Using Student Engineered Carnival Rides

to Investigate the Laws of Motion within Systems

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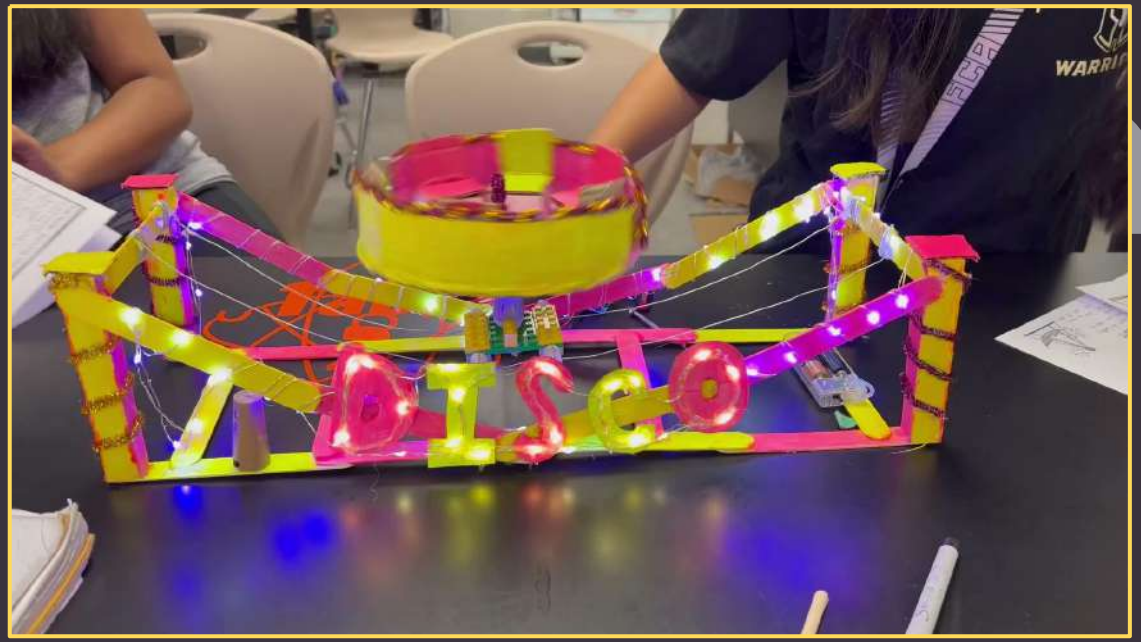
Why Carnival Rides?

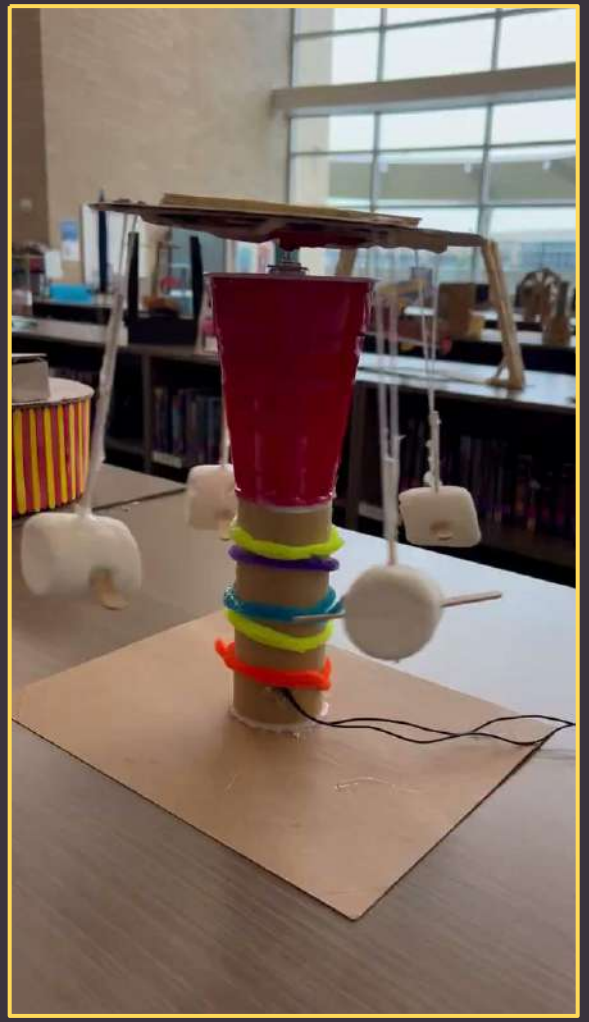
- Building carnival rides is a great way to start the year in a fun, hands-on, creative way.
- With our new TEK for Newton's Laws that now includes systems, amusement park rides demonstrate systems well.
- Students realize very quickly that to get their ride (system) to function all the parts have to come together as a whole.
- Students are required to demonstrate and discuss all of Newton's Laws as they see them in their rides.

Here are some examples from our students this year!


Spinning Schwartz
LINE STARTS HERE


MONKEY MANIA!!


DISCO




EVOLUTION


PSI
BALLOONS
Gardetto's
LEAN BODY

Agenda

- TEKS Shifts
- Engineering Design
- What is a system?
- Roll out
- Digital Organization
- Build Time

TEKS Shifts

Previous

8.6	Force, motion, and energy. The student ~~knows that there is a~~ relationship between force, motion, ~~and energy~~. The student is expected to:
8.6.A	~~demonstrate and~~ calculate how ~~unbalanced forces change the speed or direction of~~ an object's motion;
8.6.C	investigate and describe ~~applications of~~ Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.
~~**8.6.B**~~	~~differentiate between speed, velocity, and acceleration; and~~

https://tea.texas.gov/academics/2017-2021-grade-8-science-teks-side-by-side.pdf

Current Expectations

SCIENCE.8.7	Force, motion, and energy. The student understands the relationship between force and motion within systems. The student is expected to:
SCIENCE.8.7.A	calculate and analyze how the acceleration of an object is dependent upon the net force acting on the object and the mass of the object using Newton's Second Law of Motion; and
SCIENCE.8.7.B	investigate and describe how Newton's three laws of motion act simultaneously within systems such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.

https://tea.texas.gov/academics/2017-2021-grade-8-science-teks-side-by-side.pdf

3D Learning

Content

- All 3 acting SIMULTANEOUSLY

Recurring Themes

- Systems

SEPs

- “Investigate”
- Engineering Design

24-25 Assessment

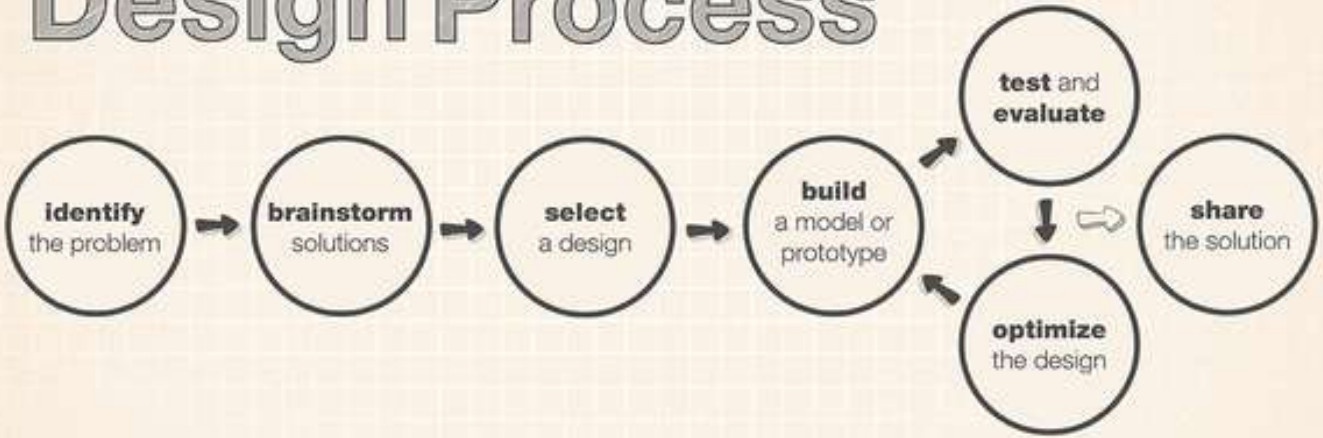
New TEKS	Implemented in 2024–2025	R/S
8.7A	calculate and analyze how the acceleration of an object is dependent upon the net force acting on the object and the mass of the object using Newton's Second Law of Motion; and	Readiness
6.7B	calculate the net force on an object in a horizontal or vertical direction using diagrams and determine if the forces are balanced or unbalanced; and	Readiness
8.7B	investigate and describe how Newton's three laws of motion act simultaneously within systems such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.	Readiness

6.8A	compare and contrast gravitational, elastic, and chemical potential energies with kinetic energy;	Supporting
7.7A	calculate average speed using distance and time measurements from investigations;	Supporting
7.7C	measure (record) and interpret an object's motion using distance-time graphs;	Supporting
6.8B	describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, or photosynthesis; and	Supporting

https://tea.texas.gov/student-assessment/testing/staar/2024-2025-staar-8-science-teks-comparison.pdf

Engineering Design

Engineering Design Process




National Aeronautics and Space Administration
The Engineering Design Process
Step 1: Identify the problem.
What are you being asked to achieve? What's the goal?
Step 2: Identify criteria and constraints.
What are the activity's requirements? (Use your rubric if you have one.)
What will limit the design (i.e., cost, supplies, time, etc.)?
nautics and Space Administration
m possible solutions.
h possible approaches to solving the problem.
sketch of your winning idea.
ministration
evaluate, and refine the design.
p that led to the final design, and how did the final product perform?
way to share what you learned.

What is a system

SERIES: Science Just-in-Times

TOPIC: Systems

TALENT: Linda Booth Sweeney
EDUCATOR/SCIENTIST

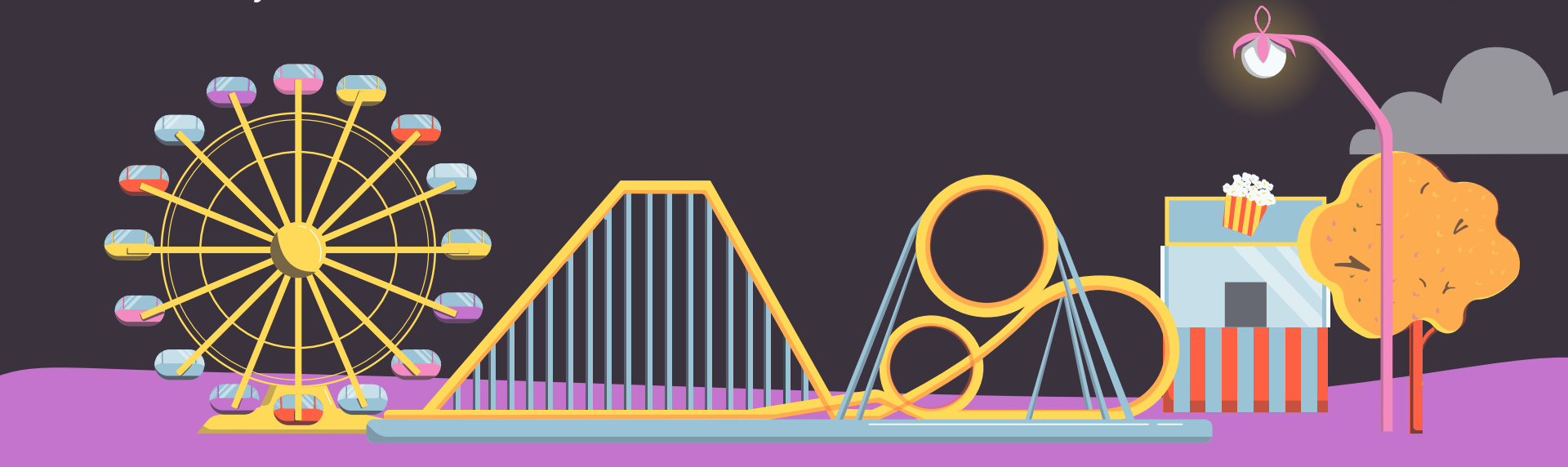

Thinking in Systems
Level 1:
Parts Working Together

Newton’s Laws at the carnival

This video is great at introducing Newton’s Laws and applying them to an amusement park. It can be your introduction to the project.

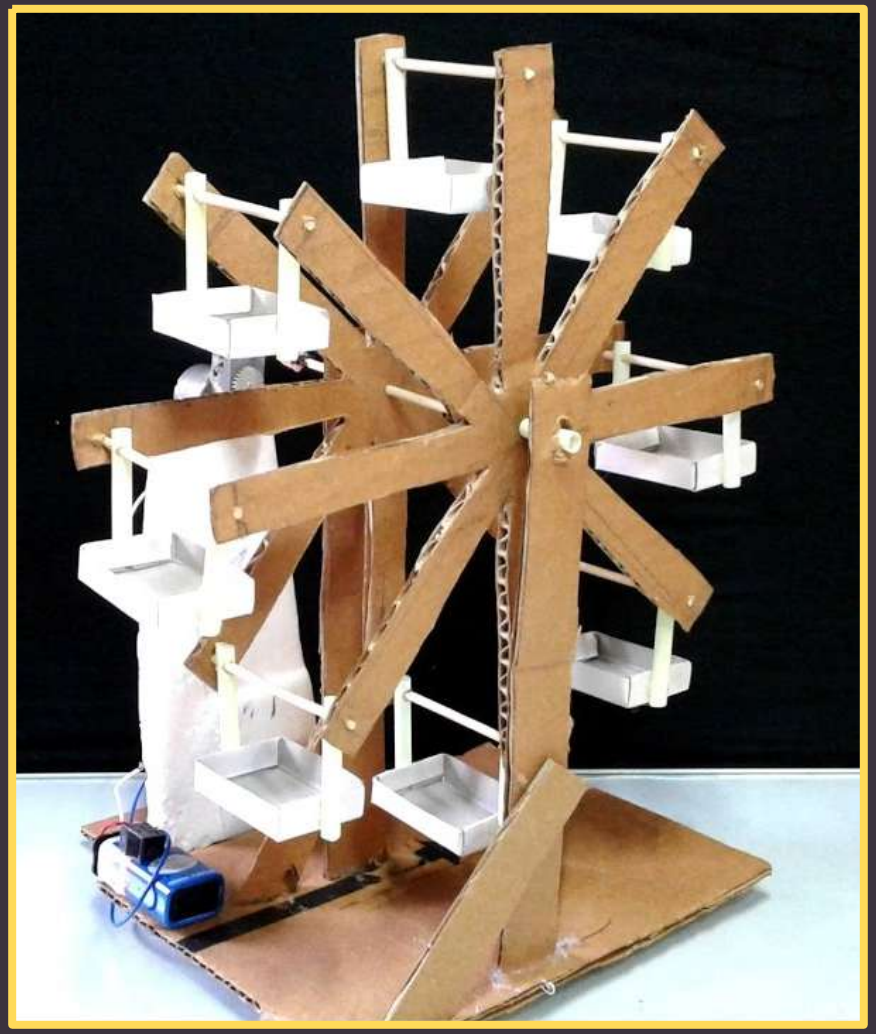
ACTIVITY GOAL

Utilizing our knowledge of Newton's 3 laws of motion we will plan, design, and construct and amusement park ride that will show how our ride works as a system of these laws.



What are we looking for?


Made by Dominic Sept's
10.9.20



Keep in mind when building your ride:

- Your ride must move either by hand or using a motor.
- Understand the pieces that make your ride so you can explain how the system works.
- You need to include safety devices for your passengers (hint: 1st law)

Rubric

Description	Possible Points	Unsatisfactory	Needs Improvement	Good	Very Good	Exemplary	Total Points
Ride Creativity	10	1	2	3	4	5	x2=
Ride Build/Mechanics/ Neatness	20	1	2	3	4	5	x4=
Rides Systems Explanation	15	1	2	3	4	5	x3
Newton's 1st Law	15	1	2	3	4		
Newton's 2nd Law	15	1	2	3	4		
Newton's 3rd Law	15	1	2	3	4		
Individual Daily Participation	10	1	2	3	4	5	x2=

Digital Organization

- Keep track of ride types, student groups, links, and grades
- Check in on real time progress
- See who is doing what and when
- Can’t “forget it at home”

Class Tracker

A	B	C	D	E
GROUP NUMBER	RIDE	LINK	NAMES	GRADE
1				
2				
3				
4				
5				
6				
7				
8				
9				

Period 1 | Period 2 | Period 3 | Period 4 | Period 6 | Period 8

Digital Proposal in Google Slides

Online

Not “lost,” feedback trail, track progress

Clear expectations

Students & parents understand expectations at a glance

Quick to grade

Student Slides

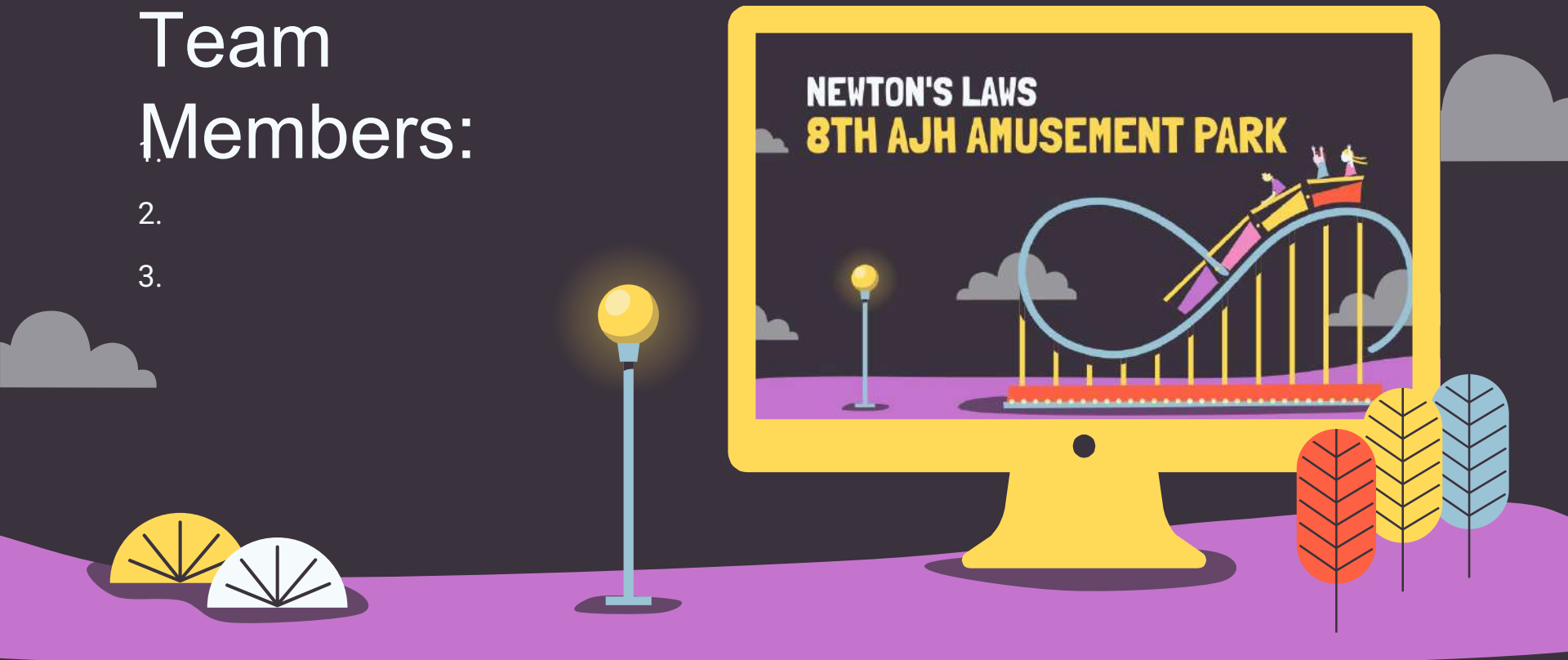
Class Period:

Team Members:

1.

2.

3.



Timeline

	Monday	Tuesday	Wednesday	Thursday	Friday
STAGE 1	4/22 Introduce Newton's Laws Amusement Park Ride Project (Major #1) Systems Lesson	4/23 STAAR: 7TH GRADE MATH, ALGEBRA I EOC Amusement Park Ride Build	4/24 Amusement Park Ride Build	4/25 STAAR: 8TH GRADE MATH Amusement Park Ride Build	4/26 Amusement Park Ride Build
STAGE 2	4/29 Amusement Park Ride Presentation of	4/30 Amusement Park Ride Presentation of	5/1 DUE TODAY: Amusement Park Ride	5/2 Amusement Park Rotations (Major #2)	5/3 Continued Amusement Park Rotations

STAGE 1 BUILD

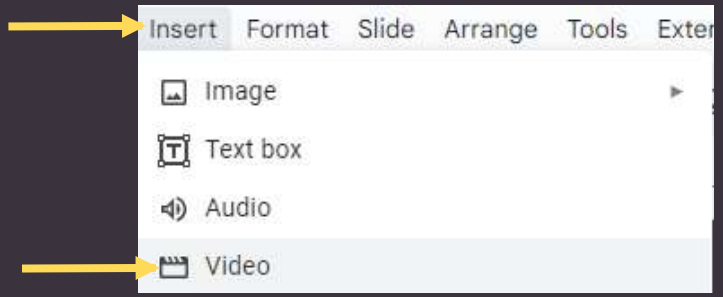
Our Ride Name:

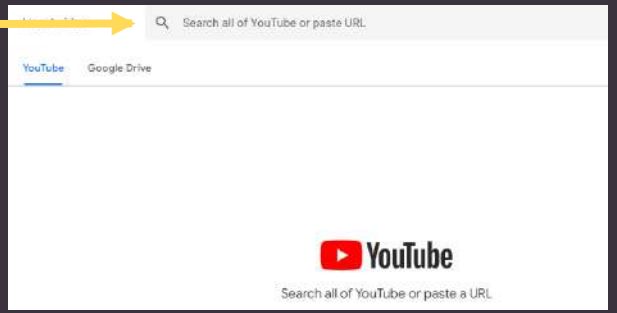
- Describe your ride: (theme, colors, movement, seats, height, start, stop, be as specific as you can)

- Insert a real life image of your ride:

Insert a tutorial video to help you build your ride:

How to insert a video:





Place your video here (if you find one, if not it is ok to not have a video here):

Materials you will need to build you ride

-

STAGE 2 PRESENTATION

Amusement Ride System Description

What are the parts of your ride?

Explain how each part listed above works together (as a system) for your ride to funcion:

Insert an image of the ride you built here

Newton’s First Law

What is Newton’s First Law?

Give TWO examples of Newton’s First Law on your ride:

1.

1.

Newton’s Second Law

What is Newton’s Second Law?

Explain how increasing the mass of the passengers would affect the acceleration of your ride.

Explain how increasing the force applied would affect the acceleration of your ride.

Newton’s Third Law

What is Newton’s Third Law?

Give TWO examples of force pairs on your ride:

1.

1.

What I Accomplished Chart Building

Ex: I was able to make a bumper car for our ride.	Team Member:	Team Member:	Team Member:
Role of team member			

What I Accomplished Chart

Ex: I was able to write how our ride functions as a system.	Team Member:	Team Member:	Team Member:
Role of team member			

Rubric

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Newton's 2nd Law	15	1	2	3	4	5	x3=
Newton's 3rd Law	15	1	2	3	4	5	x3=
Individual Contributions	10	1	2	3	4	5	x2=

Sites you can use for resource:

https://learning-center.homesciencetools.com/article/amusement-park-physics/

https://www.learner.org/wp-content/interactive/parkphysics/

https://learning-center.homesciencetools.com/article/amusement-park-physics/

https://www.teachengineering.org/lessons/view/cub_pend_lesson01

https://physicsworld.com/a/twists-turns-thrills-and-spills-the-physics-of-rollercoasters/

https://www.wonderopolis.org/wonder/can-people-stick-to-walls

https://www.titlemax.com/articles/physics-of-bumper-cars/

https://girlstart.org/wp-content/uploads/2017/07/26.Bumper-Cars.pdf

Build Time

KISD Feedback Form

https://tinyurl.com/SecScienceSummer24

Thank you!

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Resources:

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