show how you tweaked the design. Rebuild and test the car 3 times again. Make sure your car can produce consistent results. Continue tweaking the design so that each trial shows improvement.

Common problems:

Wheels do not turn.

Put wooden stick through straw so that stick (axle) can spin freely. Mount wheels on either end of wooden sticks. Then, attach straws, NOT the sticks, to the car frame.

Wheels lean or wobble when they turn or do not turn properly.

Axle is not placed in the exact center of the wheels. Wheels are not perfectly round or aligned straight forward. Wheels may not have enough traction.

Car doesn't go straight.

Wheels are not the same size. Mass of car body is not balanced. Sail or mast is not centered or balanced on car. One or more wheels is rubbing against the car body.

Mast keeps collapsing.

Sail frame needs stronger support or more spars to hold sail in place. Sail may be too big for car.

Car doesn't go very far.

Car may be too heavy; too much mass. Sail may not catch wind effectively. Wheels may be shifting position as car moves.

IMAGINE: Research Notes: LOOK at the questions from the ASK step!

Different ideas for Windcar Design

Consensus on windcar design: Which design?

Plan: Draw SIZE shape, placement of windcar parts MEASUREMENTS MUST BE SHOWN IN inches not centimeters.

Create: TEST first prototype car data

trial 1	trial 2	trial 3	trial 4	trial 5

Observations and changes to prototype 1

Improve: TWEAK your design. ALL changes must be recorded here and WHY you made those changes ALL replaced parts MUST be approved by the teacher.

Improved prototype data

trial 1									