



GRADE 5 SCIENCE

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GRADE 5

IN-SCHOOL PREPARATION

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MEETING THE EXPECTATIONS

CW Physics, Science & Math Day Activities

A correlation with the Ontario Science Curriculum Grade 5

Grade 5

S = Structures and Mechanisms

Forces Acting on Structures and Mechanisms

ACTIVITIES

GRADE 5 specific expectations

<p>Riptide Dragon Fire The Bat Vortex Mighty Canadian Minebuster Flight Deck The Fly</p>	<p>S3.1 – Identify internal forces acting on a structure (<i>e.g., compression [squeezing], tension [stretching]</i>), & describe the effects of their application</p> <p>S3.2 – Identify external forces acting on a structure (<i>e.g., the weight of people and furniture in a house, wind blowing on a tent, the movement caused by a passing train</i>), and describe their effects on the structure, using diagrams</p> <p>S3.3 – explain the advantages and disadvantages of different types of mechanical systems</p> <p>S2.3 –use scientific inquiry/research skills (see page</p> <p>S3.4 - Describe forces resulting from Natural phenomena that can have severe consequences for structures in the environment</p> <p>S 2.5 - Use appropriate science and technology vocabulary, including <i>tension, compression, torque, system, and load</i>, in oral and written communication.</p> <p>S2.1 – Follow established safety procedures for working with tools and materials.</p> <p>S 2.4 use technological problem-solving skills (see page 16) to design, build, and test a frame structure (<i>e.g., a bridge, a tower</i>) that will withstand the application of an external force (<i>e.g., a strong wind or simulated vibrations from a train</i>) or a mechanical system that performs a specific function (<i>e.g., a building crane</i>)</p>
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MEETING THE EXPECTATIONS

<p>Park Exploration</p>	<p>S3.1 - identify internal forces acting on a structure (e.g., compression [squeezing], tension [stretching]), and describe their effects on the structure</p> <p>S 3.2 Identify external forces acting on a structure (e.g., the weight of people and furniture in a house, wind blowing on a tent, the movement caused by a passing train), and describe their effects on the structure, using diagrams</p> <p>S 2.2 measure and compare, quantitatively and/or qualitatively, the force required to move a load (e.g., to lift a book, to open a drawer) using different mechanical systems (e.g., different pulley systems, a lever, a gear system), and describe the relationship between the force required and the distance over which the force moves.</p> <p>S 3.3 explain the advantages and disadvantages of different types of mechanical systems</p> <p>S 2.3 use scientific inquiry/research skills (see page see page 15) to investigate how structures are built to withstand forces</p> <p>S 3.4 describe forces resulting from natural phenomena that can have severe consequences for structures in the environment</p> <p>S 2.5 use appropriate science and technology vocabulary, including tension, compression, torque, system, and load, in oral and written communication.</p> <p>S 2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes</p> <p>S 2.1 follow established safety procedures for working with tools and materials</p> <p>S 2.2 measure and compare, quantitatively and/or qualitatively, the force required to move a load (e.g., to lift a book, to open a drawer) using different mechanical systems (e.g., different pulley systems, a lever, a gear system), and describe the relationship between the force required and the distance over which the force moves</p>
<p>Consumer Survey (Safety & Aesthetic Appeal)</p>	<p>S 2.5 use appropriate science and technology vocabulary, including tension, compression, torque, system, and load, in oral and written communication</p> <p>S 2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes</p>

AMUSEMENT RIDE JOURNAL ENTRY RUBRIC

CATEGORY	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
<p>Understanding of Concepts</p> <p>Demonstrates an understanding of the effect of forces on different structures and mechanisms</p>	- shows limited understanding of how the forces of tension and compression act on the basic structural and design features such as cylindrical piers, triangulation, etc.	- shows some understanding of how the forces of tension and compression act on the basic structural and design features such as cylindrical piers, triangulation, etc.	- shows understanding of how the forces of tension and compression act on the basic structural and design features such as cylindrical piers, triangulation, etc.	- shows thorough understanding of how the forces of tension and compression act on the basic structural and design features such as cylindrical piers, triangulation, etc.
<p>Communication</p> <p>Use appropriate vocabulary, including correct science and technology terminology to reflect on the structural and design features of the rides.</p>	- communicates information and ideas with limited clarity and precision.	- communicates information and ideas with moderate clarity and precision.	- communicates information and ideas with clarity and precision.	- communicates information and ideas with a high degree of clarity and precision.
<p>Relating Science and technology to Each Other and the World Outside the School</p> <p>Evaluate the design of systems that include structures and mechanisms</p>	- shows limited understanding of how science and technology are utilized in the design and manufacture of amusement park rides.	- shows some understanding of how science and technology are utilized in the design and manufacture of amusement park rides.	- shows understanding of how science and technology are utilized in the design and manufacture of amusement park rides.	- shows thorough understanding of how science and technology are utilized in the design and manufacture of amusement park rides.

BASIC MEASUREMENTS

To get ready for the trip to Canada's Wonderland for the Physics, Science and Math program, you should find answers to all of the questions below. On the day of the trip, take this sheet with you so you can use the numbers.

TIME

Number of seconds per minute _____

Number of minutes per hour _____

Number of seconds per hour _____

YOUR BODY MEASUREMENTS

Height _____ cm _____ m

Arm Span _____ cm _____ m

Length of Shoe _____ cm _____ m

Hand Span _____ cm _____ m

PULSE AND BREATHING RATES

	Pulse Rate (beats per minute)	Breathing Rate (breathes per minute)
Sitting		
Standing (before exercise)		
Standing (after exercise)		

MATH PRACTICE

1. Discuss in class how to find each of the following numbers:

- a) pulse rate (per minute)
- b) breathing rate (per minute)
- c) the perimeter of a square, a rectangle, or other polygon
- d) the diameter of a circle
- e) the circumference of a circle
- f) multiplying two numbers with units

e.g. 6 paces x 40 cm/pace = 240 cm
 5 hand spans x 18 cm/hand span = 90 cm
 3 cars x 4 passengers/car = 12 passengers

g) the average of two or more numbers

2. Solve the following problems. Where possible, show how you calculated the answer.

a) Julie measures 36 heart beats in 30 seconds. What is her pulse rate per minute?

b) Soo-Jin breathes 26 times in two minutes. What is her breathing rate per minute?

c) Terry measures 19 pulse beats in 15 seconds. What is his pulse beat per minute?

d) Determine the perimeter of this page in centimetres.

MATH PRACTICE

e) Measure your hand span in centimetres. Then use your hand span to estimate the length of a desk.

f) Measure your average pace in centimetres. Use your pace to find the length and width of your classroom.

g) How many desks are there in a room that has 5 rows of desks with 6 desks/row?

h) Teepu's mass is 42 kg and Angela's mass is 54 kg. Find the average of their masses.

LEARNING SCIENCE LANGUAGE

TEACHER DEFINITIONS

Aesthetic Appeal	An amusement ride has a certain aesthetic appeal. This consideration deals with safety and comfort of the ride as well as its appearance.
Compression	When pressure is applied to an object it tends to cause a decrease in the size of the object. A spring can be compressed from its original length to a shorter length.
Force	Simply, a push or pull. Forces cause things to speed up or slow down and can also cause matter to compress and stretch. If an object is stationary, its forces are balanced. When its forces become unbalanced, for example, if the object is pushed or pulled, the object will move.
Frame	A supporting structure that is used to build on. The tracks of the roller coaster are built on a frame.
Friction	Friction is a force of resistance that moving objects experience when in contact with other objects. Frictional force converts a moving object's kinetic energy (energy of motion) into another form of energy called heat energy .
Gravity	The force of gravity acts between any two objects that have mass. Every mass on earth (large or small) feels the force of gravity pulling it towards the earth. This pull gives you your weight.
Load	An object that has weight is a load. Effort is required to lift the load against gravity.
Mass	The amount of matter in an object. Mass is measured in kilograms and is different from weight. An object always has the same mass, whereas its weight may change depending on its location.
Mechanical System	A system that has machinery or mechanisms. For example, the pedals of a bicycle and the connecting chain to the sprocket are a mechanical system.

LEARNING SCIENCE LANGUAGE

TEACHER DEFINITIONS (cont'd)

Structure	Anything constructed of parts arranged together. Some roller coasters have wooden structures and others have steel structures.
Tension	The stretching of an object caused by a pulling force. An elevator exerts tension on the cables supporting it.
Torque	Any object turning as a result of a force is said to experience a torque. A mechanism's torque is measured by its potential to deliver a turning force.
Weight	The force of gravity on an object. The weight of an object can vary since the force of gravity can vary depending on its location.

LEARNING SCIENCE LANGUAGE

Applying science language to an amusement ride:

The force of **GRAVITY** between the roller coaster train in which you are riding and the earth pulls you down the roller coaster hills.

The greater the **WEIGHT** of the roller coaster train, the more strength the structure must have to support the tracks.

The addition of more passengers will increase a roller coaster's **MASS** and weight.

The supporting structure of a roller coaster is a series of connected parts called the **FRAME**.

The supporting structure of the wave pool in Splash Works is a one piece **SHELL**.

A **PIER** is the part of a structure whose function is to resist compressive forces. The cylindrical **PIERS** on a metal roller coaster support the track by resisting compressive forces caused by the weight of the roller coaster and its passengers.

On the wooden roller coasters the **TRUSS** is a structural element (whose function is to resist tension and compression forces) made up of a series of triangular frames.

The downward force, which is applied to the structures support piers, is called **COMPRESSION**.

The outward force, which occurs when the roller coaster train is travelling around a curve, puts **TENSION** on the structure's support wires.

Many of the attractions that you see at Canada's Wonderland have been chosen because they are attractive and have a certain **AESTHETIC APPEAL** to the Park's customers.

LEARNING SCIENCE LANGUAGE

Select the correct word and complete each sentence:

Compression	Torque	Weight	Force
Gravity	Velocity	Load	Mass
Tension	Structure	Friction	Frame
Aesthetic Appeal	Mechanical Systems		

1. The roller coaster train increases its _____ as it rolls down a hill.
2. An amusement ride spins in a circular motion powered by _____.
3. The force of _____ pulls you down the roller coaster hills.
4. The force of _____ slows you down throughout your roller coaster trip.
5. The greater the _____ of the roller coaster train, the more strength the structure must have to support this _____.
6. An empty roller coaster train and a loaded coaster train will travel down a hill at the same speed. Therefore we can say that a roller coaster train's speed is not affected by its _____.
7. Steel roller coasters are equipped with support piers to help resist the _____.
8. Bicycle gears and motors are examples of _____.
9. The most attractive rides in the Park have the most _____.
10. The supporting _____ of a roller coaster is a series of connected parts called the frame.



GRADE 5 SCIENCE

AMUSEMENT RIDE ACTIVITIES

RIPTIDE

DRAGON FIRE

THE BAT

VORTEX

MIGHTY CANADIAN MINEBUSTER

FLIGHT DECK

THE FLY

RIPTIDE

Riptide is Wonderland's super swing with attitude and altitude! Riptide will take passengers through snap rollovers and 360° twists and turns as they are propelled through moments of zero gravity and an inescapable wall of water. Riptide is the ultimate experience for thrill seekers who think they have done it all.



QUESTIONS

1. [S 2.1] Look for the safety guide.
 - (a) What are the ride restrictions? Explain each one.

 - (b) What are the ride requirements? Explain what they mean.

2. [S 2.1] Write out all the instructions to riders you can see and hear at the loading platform.

QUESTIONS

3. **[S 3.4]** List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

4. **[S 2.4]** Determine the following in seconds:
 - (a) the average time for one ride

 - (b) the average time the ride stays at the loading platform

5. **[S2.4]** Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading; vertical spin (Note: Several parts may be listed more than once.)

RIPTIDE

QUESTIONS

6. [S 2.4] Describe how the ride gets to its highest point. Include diagrams.
7. [S 2.3] Identify examples of turning force (torque) that you see on this ride.
8. [S 3.1] Answer the following questions for the vertical spin.
 - (a) At what point(s) do you feel the lightest?
 - (b) At what point(s) do you feel the heaviest?
9. [S 3.2] Draw a picture of a vertical spin and label the points in the spin that your body feels lightest and heaviest.

QUESTIONS

10. [S 3.1] If you are using an accelerometer, what happens to the mass when you feel lightest and heaviest?

11. [S 3.2] At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the passenger compartment with its passengers heavier when this occurs?

12. [S 3.1] Where do you feel you are being thrown forward? Why does this occur?

13. [S 3.3] Compared to other amusement rides that you have experienced in the past was this ride slower or faster? Explain your reasoning.

QUESTIONS

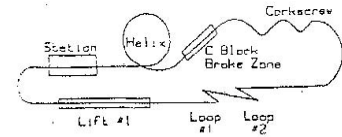
14. State your hand span in centimetres. Use your hand span to calculate the inside width of the passenger compartment. (Show your work.)

15. Conduct your **CONSUMER SURVEY** or complete your **RIDE SAFETY EXERCISE** if you haven't already done so.

16. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the structural and design features that are used to create an exciting but safe ride.

DRAGON FIRE

On *Dragon Fire*, unrelenting speed and loops are just some of this coaster's tricks. This immense steel coaster hurls riders through two 360° loops, a full corkscrew and a side-winding helix.



QUESTIONS

1. [S 2.1] Look for the safety guide.

 - (a) What are the ride restrictions? Explain each one.

 - (b) What are the ride requirements? Explain what they mean.

2. [S 2.1] Write out all the instructions to riders you can see and hear at the loading platform.

DRAGON FIRE

QUESTIONS

3. **[S 3.4]** List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

4. **[S 2.4]** Determine the following in seconds:
 - (a) the average time for one ride

 - (b) the average time the ride stays at the loading platform

5. **[S2.4]** Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading; vertical spin (Note: Several parts may be listed more than once.)

QUESTIONS

6. [S2.4] Describe how the train gets to the top of the first ramp. Include diagrams.

7. [S 3.1] Answer the following questions for the vertical loop.
 - (a) At what point(s) do you feel the lightest?

 - (b) At what point(s) do you feel the heaviest?

8. [S 3.2] Draw a picture of a vertical loop and label the points on the loop that your body feels lightest and heaviest.

DRAGON FIRE

QUESTIONS

9. [S 3.1] If you are using an accelerometer what happens to the spring when you feel lightest and heaviest?

10. [S 3.2] At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

11. [S 3.2] When the car and its passengers feel heavier are the wheels of the roller coaster car experiencing tension or compression?

12. [S 3.1] Where do you feel you are being thrown forward? Why does this occur?

13. [S 3.1] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.

DRAGON FIRE

QUESTIONS

14. **[S 3.3]** Compared to other amusement rides that you have experienced in the past, was this ride smoother or bumpier? Explain your reasoning.

15. **[S 3.1]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? Why?

16. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

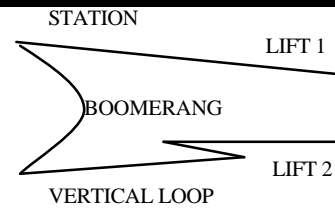
17. Estimate the length of one train. Show your calculations.

18. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

19. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the structural and design features that are used to create an exciting but safe ride.

THE BAT

On **The Bat**, riders are pulled backwards and launched through an unyielding corkscrew and a breathtaking loop. After one trip through **The Bat**'s intense, tight track, riders have little time to catch their breath when **The Bat** climbs its second launch to take riders through one more time – backwards.



QUESTIONS

1. [S 2.1] Look for the safety guide.

 - (a) What are the ride restrictions? Explain each one.

 - (b) What are the ride requirements? Explain what they mean.
2. [S 2.1] Describe the feature(s) that prevent injury to people walking on the entrance path under the train from objects that may fall out of rider's pockets.
3. [S 2.1] Write out all the instructions to riders you can see and hear at the loading platform.

QUESTIONS

7. **[S2.4]** Describe how the train gets to the top of the first ramp. Include diagrams.

8. **[S 3.1]** Answer the following questions for the vertical loop, which is beyond the boomerang.
 - (a) At what point(s) do you feel the lightest?

 - (b) At what point(s) do you feel the heaviest?

9. **[S 3.2]** Draw a picture of a vertical loop, which is beyond the boomerang and label the points on the loop that your body feels lightest and heaviest.

10. **[S 3.1]** If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?

THE BAT

QUESTIONS

12. [S 3.2] At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

13. [S 3.2] When the car and its passengers feel heavier, are the wheels of the roller coaster car experiencing tension or compression?

14. [S 3.1] Where do you feel you are being thrown forward? Why does this occur?

15. [S 3.1] Do you think the riders in the front car experience the same sensations as the rider in the rear car? Explain why.

16. [S 3.3] Compared to other amusement rides that you have experienced in the past was this ride smoother or bumpier? Explain your reasoning.

QUESTIONS

17. **[S 3.1]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? Why?

18. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

19. Estimate the length of one train. Show your calculations.

20. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

21. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the structural and design features that are used to create an exciting but safe ride.

VORTEX

*On **Vortex**, riders will enjoy the thrills of Canada's first suspended roller coaster. This steel coaster plunges over Wonder Mountain, reaching speeds of 90 km/h. **Vortex's** invisible track drives riders through unrelenting turns, swooping, diving, and plunging over a scenic waterscape.*



QUESTIONS

1. [S 2.1] Look for the safety guide.
 - (a) What are the ride restrictions? Explain each one.

 - (b) What are the ride requirements? Explain what they mean.
2. [S 2.1] Write out all the instructions to riders you can see and hear at the loading platform.
3. [S 3.4] List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

QUESTIONS

4. **[S 2.4]** Determine the following in seconds:
 - (a) the average time for one ride

 - (b) the average time the ride stays at the loading platform

5. **[S22]** Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading. (Note: Several parts may be listed more than once.)

VORTEX

QUESTIONS

6. [S 2.4] Describe how the train gets to the top of the first ramp. Include diagrams.
7. [S 3.1] Which hill on this ride is the highest? State why it must be the highest.
8. [S 3.1] At the bottom of the first drop, which way does the train turn? Which way do the cars swing? Why do you think they swing this way?
9. [S 3.1] Is there any time on the ride when you feel as if you are leaving your seat? Explain.

QUESTIONS

10. [S 3.1] If you are using an accelerometer what happens to the spring when you feel lightest and heaviest?

11. [S 3.2] At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

12. [S 3.2] When the car and its passengers feel heavier are the wheels of the roller coaster car experiencing tension or compression?

13. [S 3.1] Where do you feel you are being thrown forward? Why does this occur?

14. [S 3.1] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.

QUESTIONS

15. **[S 3.3]** Compared to other amusement rides that you have experienced in the past, was this ride smoother or bumpier? Explain your reasoning.

16. **[S 3.1]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? Why?

17. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

18. Estimate the length of one train. Show your calculations.

19. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

20. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the structural and design features that are used to create an exciting but safe ride.

MIGHTY CANADIAN MINEBUSTER

*The **Mighty Canadian Minebuster** is the largest and longest wooden coaster in Canada. Its immense wooden track is full of side-winding turns, stomach lifting camel humps, and breath-taking drops. The **Minebuster** reaches astounding speeds of more than 90 km/h on its 4000 feet of serpentine designed track.*



QUESTIONS

1. [S 2.1] Look for the safety guide.
 - (a) What are the ride restrictions? Explain each one.

 - (b) What are the ride requirements? Explain what they mean.

2. [S 2.1] Write out all the instructions to riders you can see and hear at the loading platform.

3. [S 3.4] List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

MIGHTY CANADIAN MINEBUSTER

QUESTIONS

4. **[S 2.4]** Determine the following in seconds:
 - (a) the average time for one ride

 - (b) the average time the ride stays at the loading platform

5. **[S 2.4]** Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading. (Note: Several parts may be listed more than once.)

MIGHTY CANADIAN MINEBUSTER

QUESTIONS

10. [S 3.2] At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

11. [S 3.2] When the car and its passengers feel heavier are the wheels of the roller coaster car experiencing tension or compression?

12. [S 3.1] Where do you feel you are being thrown forward? Why does this occur?

13. [S 3.1] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.

14. [S 3.3] Compared to other amusement rides that you have experienced in the past, was this ride smoother or bumpier? Explain your reasoning.

QUESTIONS

15. **[S 3.1]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? Why?

16. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

17. Estimate the length of one train. Show your calculations.

18. Conduct your **CONSUMER SURVEY** or complete your **RIDE SAFETY EXERCISE** if you haven't already done so.

19. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the structural and design features that are used to create an exciting but safe ride.

FLIGHT DECK

Flight Deck is Canada's only inverted looping jet coaster. This mega coaster simulates flight with speeds of 90 km/h, exhilarating 90° vertical climbs, barrel rolls, inverted wind loopovers, a 270° after burn and an complete snap roll over. Riders take flight in a fully open cockpit suspended beneath the coaster's steel track as the sky races below.



QUESTIONS

1. [S 2.1] Look for the safety guide.
 - (a) What are the ride restrictions? Explain each one.
 - (b) What are the ride requirements? Explain what they mean.
2. [S 2.1] Write out all the instructions to riders you can see and hear at the loading platform.
3. [S 3.4] List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

FLIGHT DECK

QUESTIONS

7. [S2.4] Put these parts in the order in which they occur: side winder; roll over; brakes; highest hill; dewinder; loading; spin

8. [S 2.4] Describe how the train gets to the top of the first ramp. Include diagrams.

9. [S 3.1] Answer the following questions for the vertical loop.
 - (a) At what point(s) do you feel the lightest?

 - (b) At what point(s) do you feel the heaviest?

10. [S2] Draw a picture of a vertical loop and label the points on the loop that your body feels lightest and heaviest.

FLIGHT DECK

QUESTIONS

11. [S 3.1] If you are using an accelerometer what happens to the spring when you feel lightest and heaviest?

12. [S 3.2] At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

13. [S 3.2] When the car and its passengers feel heavier are the wheels of the roller coaster car experiencing tension or compression?

14. [S 3.1] Where do you feel you are being thrown forward? Why does this occur?

15. [S 3.1] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.

FLIGHT DECK

QUESTIONS

16. **[S 3.3]** Compared to other amusement rides that you have experienced in the past, was this ride smoother or bumpier? Explain your reasoning.

17. **[S 3.1]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? Why?

18. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

19. Estimate the length of one train. Show your calculations.

20. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

21. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the structural and design features that are used to create an exciting but safe ride.

THE FLY

The Fly takes four thrill seekers at a time over an exhilarating 50-foot drop, through hairpin twists and turns and wild, breathtaking bumps. This coaster's unique design provides each rider with the feeling that they are riding in the front car while allowing for some of the wildest side winding turns ever experienced in a coaster.

QUESTIONS

1. [S 2.1] Look for the safety guide.
 - (a) What are the ride restrictions? Explain each one.

 - (b) What are the ride requirements? Explain what they mean.

2. [S 2.11] Write out all the instructions to riders you can see and hear at the loading platform.

3. [S 3.4] List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

THE FLY

QUESTIONS

4. [S2.4] Determine the following in seconds (show your work):
 - (a) the average time for one ride

 - (b) the average time the ride stays at the loading platform

5. [S2.4] Put these parts listed in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading; zigzag (Note: several parts may be listed more than once)

QUESTIONS

9. [S 3.1] If you are using an accelerometer what happens to the spring when you feel lightest and heaviest?

10. [S 3.2] At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

11. [S 3.2] When the car and its passengers feel heavier are the wheels of the roller coaster car experiencing tension or compression?

12. [S 3.1] Where do you feel you are being thrown forward? Why does this occur?

13. [S 3.3] Compared to other amusement rides that you have experienced in the past, was this ride smoother or bumpier? Why?

QUESTIONS

14. **[S 3.1]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? Why?

15. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

16. Estimate the length of one cart. Show your calculations.

17. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

18. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the structural and design features that are used to create an exciting but safe ride.



GRADE 5 SCIENCE

OTHER ACTIVITIES

PARK EXPLORATIONS

PARK EXPLORATIONS #2

CONSUMER SURVEY

RIDE SAFETY EXERCISE

PARK EXPLORATIONS

- Travel to each of the following rides at Canada's Wonderland and indicate the type of mechanical system that engineers have used in building them.

Types of mechanical systems: Gears, Motor, Levers, and Brakes

Amusement Ride	Type of Mechanical System
Skyrider	<i>e.g. Motor, Gears, Brakes</i>
The Bat	
Riptide	
Vortex	
Dragon Fire	
Mighty Canadian Minebuster	
Flight Deck	

- While you are exploring the Park, search for examples of turning force (torque), list where in the Park you observe these features and describe their function.

Where Observed	Feature Observed	Function
<i>e.g. Dragon Fire</i>	<i>sprocket</i>	<i>Moves chain which brings train up 1st ramp</i>

PARK EXPLORATIONS

3. As you make your way through Canada's Wonderland, observe objects that have been designed to withstand tension and compression. In the chart below, list 4 objects and identify whether they are experiencing tension or compression.

Object Observed	Tension or Compression
<i>e.g. roller coaster car on track</i>	<i>- track under compression - wheels under compression</i>

4. While walking past the attractions at Canada's Wonderland, make a list of all the safety features you observe. Across from each safety feature, identify its function.

e.g. fences surrounding amusement rides – prevent injury

JOURNAL QUESTION

In a journal entry, reflect on all of the forces acting on a structure that must be taking into account when creating an amusement ride. (e.g. frictional force of the wind)

PARK EXPLORATIONS #2

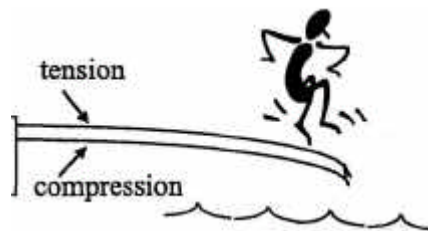
TENSION & COMPRESSION FORCES IN THE PARK

1. [S 3.2] Compression is experienced by a material when it is being squeezed. Tension is experienced by a material when it is being stretched.

→ compression ← ← tension →

Visit International Showplace. Identify whether the parts of the structure listed below are under tension or compression:

- a) Tent fabric
 - b) Cables attaching tent to rest of structure
 - c) Centre poles
 - d) Poles around the perimeter of the tent
2. [S 3.2] Visit **The Fly**. Look at the piers (columns) supporting the structure.
 - a) Are the piers under tension or compression?
 - b) Notice that the piers are wider near the bottom than they are at the top. Why do you think they're made that way?
 3. [S 3.1] A cantilever beam is a horizontal part of a structure that is only supported at one end. An example of a cantilever is a diving board. The top of a cantilever beam is in tension. The bottom of a cantilever beam is under compression.

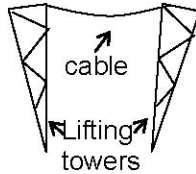


Look at the blue cantilever beams that are holding up the track on **The Fly**. (They are attached to the piers.) Why do you think that the cantilevers are thickest near the piers, and thinnest near track?

PARK EXPLORATIONS #2

4. [S 2.2] Look at **Xtreme Skyflyer**. Look at the structure that supports the riders. Notice the arch shape, a strong shape for a structure.

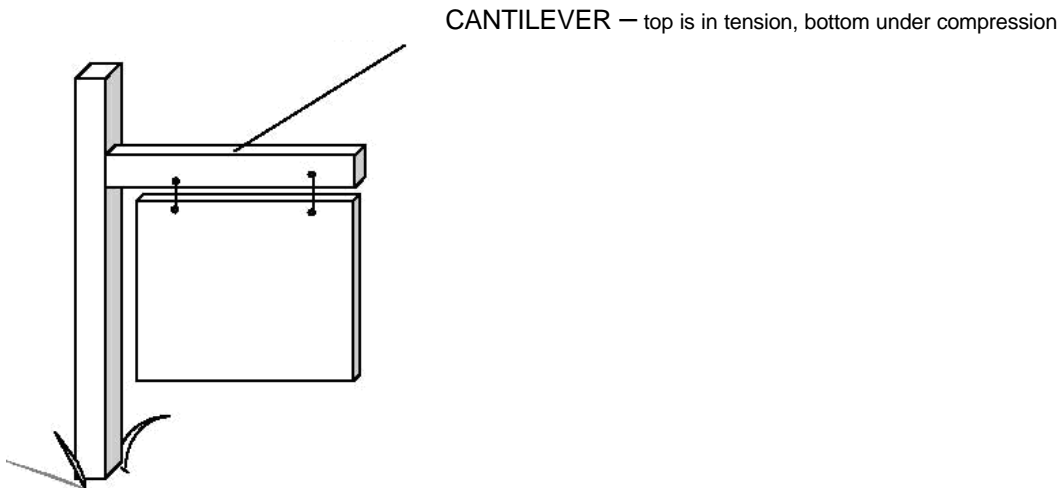
a) Are the cables supporting the riders under tension or compression? What about the cable in between the two lifting towers?



b) What simple machine is used to help lift the riders?

c) If the engineers at Canada's Wonderland wanted to use a smaller motor to lift the riders, i.e. they wanted a smaller lifting force, what could they do?

5. [S 3.2] As you walk around the Park, look for examples of cantilevers. List 3 below.



CONSUMER SURVEY

Canada's Wonderland conducts many consumer surveys, which are designed to gain an understanding of consumer expectations about the aesthetic qualities of the attractions that they display. The consumer survey is intended to gather information on public opinion of many topics that are of interest to businesses and the public. In each of the activities you are asked to conduct a survey which will identify consumer expectations regarding the aesthetic appeal of amusement rides.

I YOUR CHALLENGE (*Authentic Problem*)

You have been hired by Canada's Wonderland as a junior researcher who is gathering information on the current rides in the Park in order to choose a new ride for next season. Your job before you come to the Park is to design a survey, which will allow you to gather information on student opinions on aesthetic qualities of amusement rides. You know that the main function of an amusement ride is excitement and that safety is one indicator of the effectiveness of an amusement ride. Your task, when you return to your school, is to write a report to your supervisor at Canada's Wonderland explaining your findings.

II DESIGNING YOUR SURVEY (*Pre-visit*)

Survey topic: Aesthetic Appeal of Amusement Rides

- 1) Generate 5 open ended questions for your survey
- 2) Prepare 5 sheets of paper, use one sheet for each question to collect an array of data

III CONDUCTING YOUR SURVEY

- 1) Choose a sample group of 15 people (e.g., girls age 11)
- 2) Approach your population one person at a time or small groups
- 3) Ask all 5 questions to each person and create an array of data for each on your pre-prepared sheets

IV ANALYZING YOUR RESULTS

- 1) Summarize your data gathered in tally charts
- 2) Display your data using appropriate graphs
- 3) Analyze and interpret your data to determine, based on your findings, the kind of ride you feel should be considered for next season
- 4) Write a report to your supervisor at Canada's Wonderland explaining your findings.

V JOURNAL QUESTION

Interview a classmate about their consumer survey. In a journal entry identify bias in your classmate's questions, data collection methods, sample group or analysis of data. If you are unable to find bias, explain in detail the things that your classmate did to avoid bias.

RIDE SAFETY EXERCISE

Canada’s Wonderland provides for the safety of their guests in many ways. Security personnel walk the grounds, making sure Park rules are followed by all guests and Park staff. Park ride operators are well informed about the rides and are always watching to be sure that the ride is operating properly and safely. Rules are posted at each ride and are to be obeyed for a safe and enjoyable ride.

Select two different types of rides and answer the following questions on the table.

QUESTIONS	FIRST RIDE	SECOND RIDE
1. What is the name of the ride?		
2. What type of ride is it? (Is it a wooden roller coaster, loop-the-loop roller coaster, circular ride, etc?)		
3. Do you have to be a certain height to ride the ride? If so, how is this height measured?		
4. What safety checks does the ride operator make prior to starting the ride?		
5. How does the ride operator start and stop the ride?		
6. Does the ride have a lap bar or safety belt that holds you firmly in the seat? If so, what form of safety belt is used and how does it work?		
7. Are there specific rules or restrictions posted at the ride? If so, what are they?		
8. What other safety features or operation checks do you see on the ride?		
GENERAL QUESTIONS		
9. Why is there a height rule for some rides and not others?		

10. Which rides are more likely to have safety belts or lap bars?		
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