

Pumpkin Derby Car STEM Challenge

Design and build your Pumpkin Derby Car and bring it to the farm for the Contest and Race on October 25. Participants should arrive by 1 pm. Race at 2 pm.

To participate in this STEM Challenge please email Cindi Hughes for more details - info@heritagecreekfarmcamp.com.

STEM CHALLENGE - To build a Derby Car with two independent axles using a pumpkin.

Design and Build your Pumpkin Derby Car to meet the following criteria:

1. Overall Design - A well-balanced, functional, and visually cohesive structure
2. Distance of Travel - Maximized rolling distance through efficient engineering
3. Innovation - Unique and create engineering features
4. Artist Appeal - Eye-catching, creative, and aesthetically pleasing design
5. Name - pick a name based upon the theme for your "pumpkin racer".

STEM Challenge Age Categories:

1. Lower Elementary (Ages 6-9) with help from adults
2. Upper Elementary & Middle School (Ages 10-14)
3. Ages 15+

Pumpkin Derby Car Rules

- Race Cars must be constructed using a pumpkin. Pumpkin weight limit: 20 lbs.
- Pumpkins may be carved or used whole. TIP: Pumpkins should not be carved or drilled too early to prevent rotting.
- While the pumpkin may be hollowed out, it must retain its shape. TIP: Pumpkin car should be kept as cool as possible prior to check-in.
- All types and sized wheels may be used.
- The axles must penetrate the pumpkin and support it. TIP: Race Cars with perfectly parallel axles will have a better chance of traveling straight down the track.
- Race Cars must be powered by gravity and the slope of the track. No fans, batteries, motor, rockets, etc. allowed, and no pushing of Race Cars
- The use of a solid base with affixed wheels is prohibited - this includes skateboards, roller skates, Tonka trucks and/or other similar bases.

Engineers always test their designs. Prior to the Pumpkin Derby Race at the farm, make sure to test run your car, troubleshoot and make any adjustments to design if necessary. Bring extra supplies to the farm in case your car needs repaired. We will be using a steep driveway for the race!

Pumpkin Derby Additional Resources & Vocabulary

Simple Machines

- Pulley
- Wedge
- Inclined Plane
- Lever
- Screw
- Wheel & Axle

Simple machines make our work easier and help people work “smarter, not harder”. They have few or no moving parts and work by changing the direction of force or the amount of force needed to complete a task.

Our budding engineers will be using the wheel and axle in their Pumpkin Derby Car Project. The wheel and axle are used to reduce friction.

What is Friction?

The force felt between two surfaces when one attempts to slide or roll one against the other. Friction always acts to slow things down or even stop the motion of an object. In the pumpkin derby race the friction will be between the car's wheels and the ramp or pavement in which the car is traveling.

You will want your derby car to be designed in a way that it gains momentum as it travels. Momentum is the force gained by the pumpkin derby car as it travels down the ramp or inclined pavement.

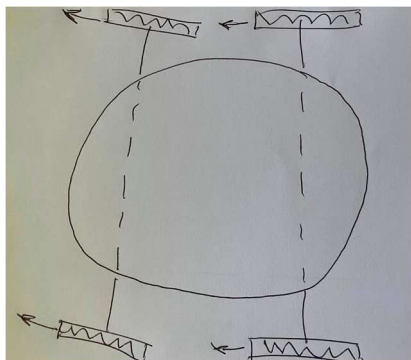
The theory of inertia states a body in motion tends to stay in motion. Newton's first law states that every object will remain at rest or in uniform motion in a straight line unless it is changed by external force. Isaac Newton was one of the world's great scientists that explained the laws of motion and gravitation.

Acceleration is the ability for an object to gain speed within a short distance and time.

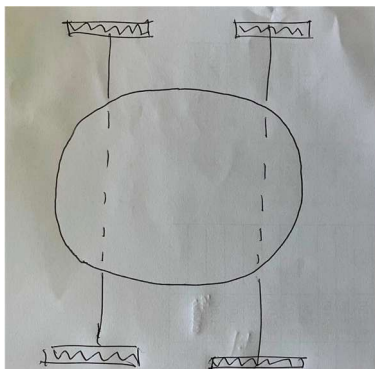
Deceleration is the act of slowing down or reducing the speed of something. The deceleration of your pumpkin derby car is caused by friction.

Tips for building a fast pumpkin derby car:

1. Determine any source of friction
2. Make sure axles and wheels are lubricated and moving freely
3. Test your pumpkin derby car to make sure it rolls straight. The axles need to be as parallel as possible.



An example of axles not be parallel



An example of axles being parallel

Pumpkin Derby Car Entry Form

In addition to filling out this form, please make a name card for your pumpkin car.

Participant's Name: _____ Age: _____

Car's Name: _____ School _____

STEM Challenge Age Categories (circle age category)

1. Lower Elementary (Ages 6-9) with help from adults
2. Upper Elementary & Middle School (Ages 10-14)
3. Ages 15+

Pit Stop: Reflection Questions for Participants ages 10+

Please answer the following questions in a few sentences on a separate piece of paper.

1. What challenges did you face during this STEM challenge and building process and how did you overcome them?
2. What are you most proud of in your final design?
3. If you could redesign your car, what would you do differently and why?
4. Which skills or lessons from this STEM challenge do you think will help you in the future?

This section is for Judges only.

Pumpkin Derby Car Judging Rubric - For Participants Ages 10+

Category	5 - Excellent	4 - Good	3 - Satisfactory	2 - Needs Improvement	1 - Limited
1. Overall Design	Car is structurally sound, well-balanced, and carefully constructed	Minor flaws; mostly well-assembled and balanced.	Functional design but lacks polish or balance.	Unstable or awkward design; assembly issues.	Poorly constructed; falls apart or fails to function.
2. Distance of Travel	Car travels a long distance smoothly and straight.	Travels a good distance with slight veering or resistance.	Average distance; may wobble or slow prematurely.	Short travel distance; struggles to roll properly.	Barely moves or does not travel at all.
3. Innovation	Features highly creative or original engineering elements.	Some creative features or unique concepts present.	One or two basic creative elements.	Limited creativity; mostly conventional design.	No signs of innovation; very basic or copied design.
4. Artistic Appeal	Design is visually striking, themed, and well-executed.	Strong artistic effort with attention to detail.	Shows artistic intent; design is somewhat appealing.	Minimal artistic effort; lacks cohesion or detail.	No artistic features; design appears rushed or unfinished.
5. Reflection Questions	Answers are clear, thoughtful, complete, and strongly connected to the STEM challenge.	Answers are mostly clear and detailed with good reflection and connection to the STEM challenge.	Answers are basic and address questions but lack depth or full detail.	Answers are incomplete or unclear with limited reflection or connection to the STEM challenge.	Answers are minimal, confusing, or off-topic with little to no reflection.