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Grades 5 – 6

Day 1: Introduction

English Language Arts

In this unit you will learn about the historical development of 5 major roller coasters. Some of these coasters have been around since the 1900's! Kennywood Park has been an attraction in the Pittsburgh area for over 120 years!! Located in West Mifflin, PA, Kennywood was designated as a National Historical Landmark in 1987. You will be constructing a Compare and Contrast essay. In the essay you will research the oldest and newest of the roller coasters you will learn about in the history section of this unit: The Jack Rabbit; The Steel Curtain; The Phantom's Revenge; The Thunderbolt; and The Racer

Let's think about our Essential Questions:

- **What does it mean to Compare and Contrast? Do a five-minute brainstorming activity using what you have learned previously about these skills.**

- **Are both of these skills equal when writing this type essay? This question is your opinion answer...be as honest as you can about your thoughts. If the answer is yes, then give 3 reasons; if no, then give 3 reasons why you think they aren't equal.**

Day 1: Rate/Unit Rate

Math

In this unit you will learn about unit rate and absolute value by taking a closer look at the roller coasters in Kennywood! The lesson will be finished by comparing the overall change in altitude to the speed of the rollercoaster.

Describe key terms:

- **Rate** - A ratio comparing two quantities of different kind of units
- **Unit Rate**- A rate that is simplified so that it has a denominator of one

Define each term and use them in a real-world context.

_____

_____

_____

_____

_____

_____

Day 1: Key Terms

Science

In this unit you will learn about energy and how it transfers through a rollercoaster! The lesson will be finished by using the scientific method to make Kennywood Park even better!

Describe key terms: Use any resource available to you! Even ask a friend or family member!

- Energy - Ability to do work
- Kinetic energy - Energy in MOTION
- Potential energy - Stored energy
- Lift hill - Upward slope of a roller coaster that the car will be pulled up
- Freefall - Downward slope that is driven by **gravity**
- Friction - Force between two surfaces that are touching each other

To help describe these terms, let me use the example of riding your bike! You expend energy by pushing the pedals of the bike up the lift hill. When your bike is at the top of the hill it has **potential energy** then when you start to go down the hill, the free fall, **kinetic energy** is released. You push your brake which causes some friction in the brakes that slow down the bike until you stop! Energy is never lost; it just changes forms.

Provide real life examples of the key terms:

Energy: _____

Kinetic Energy: _____

Potential Energy: _____

Lift Hill: _____

Freefall: _____

Friction: _____

Day 1: Introduction

Social Studies

In this unit we will be focusing on the fun topic of roller coasters! Not just any roller coasters, but Kennnywood roller coasters, some of the oldest and most interesting coasters in the country!

1. Write a five-minute quick write about your experiences at Kennywood Park. If you have never been there, you may write about what you know about the park.

2. After you finish with the short writing assignment, try engaging with your family or friends about their experiences at Kennywood Park. This will help give you a different perspective on what Kennywood means to other people.

3. What are some common themes you found?

   _____

   _____

Day 2: Discovering Compare and Contrast

English Language Arts

Compare - refers to the process of identifying the similarities and differences between 2 things.

- Look around your house and find **6 sets** of **2 items**.
- When you find these sets of items, take 2 of the items and write 3 things that are the same and 3 things that are different. -**Do this with all 6 sets**.

Contrast - refers to identifying only the differences between 2 things.

- Look around your house and find **6 <u>different</u> sets** of **2 items**.
- When you find these sets of items, take 2 of the items and write 5 things that are different about each item.
- After the Compare and Contrast activity, summarize in 5 sentences what you have learned about these skills.

Day 2: Rate/Unit Rate Part 2

Math

Describe the terms from Day 1 by using an example of riding in a car. The rate at which you travel is comparing two different quantities. It compares the distance you drive (miles) to the amount of time (hours) that you travel. Most commonly, it is expressed in miles per (one) hour which is the unit rate because it describes the rate by simplifying the denominator to one hour.

Create a word problem using unit rate. If possible, trade with a partner from class and then solve.

Your Word Problem:

_____

_____

_____

_____

_____

If applicable, name of classmate whose word problem you solved _____

Classmate's Word Problem:

_____

_____

_____

_____

_____

Day 2: Energy Exploration

Science

Now we will do an activity to show that energy is never created or destroyed! You will need 3 baggies, one with 10 buttons, one with 10 pennies, and one with 10 paper clips, which will symbolize different forms of energy.

Take a look at the baggies and recognize that the energy is the same in each baggie! Now spill them all out and mix things up a bit, at random put 10 items back in each baggie and observe… did the energy in their bag now change? Did any energy get lost or gained?

Tomorrow we are going to take the information you learned so far and make our own roller coaster so use the rest of today to think about a rough draft of what you would build!

Day 2: Racer
Social Studies

A brief history of Kennywood Park will lead into the history of the following five Kennywood roller coasters.

1. The Racer
2. Thunderbolt
3. The Jack Rabbit
4. Phantom's Revenge
5. Steel Curtain

Write down what you find interesting about each coaster. Is there anything that you would want to know more about? Is there anything about each coaster that you do know about?

_____

_____

_____

_____

_____

_____

Research the first coaster on the list above. Then please answer the following five questions about the Racer. Please write at least three sentences for your answers.

1. When was the Racer first built and who designed it?

   _____

2. Describe what kind of roller coaster it is.

   _____

   _____

3. What was its top speed? And it's highest and lowest points?

   _____

4. What changes have been made to the Racer over the years?

   _____

   _____

5. According to the information you found about the Racer, do you believe the Racer should still be in operation? Explain your decision.

   _____

   _____

   _____

   _____

- All research material can be printed from this site https://en.wikipedia.org/wiki/Racer_(Kennywood)

Day 3: 5 Step Writing Process

English Language Arts

Essential Question: What is involved the 5 Step Writing Process?

- **Time to think…** Write 2 sentences for each question.
- **How do you begin your writing?**
- **What do you think about?**
- **Do you find it hard to get started?**

Most people find it difficult to start writing because there are so many things to think about. The Writing Process will allow you to take each step separately while creating your masterpiece.

Let's begin with the 1st step.

PreWriting - thinking about a topic, brainstorming then planning ideas (In this section the topic is already chosen for you. This step is important because you have to consider the audience (the reader who will be reading your essay).

This may sound like a lot but the step is simple...you think about ideas that you would like to write about. Ask yourself: What things do I like? What things interest me? What things would others like to know about?

After you have thought about these questions start writing down some thoughts.
Don't think too hard about it just let your imagination take control.

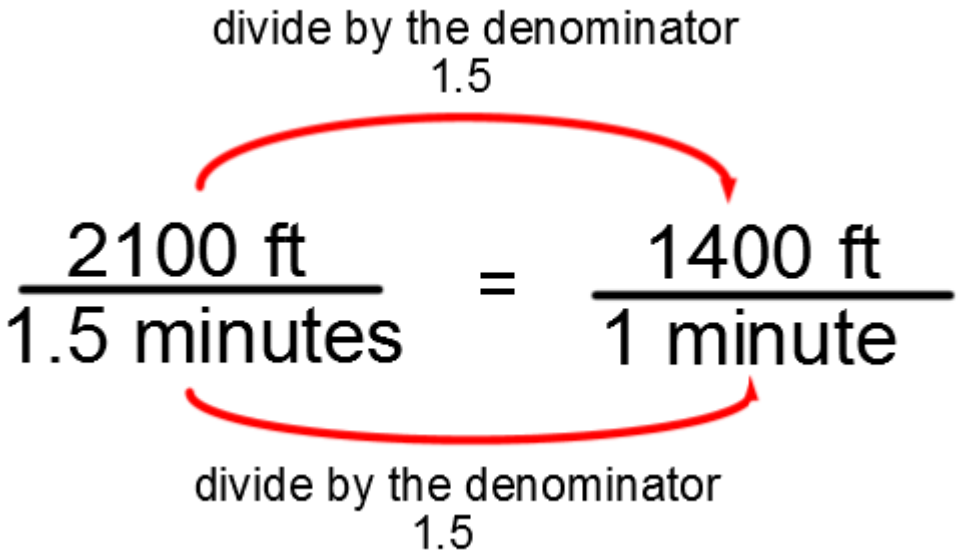
Activity: Come up with a list of 5 things that you think would be good topics to write about.
Decide who will be your audience and then for each 5 things
Write 3 things that would be interesting to know about the topic.

Example: Vacation Destinations - Where to go? What is there to do? What exciting things would you see?

Day 3: Jack Rabbit Rate

Math

Example 1: The Jack Rabbit has about 2,100 feet of track and lasts for around 1 minute and 30 seconds. What is the average speed of the ride in feet per minute? Use the formula below:



Answer: _____

Day 3 and 4: Build a Roller Coaster

Science

Let's build a paper roller coaster so we test some of the concepts we learned.

Materials needed:

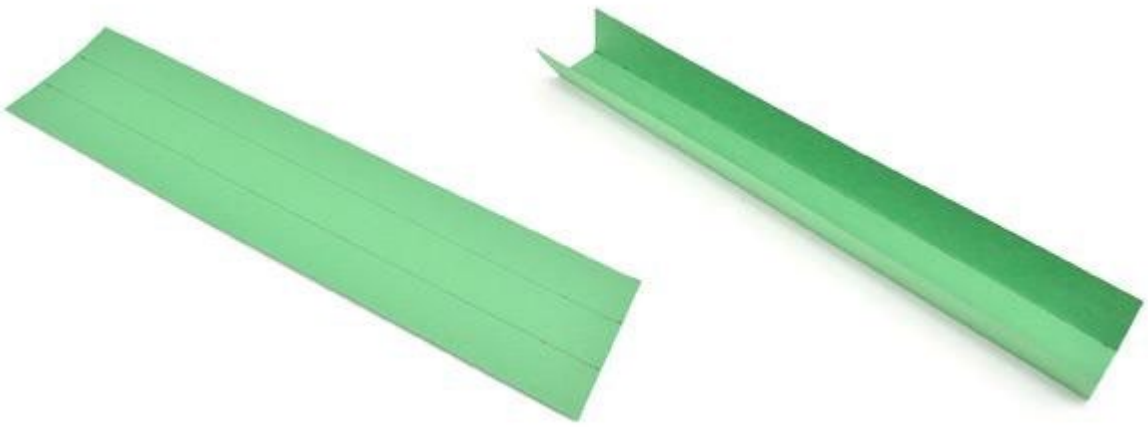
- Paper
- Tape
- Scissors
- Rulers
- Pencil
- corrugated cardboard
- instruction paper
- a marble

Build a Paper Roller Coaster!

Taken from: www.sciencebuddies.org/stem-activities/paper-roller-coaster#summary

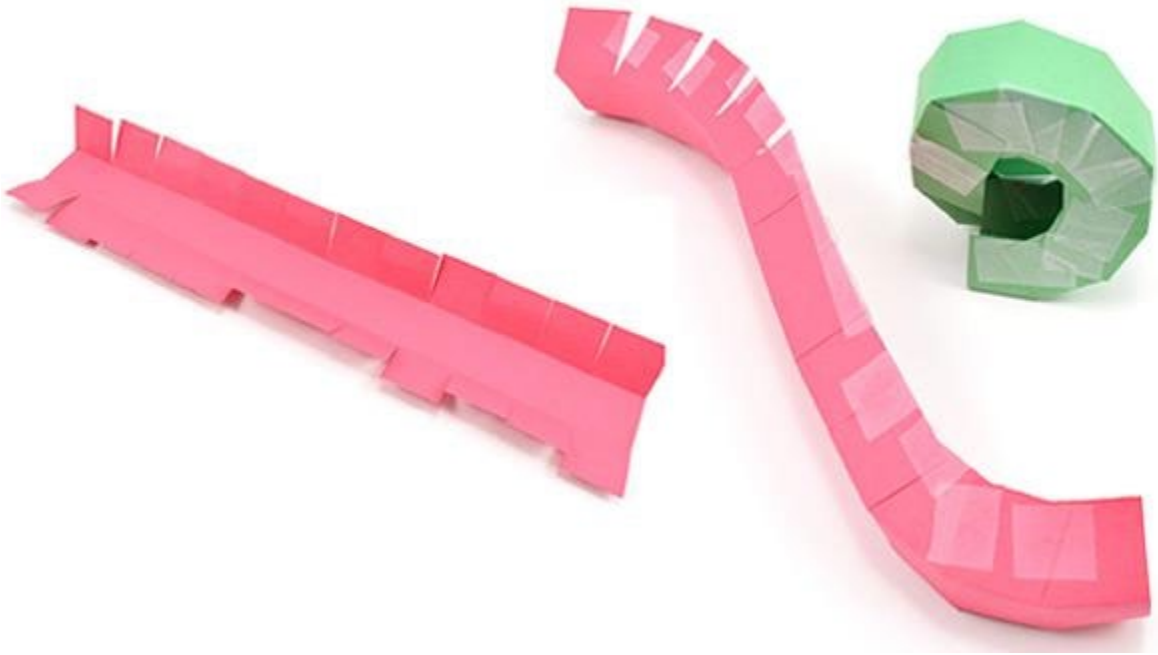
Prep Work

1. Before you try building an entire roller coaster, practice building the individual track segments. You can print the template from the weblink and cut out the pieces, or follow the instructions to draw your own with a pencil and ruler.
2. To build a straight segment:
    a. Cut a 7.5 cm (3 inch) wide strip of paper.
    b. Draw two parallel lines that divide it into three 2.5 cm-wide strips.
    c. Fold the two sides up 90 degrees along those lines to form walls.



Day 3 and 4: Build a Roller Coaster
Science

3. To build a loop or a hill:
    a. Cut a 7.5 cm (3 inch) wide strip of paper.
    b. Draw two parallel lines that divide it into three 2.5 cm-wide strips.
    c. Make marks every 2.5 cm along the long edges of the paper.
    d. Cut inward 2.5 cm from these marks to form tabs.
    e. Fold the tabs up 90 degrees.
    f. Bend the track into the shape you want, and tape the tabs together to hold it in place. This step is easier with two people, one to hold the track in place and one to do the taping.



4. To build a curve:
    a. Cut a 7.5 cm (3 inch) wide strip of paper.
    b. Draw two parallel lines that divide it into three 2.5 cm-wide strips.
    c. Make marks every 2.5 cm along one long edge of the paper.
    d. Cut inward 5 cm (2 inches) from these marks.
    e. Fold up the uncut side of the paper 90 degrees to form a wall.
    f. Fold up the tabs on the other side to form the other wall.
    g. Since the bottom portion of the track is cut into segments, you can bend it horizontally to form a curve. Tape the tabs together to hold the curve in place.

Day 3 and 4: Build a Roller Coaster
Science

5. To build a support strut:
    a. Cut a 6.25 cm (2.5 inch) wide strip of paper.
    b. Draw four parallel lines that divide it into five 1.25 cm (0.5 inch) wide strips.
    c. Cut inward 2.5 cm along these lines from one edge.
    d. Fold along the lines to form a square shape (so two of the segments overlap), and use tape to hold in place.
    e. Fold the tabs you cut at the end outward. This will allow you to tape the tabs flat to a piece of cardboard, so your strut can stand upright.

Procedure

1. Before you start building, plan out a design for your roller coaster. Draw your design on paper. Figure out how many supports and pieces of track you will need. Make sure your marble starts at the top of a hill.
2. Using a piece of corrugated cardboard as a base, assemble your track according to your plan. Tape the track segments together end-to-end to connect them.
3. Place the marble at the top of your track and let it go. Watch carefully.

What happens? Does it make it the whole way through the track?

4. If the marble made it the whole way to the end, try making your track longer by adding more pieces.

   How long can you make your track before the marble comes to a stop?

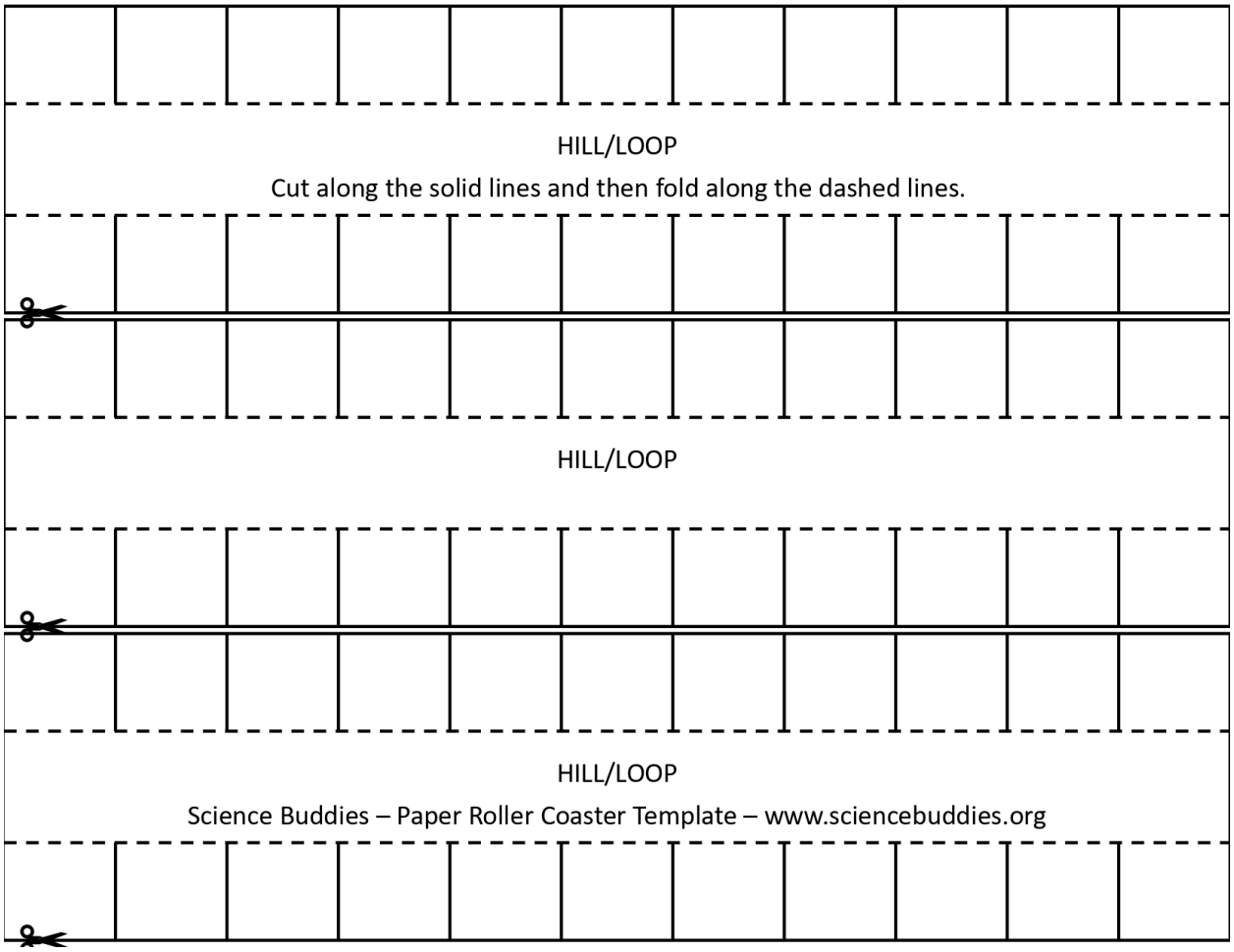
5. If your marble didn't make it to the end, try to figure out why. Is there a spot in your track where the marble got stuck? Was the marble going too slow to make it through a loop? If necessary, make changes to your design, like making the curves more gradual or the starting hill taller, and try again.

What Happened?

If you made your starting hill tall enough, and all the curves and loops of your roller coaster were gradual, your marble should have been able to get all the way to the end. However, if your coaster had any sharp turns or corners, your marble might have gotten stuck. If you tried to have your marble go up a hill or through a loop that was taller than the hill it started on, it wouldn't make it all the way through. Why not? It is all about energy!

Day 3 and 4: Build a Roller Coaster

Science



- Did the marble make it the whole way?
- How could we make the marble stop?
- What term that you learned is stopping the marble?

Day 3: Thunderbolt

Social Studies

Research the second coaster on the list above. Then please answer the following five questions about the Thunderbolt. Please write at least 3 sentences for your answers.

1. When was the Thunderbolt first built and who designed it?

_____

2. Was the Thunderbolt known by another name? If so, what was it?

_____

3. What was its top speed? And it's highest and lowest points?

_____

4. What changes have been made to the Thunderbolt over the years?

_____

_____

_____

5. According to the information you found about the Thunderbolt, do you believe the Thunderbolt should still be in operation? Explain your decision

_____

_____

_____

_____

- All research material can be printed from this site https://en.wikipedia.org/wiki/Thunderbolt_(Kennywood)

Day 4: Time to Write

English Language Arts

Now it's time to write...

Another name for drafting is writing.

Drafting/Writing - taking information and putting your thoughts and ideas on paper.

- Pick one of your 5 ideas that you worked on yesterday.
- Start writing down information you know about your idea and also think about what more information you will need for your writing.
- As you are putting your thoughts and ideas onto paper make note to yourself about the information you need to find to add to your idea to bring all your thoughts together.

Activity: Keep in mind that you will be creating a 5 paragraph essay. Start putting your thoughts and ideas into complete sentences. Create a 2 paragraph 5 sentence draft of your idea

Day 4: Length and Time Conversion

Math

You have been given the length and time of several roller coasters. Convert them to feet per minute (unit rate) to determine which one has the highest average speed. Complete the chart below:

Roller Coaster	Approx Length in feet	Approx Time in minutes	Unit Rate(ft/min)
Jack Rabbit	2100	1.5	1400ft/min
The Steel Curtain	4000	2	
Phantom's Revenge	3200	2	
Thunderbolt	3250	1.8	
The Racer	4500	1.5	

Day 4: Jack Rabbit

Social Studies

Research the third coaster on the list above. Then please answer the next following five questions about the Jack Rabbit. Please write at least 3 sentences for your answers.

1. When was the Jack Rabbit first built and who designed it?

_____

2. Describe what kind of roller coaster it is.

_____

_____

3. What was its top speed? And it's highest and lowest points?

_____

4. What changes have been made to the Jack Rabbit over the years?

_____

_____

_____

5. According to the information you found about the Jack Rabbit, do you believe the Jack Rabbit should still be in operation? Explain your decision.

_____

_____

_____

_____

- All printed material for the research can be found at this site https://en.wikipedia.org/wiki/Jack_Rabbit_(Kennywood)

Day 5: Revising

English Language Arts

Now let's look at what you wrote…

Revising - taking the research you gathered and organizing it into details which will make sense to the audience.

Put your thinking cap on and really consider what it is you want the audience to know about your topic.

Activity:

- Read and reread what you wrote. How does it sound? Would you be interested if you were the reader.
- Think about the information you provided. Is it enough to understand or do you need more? Is there too much information that it can leave the reader confused?
- Lastly, add in or take out information to get the best results for the reader to understand.

Take your time on this part because you want your writing to have the very affect you intended it to have on its reader.

Day 5: Summary

Math

Answer the questions below:

Questions:

1. Based on this information, which rollercoaster has the highest average speed?

   _____

2. Based on what you know about Kennywood and rollercoasters, do you think that is the fastest roller coaster there?

   _____

   _____

   _____

3. Based on your knowledge of roller coasters, explain why the top speed of a roller coaster and the unit rate are not the same.

   _____

   _____

   _____

   _____

Day 5: Illustrate

Science

1. Pick your favorite ride at Kennywood and draw the ride.
2. Draw the ride and label: **lift hill**, **free fall**, **kinetic energy**, **potential energy**, **gravity**, and where **friction** occurs to slow down the roller coaster.

Day 5: Phantom's Revenge

Social Studies

Research the fourth coaster on the list above. Then please answer the next following five questions about the Phantom's Revenge. Please write at least 3 sentences for your answers.

1. When was the Phantom's Revenge first built and who designed it?

   _____

2. Describe what kind of roller coaster it is.

   _____

   _____

3. What was its top speed? And it's highest and lowest points?

   _____

4. What changes have been made to the Phantom's Revenge over the years?

   _____

   _____

   _____

5. According to the information you found about the Phantom's Revenge, what name did it have when it was first built?

   _____

- All research material can be printed from this site https://en.wikipedia.org/wiki/Phantom%27s_Revenge

Day 6: Editing

English Language Arts

Look how far you have come!

Now that your thoughts are in order and your writing is the way you want it...let's check the grammar and mechanics of your writing.

Editing - this section you will not be changing your material, you will be correcting spelling mistakes, grammatical errors, capitalization and punctuation.

Activity - Fix your grammar and mechanics - watch your capitalization, punctuation, spelling and make sure each sentence is a complete sentence with a subject and verb.

Day 6: Absolute Value

Math

Describe key term:

- **Absolute Value -** The distance between a number and zero on a number line

Define the term and use it in a real-world context.

_____

_____

_____

_____

_____

Day 6 and 7: Design Your Roller Coaster

Science

1. Take what you learned and create your own roller coaster in Kennywood Park!
2. Add your favorite features.
3. Give your roller creation a name, draw the roller coaster, and label your creation with your newfound terms.
4. You are now a physics roller coaster genius for your age!

Day 6: Steel Curtain

Social Studies

Research the fifth coaster on the list above. Then please answer the next following five questions about the Steel Curtain roller coaster. Please write at least 3 sentences for your answers.

1. When was the Steel Curtain first built and who designed it?

   _____

2. Describe what kind of roller coaster it is.

   _____

   _____

3. What was its top speed? And it's highest and lowest points?

   _____

4. What is the Steel Curtain named after?

   _____

5. According to the information you found about the Steel Curtain, what rollercoaster records does it have?

   _____

- All research material can be printed from this site. https://en.wikipedia.org/wiki/Steel_Curtain_(roller_coaster)

After completing the above assignment, use the knowledge that you have gained to list the five roller coasters that you have researched and put them in order from oldest to newest.

Oldest

1. _____

2. _____

3. _____

4. _____

5. _____

Newest

Day 7: Publishing

English Language Arts

Holy Cow! We made it through The Writing Process!

Publishing - sharing your final draft with the audience.

- Let someone in your family read your masterpiece!
- Talk about what you liked about the process and discuss what area you struggled with.

Day 7: Absolute Value Part 2

Math

Based on our earlier conversation, we determined that top speed and average speed are not comparable. In fact, the Phantom's Revenge is the fastest roller coaster at Kennywood with a top speed of 85 mph or 7480ft/min! The average speed is slowed down by the time it takes for you to ascend to the highest point of the roller coaster. But the top speed is created by the drop in elevation. In the next part of the lesson, we are going to use absolute value to determine the drop in feet of several of the rollercoasters.

Create a word problem using unit rate. If possible, trade with a partner from class and then solve.

Your Word Problem:

_____

_____

_____

_____

_____

If applicable, name of classmate whose word problem you solved _____

Classmate's Word Problem:

_____

_____

_____

_____

_____

Day 7: Sketching
Social Studies

Look up pictures of each rollercoaster, draw them to the best of your ability in the boxes below and identify and date each roller coaster that you have sketched.

Day 8: Compare and Contrast Essay

English Language Arts

Now let's begin to look at how your Compare and Contrast essay will develop.

Look at the specific instructions for the essay.

Layout of a 5 paragraph essay: ***Included 5 paragraphs with 5-7 sentences each. The use of capitalization and punctuation is essential to make complete sentences. Appropriate grammar and sentence structure ensures the audience will understand your writing.***

Complete this section:

Questions to consider when researching your chosen roller coasters:

- How old is each rollercoaster?
- The description of rollercoasters.
- How have the roller coasters developed over the years?
- Which rollercoaster is the most popular roller coaster?
- Which one do you prefer and why?

Introduction - Introduce topic and create thesis statement (summary of the essay)
(You already have your topic. **Kennywood Rollercoasters - Pick your 2 favorite coasters. Don't forget that you can use your information from social studies, Math, and science to help you.)**

Day 8: Scientific Method

Science

1. Finally let's apply the scientific method to make Kennywood Park the best park ever!!
2. Think about being at Kennywood and write down 3 problems that you have observed (examples: lines too long, litter, more food options).
3. Now come up with a hypothesis, an educated guess to solving one of the problems! Use all the steps of the scientific method.

Scientific Method:
Ask a question
Gather information and observe
Make a hypothesis
Experiment and test your hypothesis
Analyze your test results
Present a conclusion

Problem:

1._____

_____

2._____

_____

3._____

_____

Hypothesis to solve the problem:

1._____

_____

2._____

_____

3._____

_____

Day 8: Compare and Contrast

Social Studies

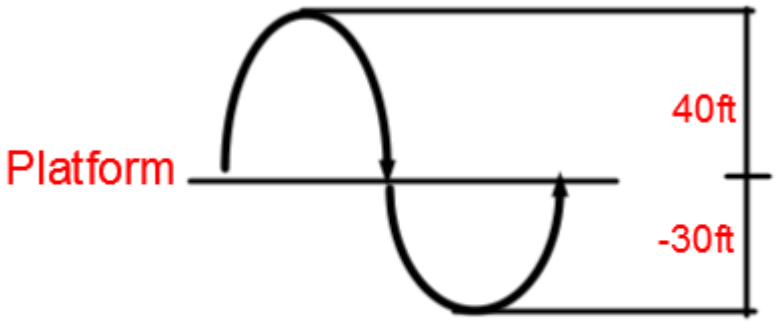
1. Talk to your family or friends and ask one of them what their favorite Kennywood roller coaster is.
2. Compare and contrast their favorite roller coaster with a roller coaster that you found to be your favorite based on the research that you have done.
3. Write a paragraph comparing and contrasting between the favorites.

Day 8: Jack Rabbit Absolute Value

Math

The students will be shown how to find the drop of the Jack Rabbit by adding the absolute values of the height above the platform and depth it dives below it.

Example 2: The Jack Rabbit has a top speed of 45mph that is created from a drop with a top elevation of 40 ft above the starting platform and a low elevation of 30 feet below (-30) the starting platform. Determine the length of the drop to get the Jack Rabbit to its top speed by adding their absolute values.



$$|40| + |-30| = 70$$

Answer: _____

Day 9: 3 Paragraphs

English Language Arts

Complete these sections:

Paragraph 1 - topic sentence, introduce first roller coaster researched, use precise details.

Paragraph 2 - topic sentence, introduce second roller coaster researched, use precise details.

Paragraph 3 - Comparison of 2 roller coasters.

***Remember each paragraph has to be 5-7 complete sentences. ***

Day 9: Total Drop

Math

You have been given the top speed, highest points and lowest points in relation to the starting point of several roller coasters. Find the total drop of each. Complete the table below:

Roller Coaster	Top Speed	High Point	Low Point	Total Drop
Jack Rabbit	45 mph	40	-30	70
The Steel Curtain	75 mph	197	-8	
Phantom's Revenge	85 mph	160	-68	
Thunderbolt	55 mph	70	-20	
*The Racer (both points above 0)	40 mph	72	22	

Day 9: Test Hypothesis

Science

Set up an experiment that you could present to Kennywood so they can try your solution (hypothesis). Try to be as detailed as possible.

Day 9: Summary

Social Studies

Pick two rollercoasters and give a five-sentence summary of each one.

Day 10: Conclusion

English Language Arts

Conclusion - summarize the research from paragraphs 1 and 2 then evaluate that research by explaining the importance of the research found.

Remember **summarize** means to give a brief statement about the main points.
Remember to **evaluate** means to form an idea about the research you found. What makes it important information for the readers to know.

YOU DID IT!!!

Share your essay with someone so they can see your hard work and enjoy your finished product.

**Please reference your other subjects (science, history, and math) to help you with your essay. Their information is essential in establishing concrete understanding of this project.
**

Day 10: Summary

Math

Answer the questions below:

Conclusion Questions:

1. How does the high point of the drop impact the top speed of the roller coaster?

   _____

   _____

   _____

2. Explain how finding the distance between the points on the Racer differs from finding the distance of all the others.

   _____

   _____

   _____

3. Competition in the roller coaster design game is fierce. Everyone wants to go fast. If you were to design the next roller coaster for Kennywood, what factors would you take into consideration to not only have top speed, but also the highest rate of travel?

   _____

   _____

   _____

   _____

   _____

Day 10: Experiment Proposal

Science

We can write a short description of your experiment to send to Kennywood to see if they will test your hypothesis and come up with a conclusion!

Day 10: Virtual Visit

Social Studies

Expand your knowledge further by taking a virtual tour of each coaster. Visit www.kennywood.com/education-Days and/or search YouTube for virtual Kennywood roller coaster tours by typing in the roller coaster names and pushing the search tab.