



GRADE 7 & 8 SCIENCE

TABLE OF CONTENTS

In-School Preparation (includes Curriculum Correlations)	page 2
Amusement Ride Activities	page 22
Park Exploration	page 71
Consumer Survey	page 71
Building Project – <i>WonderCoaster Competition</i>	page 71
Building Project Report	page 71



**GRADE 7 & 8
IN-SCHOOL PREPARATION**

MEETING THE EXPECTATIONS – Ontario Curriculum Correlations

AMUSEMENT RIDE RUBRICS

BASIC MEASUREMENTS

MATH PRACTICE

LEARNING SCIENCE LANGUAGE

SCIENCE LANGUAGE EXERCISE

MEETING THE EXPECTATIONS

CW Physics, Science & Math Day Activities

A correlation with the Ontario Science Curriculum Grades 7 & 8

This is a list of the Specific Expectations met by our activities. They are divided by the type of activity we provide and the expectations these activities meet. Sometimes beside the question in the activity portion of the manual there will be specific reference to which expectation the activity meets.

G7 – refers to Grade 7 Expectation number

G8 – refers to Grade 8 Expectation number

Grade 7 – Understanding Structures and Mechanisms Form and Function

Amusement Ride Activities

Includes activities related to Riptide, The Bat, Vortex, Mighty Canadian Minebuster, and Flight Deck

Developing Investigation and Communication Skills

- 2.3** investigate the factors that determine the ability of a structure to support a load
- 2.4** use technological problem-solving skills to determine the most efficient way for a structure to support a given load
- 2.6** use appropriate science and technology vocabulary, including in oral and written communication
- 2.7** use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

- 3.1** classify structures as solid structures, frame structures, or shell structures
- 3.2** describe ways in which the centre of gravity of a structure affects the structure's stability
- 3.3** identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure
- 3.4** distinguish between external forces and internal forces acting on a structure
- 3.5** describe the role of symmetry in structures

Park Exploration

Developing Investigation and Communication Skills

- 2.3** investigate the factors that determine the ability of a structure to support a load
- 2.4** use technological problem-solving skills to determine the most efficient way for a structure to support a given load
- 2.7** use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

- 3.1** classify structures as solid structures, frame structures, or shell structures
- 3.2** describe ways in which the centre of gravity of a structure affects the structure's stability
- 3.3** identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure
- 3.5** describe the role of symmetry in structures

Consumer Survey

Relating Science and Technology to Society and the Environment

1.1 evaluate the importance for individuals, society, the economy, and the environment of factors that should be considered in designing and building structures and devices to meet specific needs

Developing Investigation and Communication Skills

2.6 use appropriate science and technology vocabulary, including in oral and written communication

2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

Wonderland Building Project (Roller Coaster) – see Contest rules on website

Relating Science and Technology to Society and the Environment

1.1 evaluate the importance for individuals, society, the economy, and the environment of factors that should be considered in designing and building structures and devices to meet specific needs

Developing Investigation and Communication Skills

2.1 follow established safety procedures for using tools and handling materials

2.2 design, construct, and use physical models to investigate the effects of various forces on structures

2.3 investigate the factors that determine the ability of a structure to support a load

2.4 use technological problem-solving skills to determine the most efficient way for a structure to support a given load

2.5 investigate methods used by engineers to ensure structural safety

2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

3.3 identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure

3.4 distinguish between external forces and internal forces acting on a structure

3.5 describe the role of symmetry in structures

3.6 identify and describe factors that can cause a structure to fail

3.7 identify the factors that determine the suitability of materials for use in manufacturing a product

Building Project Report

Developing Investigation and Communication Skills

2.3 investigate the factors that determine the ability of a structure to support a load

2.6 use appropriate science and technology vocabulary, including in oral and written communication

2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

3.2 describe ways in which the centre of gravity of a structure affects the structure's stability

3.3 identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure

3.4 distinguish between external forces and internal forces acting on a structure

3.5 describe the role of symmetry in structures

3.7 identify the factors that determine the suitability of materials for use in manufacturing a product

Grade 8 – Understanding Structures and Mechanisms Systems in Action

Amusement Ride Activities

Includes activities related to Riptide, The Bat, Vortex, Mighty Canadian Minebuster, Flight Deck and Drop Zone

Developing Investigation and Communication Skills

2.2 investigate the work done in a variety of everyday activities and record the findings quantitatively

2.4 use technological problem-solving skills to investigate a system that performs a function or meets

2.5 investigate the information and support provided to consumers/clients to ensure that a system functions safely and effectively

2.6 use appropriate science and technology vocabulary, in oral and written communication

2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

3.3 identify the various processes and components of a system that allow it to perform its function efficiently and safely

3.5 understand and use the formula work = force \times distance ($W = F \times d$) to establish the relationship between work, force, and distance moved parallel to the force in simple systems

Park Exploration

Developing Investigation and Communication Skills

2.6 use appropriate science and technology vocabulary, in oral and written communication

2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

3.3 identify the various processes and components of a system that allow it to perform its function efficiently and safely

Consumer Survey

Developing Investigation and Communication Skills

2.6 use appropriate science and technology vocabulary, in oral and written communication

2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

3.9 identify social factors that influence the evolution of a system

Wonderland Build Project (Roller Coaster) – see Contest Rules on website

Developing Investigation and Communication Skills

2.1 - follow established safety procedures for working with apparatus, tools, materials,

2.2 investigate the work done in a variety of everyday activities and record the findings quantitatively

2.4 use technological problem-solving skills to investigate a system that performs a function or meets a need

Building Project Report

Relating Science and Technology to Society and the Environment

- 1.1 assess the social, economic, and environmental impacts of automating systems
- 1.2 assess the impact on individuals, society, and the environment of alternative ways of meeting needs that are currently met by existing systems, taking different points of view into consideration

Developing Investigation and Communication Skills

- 2.2 investigate the work done in a variety of everyday activities and record the findings quantitatively
- 2.4 use technological problem-solving skills to investigate a system that performs a function or meets a need
- 2.6 use appropriate science and technology vocabulary, in oral and written communication
- 2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

Understanding Basic Concepts

- 3.5 understand and use the formula work = force \times distance ($W = F \times d$) to establish the relationship between work, force, and distance moved parallel to the force in simple systems

Grade 8 – Understanding Matter and Energy - Fluids

Amusement Ride Activities

Includes activities related to Riptide, The Bat, Vortex, Mighty Canadian Minebuster, Flight Deck and Drop Zone

Developing Investigation and Communication Skills

- 2.7 use appropriate science and technology vocabulary in oral and written communication

Understanding Basic Concepts

- 3.1 demonstrate an understanding of viscosity and compare the viscosity of various liquids
- 3.4 explain the difference between liquids and gases in terms of their compressibility and how their compressibility affects their usage
- 3.6 explain in qualitative terms the relationship between pressure, volume, and temperature when a liquid or a gas is compressed or heated
- 3.8 compare the ways in which fluids are used and controlled in living things to the ways in which they are used and controlled in manufactured devices

Park Exploration and Consumer Survey

- 2.7 use appropriate science and technology vocabulary in oral and written communication
- 2.8 use a variety of forms to communicate with different audiences and for a variety of purposes

CATEGORY	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
<p>Understanding of concepts</p> <p>Demonstrates an understanding of the effect of forces acting 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>Uses 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 minutes)	Breathing Rate (breaths 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. $6 \text{ paces} \times 40 \text{ cm/pace} = 240 \text{ cm}$
 $5 \text{ hand spans} \times 18 \text{ cm/hand span} = 90 \text{ cm}$
 $3 \text{ cars} \times 4 \text{ passengers/car} = 12 \text{ passengers}$

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 the diameter of a loonie in centimetres.

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

- g) Use your hand span to estimate the diameter of a large circle, such as a bicycle wheel or a hula-hoop.

- h) Use your hand span to estimate the circumference of the circle in g).

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

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

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

LEARNING SCIENCE LANGUAGE

TEACHER DEFINITIONS

Acceleration	The rate at which velocity increases. When a roller coaster train moves down a hill, its velocity increases. That is, the train is accelerating.
Centripetal Force	Any object undergoing circular motion has force acting on it which pushes it toward the center of the circular path. This is the centripetal force.
Compressibility	When pressure is applied to an object it tends to cause a decrease in the size of the object. Air has a high compressibility.
Deceleration	The rate at which velocity decreases. When a roller coaster train is moving up a hill, its velocity decreases. That is, the train is decelerating.
Ergonomic Design	Designing machinery to suit the comfort and safety of humans. Roller coaster cars are designed to be comfortable as well as safe.
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.
Hydraulics	The branch of physics, which uses water power to do work. An auto-mechanic shop uses hydraulic lifts to raise vehicles off the ground.
Incompressibility	When pressure applied to an object does not cause a decrease in the volume of the object. Most solid objects are incompressible.
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.
Momentum	The momentum of a moving object determines how easy or difficult it is to stop the object. Momentum depends on the velocity of the object as well as its mass. Therefore, the momentum of a heavy truck is much greater than that of a small car moving at the same velocity.

LEARNING SCIENCE LANGUAGE

TEACHER DEFINITIONS *(cont'd)*

Parabola	A curve that can be constructed by slicing a cone. Cutting the cone parallel to its side and through its base will create a parabolic shape. An object thrown forward in the air follows a parabolic path.
Pier	A piece of metal tubing or solid concrete that supports a large structure. A bridge has piers that support it at either end. Roller coasters use piers to support their large structure.
Pneumatics	The branch of physics, which deals with compressed gases such as air. Many roller coasters use pneumatic braking systems.
Shell	The outside covering of an object. The framework of a structure.
Truss	A framework that uses triangular shapes to support a structure. Trusses are used for large spans, as in bridges, and also used to support heavy loads.
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.
Weightlessness	A person falling freely is said to be weightless. This is because there is no force acting upwards on them from the ground.

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 structure's support piers, is called **COMPRESSION**.

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

The **VELOCITY** of the roller coaster train increases as it rolls down a hill.

A roller coaster train **ACCELERATES** as it gains speed while rolling down a hill.

A roller coaster train **DECELERATES** as it loses speed while climbing up a hill.

A roller coaster train gains enough **MOMENTUM** falling down a hill to keep it going all the way to the top of the next hill.

LEARNING SCIENCE LANGUAGE

A roller coaster has the most **POTENTIAL ENERGY** when it is at the highest peak of the ride. As the velocity increases going down a hill, a roller coaster train gains **KINETIC ENERGY**. **INERTIA** causes the passenger to lean forward when the roller coaster train stops at the end of the ride.

The rubbing between the roller coaster train's wheels and the track causes a **FRictionAL** force,
This slows the roller coaster train down.

SCIENCE LANGUAGE EXERCISES

Select the correct word and complete each sentence.

GRAVITY MASS PARABOLA
WEIGHTLESS WEIGHT

1. The gravity pull between an object and the earth (or another large body) is called _____.
2. The amount of material a body contains is its _____.
3. A _____ object appears to have no weight.
4. A curved path produced by a falling body is called a _____.
5. The force of attraction between all bodies in the universe is called _____.

ACCELERATION DECELERATION
KINETIC ENERGY POTENTIAL ENERGY

1. The energy that an object has because of its position is called _____.
2. An increase in speed is called _____.
3. The energy that an object in motion has is called _____.
4. A decrease in speed is called _____.

FRICTION INERTIA
CENTRIPETAL FORCE FORCE

1. The tendency of an object to remain at rest or in motion unless acted on by force is called _____.
2. A push or pull is a _____.
3. A force pulling or pushing an object towards the centre of its circular path is called _____.
4. Resistance to motion due to one object rubbing against another is called _____.

SCIENCE LANGUAGE EXERCISES

Select the correct word and complete each sentence.

TENSION **FRAME** **PIER**
TRUSS **SHELL** **COMPRESSION**

1. A _____ is a series of triangular or rectangular frames.
2. A structure used to support the compression caused by steel roller coasters is called a _____.
3. _____ is the force that tends to stretch an object.
4. A supporting skeleton of a structure is called a _____.
5. A _____ is a one piece supporting structure.
6. _____ is the downward force exerted at the structure's support piers.

PNEUMATIC **INCOMPRESSIBLE** **HYDRAULIC**
ERGONOMIC DESIGN **COMPRESSIBLE**

1. If a substance can be made smaller by means of pressure, then it is _____. If, on the other hand, the substance will not reduce in size, then it is _____.
2. Mechanical devices that use fluids such as oil to operate are _____ systems; those that use gases, such as air or nitrogen, are _____ systems.
3. When an amusement ride is built to be comfortable, adjustable to different sizes of people, and supportive to prevent injury, we can say that it has a/an _____.

SCIENCE LANGUAGE EXERCISES

Select the correct word and complete each sentence.

ACCELERATE
MASS
MOMENTUM
POTENTIAL ENERGY
TRUSS
PARABOLA

INERTIA
GRAVITY
FRICTION
FRAME
COMPRESSION

CENTRIPETAL FORCE
KINETIC ENERGY
WEIGHTLESS
PIERS
TENSION

1. As the roller coaster cars roll over a peak, you rise off your seat and feel _____.
2. The shape of a roller coaster hill is called a _____.
3. The force of _____ pulls you down the roller coaster.
4. The force of _____ slows you down throughout your roller coaster trip.
5. When you are the highest on the track above the ground, you have the most _____.
6. When you are moving the fastest, you have the most _____.
7. Because of your speed at the bottom of the roller coaster hill, you have enough _____ to climb to the top of the next hill.
8. An inward _____ is required to make you turn.
9. Your body has _____ and, therefore, tries to move in a straight line when the roller coaster track turns.
10. An empty roller coaster train and a loaded 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 _____.
11. The parts of a steel roller coaster that are used to resist compression forces are called _____.
12. Wooden roller coasters use this type of triangular structure: _____.
13. A series of connected parts that make up a roller coaster is called a _____.
14. _____ occurs on the structure of a roller coaster when the force of the train tends to cause extension of the supporting structure.
15. Steel roller coasters are equipped with support piers to help resist the _____ forces applied by the trains.



GRADE 7 & 8

AMUSEMENT RIDE ACTIVITIES

RIPTIDE

THE BAT

VORTEX

MIGHTY CANADIAN MINEBUSTER

FLIGHT DECK

DROP TOWER

THE FLY

RIPTIDE

Riptide is Wonderland's super swing with attitude and altitude! Riptide will take passengers through snap rollovers and 360° degree 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. 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. Write out all the instructions to riders you can see and hear at the loading platform.

QUESTIONS

3. List the materials used to build this ride. Why would ride engineers choose these materials for the outdoor environment?

4. **[G8-3.9]** List three things that have been done to this ride to make it look fun, attractive and exciting.

5. **[G7-2.6, G8-S2.6]** 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

6. **[G7-2.6, G8-S2.6]** 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.)

7. **[G7-2.6, G8-S2.6]** Where on this ride is the train's kinetic energy the highest?

QUESTIONS

8. **[G7-2.6, G8-S2.6]** Answer the following questions for the vertical spin.
- a) At what point(s) are you losing speed?

 - b) At what point(s) are you gaining speed?

 - c) At what point(s) do you feel the lightest?

 - d) At what point(s) do you feel the heaviest?
9. **[G7-2.3,2.4,3.2,3.3]** Draw a picture of a vertical spin and label the points in the spin where you feel pressed down on your seat the most. Why does this occur? Is the passenger compartment heavier when this occurs?
10. **[G7-2.3,2.4,3.2,3.3]** If you are using an accelerometer record the number of g's you observe when you feel lightest and heaviest? Where do these points occur?

RIPTIDE

QUESTIONS

11. **[G7-3.4]** List all of the forces that affect the movement of this ride.

12. **[G7-2.3,2.4,3.2,3.3]** 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? Explain.

13. **[G8-2.5]** State your hand span in centimetres. Use your hand span to calculate the inside width of the passenger compartment. (Show your work.)

14. **[G7-3.5, G8-3.3]** Use symmetry to determine where the centre of gravity is located on this ride? Draw a picture that shows the approximate location of the centre of gravity.

15. **[G8-2.5]** What do you think engineers have done in the ergonomic design of the seating compartments to accommodate people of different weight, height and age?

QUESTIONS

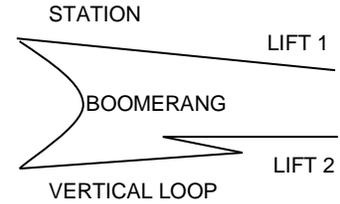
16. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.
17. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all the structural and design features that are used to create an exciting but safe ride.

FOR GRADE 8 ONLY

1. **[G8-3.6]** Use your understanding of viscosity to predict how the temperature of the day in the park might affect the speed of the ride.
2. **[G8-2.5]** Use your understanding of the relationship between mass and weight to explain why, even though your mass stays constant, you feel less heavy when falling.
3. **[G8-2.5,3.5]** Locate the levers used in this ride. Hypothesize whether shorter or longer levers would change the efficiency of the mechanism. Explain your answer.

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. 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. Describe the feature(s) that prevent injury to people walking on the entrance path under the train from objects that may fall out of riders' pockets.

THE BAT

QUESTIONS

6. [G7-2.3,2.4,3.2,3.3, G8-2.2,3.5] Draw a diagram of the arrangement of the wheels on each car and label them top, side and bottom. Which wheel experiences the most force? Explain.

When the car is:

Turning _____, Climbing _____, Upside Down _____

7. [G7-2.6, G8-2.6] Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; boomerang; breaking; loading; vertical loop (Note: Several parts may be listed more than once.)
8. [G7-2.6, G8-2.6] Describe how the train gets to the top of the first ramp. Include diagrams.
9. [G7-2.6, G8-2.6] a) Where on this ride is the train's potential energy due to gravity the highest?
- b) Where is the train's kinetic energy the highest?

THE BAT

QUESTIONS

10. **[G7-3.4]** Answer the following questions for the vertical loop, which is beyond the boomerang.
- a) At what point(s) are you losing speed?

 - b) At what point(s) are you gaining speed?

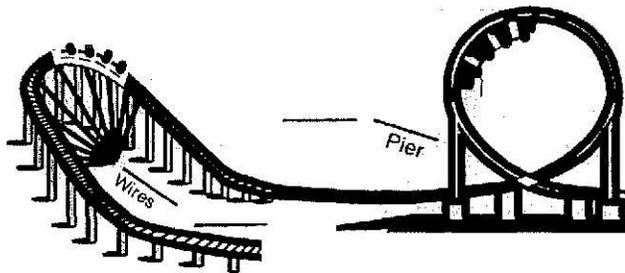
 - c) At what point(s) do you feel the lightest?

 - d) At what point(s) do you feel the heaviest?
11. **[G7 –3.4]** 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? Explain.
12. **[G7-2.3, 2.4, 3.2, 3.3]** If you are using an accelerometer record the number of g's you observe when you feel lightest and heaviest? Where do these points occur?

THE BAT

QUESTIONS

13. [G7-2.3, 2.4, 3.2, 3.3, G8-2.4] Use the observations made with your accelerometer to determine how gravitational force affects the movement of an object. (e.g. Do greater g's cause faster or slower speeds?)
14. [G7-3.4] Where do you feel you are being thrown forward? Why does this occur?
15. [G7-2.3, 2.4, 3.2, 3.3] Use the following diagram to identify where tension and compression forces affect the structure of the ride.



16. [G7-2.6, G8-2.6] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.
17. [G8-3.3] State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

QUESTIONS

3. Describe what the operators do to ensure this ride is safe.

4. **[G7-2.6, G8-2.6]** List three things that have been done to this ride to make it look fun, attractive and exciting.

5. **[G7-2.6, G8-2.6]** Determine the following in seconds (show your work):
 - a) the average time for one ride

 - b) the average time a train stays at the loading platform

6. **[G7-2.6, G8-2.6]** Describe how the train gets to the top of the first hill. Include diagrams.

7. **[G7-2.6, G8-2.6]** Which hill on this ride is the highest? State why it must be the highest.

QUESTIONS

8. **[G7-2.6, G8-2.6]** 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. **[G7-2.6]** (a) At what location(s) do you travel the fastest on this ride?

b) After dropping down the first hill, where do you travel slowest?

c) Do you think you travel faster at the top of a low hill or at the top of a high hill? Why?

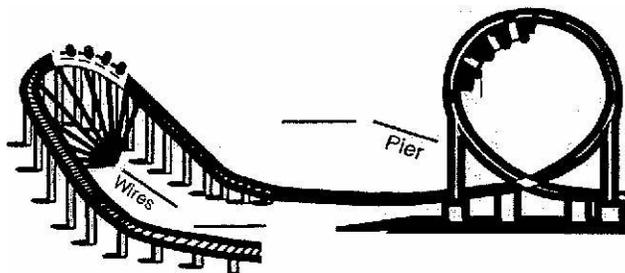
10. **[G7-2.6]** Is there any time on the ride when you feel as if you are leaving your seat? Explain.

11. **[G7-2.6]** 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? Explain.

VORTEX

QUESTIONS

12. [G7-2.3,2.4,3.2,3.3,] If you are using an accelerometer record the number of g's you observe when you feel lightest and heaviest? Where do these points occur?
13. [G7-2.3,2.4,3.2,3.3, G8-2.4] Use the observations made with your accelerometer to determine how gravitational force affects the movement of an object. (e.g. Do greater g's cause faster or slower speeds?)
14. [G7-2.6] Where do you feel you are being thrown forward? Why does this occur?
15. [G7-2.3,2.4,3.2,3.3] Use the following diagram to identify where tension and compression forces affect the structure of the ride.



QUESTIONS

16. [7-S2.6, 8-S2.6] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.
17. [8-S2.5] 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. [7-S2.3,2.4,3.2,3.3] State the location(s) on the ride where the train has the most:
- a) potential energy due to gravity
 - b) kinetic energy
 - c) centripetal force acting on it
 - d) deceleration

QUESTIONS

20. **[8-S3.3]** What do you think engineers have done in the ergonomic design of the seating compartments to accommodate people of different weight, height and age?

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

22. **[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.

FOR GRADE EIGHT ONLY

1. **[8-M3.6]** Use your understanding of viscosity to predict how the temperature of the day in the park might affect the speed of the ride.

2. **[8-S2.5]** Use your understanding of the relationship between mass and weight to explain why even though your mass stays constant you feel less heavy when falling.

3. **[8-M3.4]** Pneumatic braking systems are used in the roller coaster rides at Canada's Wonderland. Why is air a better substance to use than oil to operate these systems? (Use words such as, compressibility and incompressibility to explain your answer)

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. 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. Write out all the instructions to riders you can see and hear at the loading platform.

3. Describe what the operators do to ensure this ride is safe.

MIGHTY CANADIAN MINEBUSTER

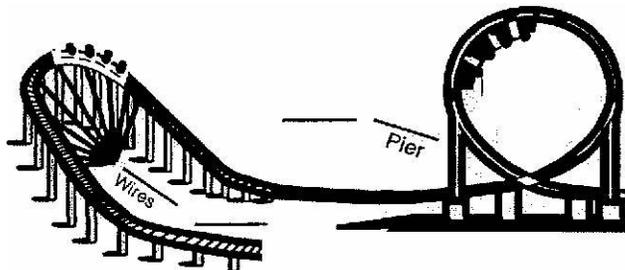
QUESTIONS

8. [7-S2.6, 8-S2.6] (a) At what location(s) do you travel fastest on this ride?
- b) After dropping down the first hill, where do you travel the slowest?
- c) Do you think you travel faster at the top of a low hill or at the top of a high hill? Why?
9. [7-S3.4] Is there any time on the ride when you feel as if you are leaving your seat? Explain.
10. [7-S3.4] At what location(s) do you feel pressed down on your seat the most? Why does this occur?
11. [7-S2.3,2.4,3.2,3.33] If you are using an accelerometer record the number of g's you observe when you feel lightest and heaviest? Where do these points occur?

MIGHTY CANADIAN MINEBUSTER

QUESTIONS

12. [7-S2.4,2.4,3.2,3.3, 8-S2.5] Use the observations made with your accelerometer to determine how gravitational force affects the movement of an object. (e.g. Do greater g's cause faster or slower speeds?)
13. [7-S3.4] Where do you feel you are being thrown forward? Why does this occur?
14. [7-S.3,2.4,3.2,3.3] Use the following diagram to identify where tension and compression forces affect the structure of the ride.



15. [7-S2.6, 8-S2.6] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.
16. [8-S2.5] State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

MIGHTY CANADIAN MINEBUSTER

QUESTIONS

17. Estimate the length of one train. Show your calculations.
18. **[7-S2.3,2.4,3.2,3.3]** State the location(s) on the ride where the train has the most:
- a) potential energy due to gravity

 - b) kinetic energy

 - c) centripetal force acting on it

 - d) deceleration
19. **[8-S3.3]** What do you think engineers have done in the ergonomic design of the seating compartments to accommodate people of different weight, height and age?

MIGHTY CANADIAN MINEBUSTER

QUESTIONS

20. Conduct your CONSUMER SURVEY or complete the 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.

FOR GRADE EIGHT ONLY

1. **[8-M3.6]** Use your understanding of viscosity to predict how the temperature of the day in the Park might affect the speed of the ride.
2. **[8-S2.5]** Use your understanding of the relationship between mass and weight to explain why even though your mass stays constant you feel less heavy when falling.
3. **[8-M3.4]** Pneumatic braking systems are used in the roller coaster rides at Canada's Wonderland. Why is air a better substance to use than oil to operate these systems? (Use words such as, compressibility and incompressibility to explain your answer)

FLIGHT DECK

QUESTIONS

8. [7-S2.6, 8-S2.6] Describe how the train gets to the top of the first hill. Include diagrams.

9. [7-S2.6, 8-S2.6] Which hill on this ride is the highest? State why it must be the highest.

10. [7-S2.6, 8-S2.6] (a) At what location(s) do you travel fastest on this ride?

b) after dropping down the first hill, where do you travel the slowest?

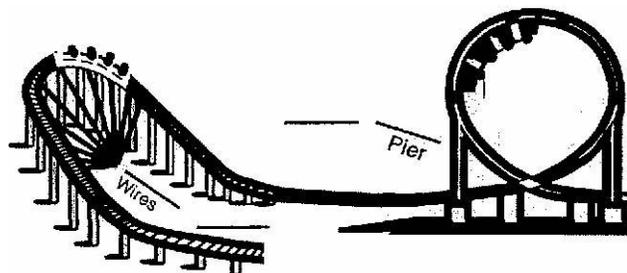
c) Do you think you travel faster at the top of a low hill or at the top of a high hill? Why?

11. [7-S3.4] Is there any time on the ride when you feel as if you are leaving your seat? Explain.

FLIGHT DECK

QUESTIONS

12. [7-S2.6] At what location(s) do you feel pressed down on your seat the most? Why does this occur?
13. [7-S2.3,2.4,3.2,3.3] If you are using an accelerometer record the number of g's you observe when you feel lightest and heaviest? Where do these points occur?
14. [7-S2.3,2.4,3.2,3.3, 8-2.4] Use the observations made with your accelerometer to determine how gravitational force affects the movement of an object. (e.g. Do greater g's cause faster or slower speeds?)
15. [7-S2.6] Where do you feel you are being thrown forward? Why does this occur?
16. [7-S2.3,2.4,3.2,3.3] Use the following diagram to identify where tension and compression forces affect the structure of the ride.



17. [7-S2.6, 8-S2.6] Do you think the riders in the front car experience the same sensations as the riders in the rear car? Explain why.

QUESTIONS

18. **[8-S2.5]** 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. **[8-S3.3]** What do you think engineers have done in the ergonomic design of the seating compartments to accommodate people of different weight, height and age?

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

22. **[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

QUESTIONS

FOR GRADE EIGHT ONLY

1. **[8-M3.6]** Use your understanding of viscosity to predict how the temperature of the day in the park might affect the speed of the ride.

2. **[8-S2.5]** Use your understanding of the relationship between mass and weight to explain why even though your mass stays constant you feel less heavy when falling.

3. **[8-M3.4]** Pneumatic braking systems are used in the roller coaster rides at Canada's Wonderland. Why is air a better substance to use than oil to operate these systems? (Use words such as, compressibility and incompressibility to explain your answer)

DROP TOWER

On **Drop Tower** riders sit on a high-speed transport lift that travels over 16 feet per second, 230 feet in the air. At the top of the tower, guests have but moments to take in the panoramic view of the Park before it registers that what goes up must come down. Free falling at more than 100 km/h, 23 stories flash by as the ground races up and catches riders in a silent, smooth stop.



QUESTIONS

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. Write out all the instructions to riders you can see and hear at the loading platform.
3. **[8-S3.9]** List the materials used to build this ride. Why would amusement ride engineers choose these materials for the outdoor environment?

DROP TOWER

QUESTIONS

8. [7-S2.6, 8-S2.6] Answer the following questions for this ride.
- a) At what point(s) are you gaining speed?

 - b) At what point(s) are you losing speed?

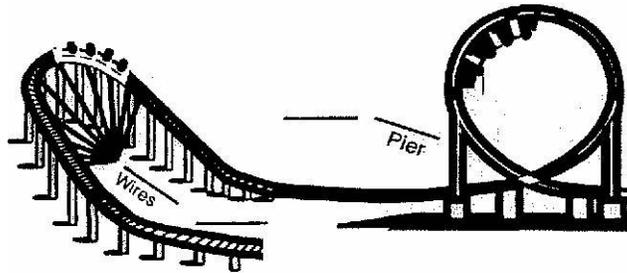
 - c) At what point(s) do you feel the lightest?

 - d) At what point(s) do you feel the heaviest?
9. [7-S3.4] Draw a picture of the stunt tower and label the points where you feel pressed down on your seat the most. Why does this occur? Is the passenger compartment heavier when this occurs?
10. [7-S2.3,2.4,3.2,3.3] If you are using an accelerometer record the number of g's you observe when you feel lightest and heaviest?

DROP TOWER

QUESTIONS

11. [7-S2.3,2.4,3.2,3.3, 8-S2.4] Use the observations made with your accelerometer to determine how gravitational force affects the movement of an object. (e.g. Do greater g 's cause faster or slower speeds?)
12. [7-S2.3,2.4,3.2,3.3] Use the following diagram to identify where tension and compression forces affect the structure of the ride.



13. [7-S3.4, 8-S2.6] List all of the forces that affect the movement of this ride.
14. [8-S2.5] State your hand span in centimetres. Use your hand span to calculate the inside width of the passenger compartment. (Show your work.)

DROP TOWER

QUESTIONS

FOR GRADE EIGHT ONLY

1. **[8-M3.6]** Use your understanding of viscosity to predict how the temperature of the day in the park might affect the speed of the ride.

2. **[8-S2.5]** Use your understanding of the relationship between mass and weight to explain why even though your mass stays constant you feel less heavy when falling.

3. **[8-M3.4, 8-S2.6]** **Drop Tower** has a dual braking system. You are stopped from the free fall by a copper braking mechanism. The ride comes to a complete stop and descends the remaining few meters onto pneumatic bumpers, which secure the car at the loading and unloading platform. Describe the different sensations that you feel as a result of these two braking systems. (Use words such as friction and compressibility)

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 also allowing for some of the wildest side winding turns ever experienced in a coaster.

QUESTIONS

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. Write out all the instructions to riders you can see and hear at the loading platform.

3. **[7-S10, 8-S12]** List three things that have been done to this ride to make it look fun, attractive and exciting. (e.g. form, colour, pattern, type, surface)

THE FLY

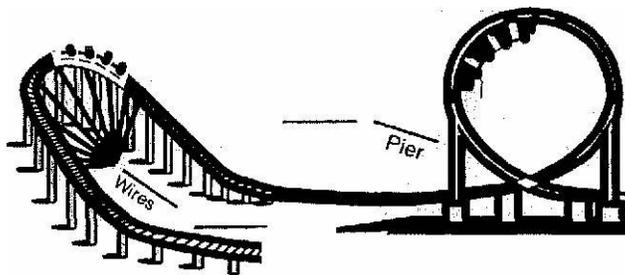
QUESTIONS

8. [7-S2.6, 8-S2.6] (a) At what location(s) do you travel fastest on this ride?
- b) After dropping down the first hill, where do you travel the slowest?
- c) Do you think you travel faster at the top of a low hill or at the top of a high hill? Why?
9. [7-S3.4] Is there any time on the ride when you feel as if you are leaving your seat? Explain.
10. [7-S3.4] At what location(s) do you feel pressed down on your seat the most? Why does this occur?
11. [7-S2.3,2.4,3.2,3.3] If you are using an accelerometer record the number of g's you observe when you feel lightest and heaviest? Where do these points occur?

THE FLY

QUESTIONS

12. [7-S2.3,2.4,3.2,3.3, 8-2.4] Use the observations made with your accelerometer to determine how gravitational force affects the movement of an object. (e.g. Do greater g's cause faster or slower speeds?)
13. [7-S3.4] Where do you feel you are being thrown forward? Why does this occur?
14. [7-S2.3,2.4,3.2,3.3] Use the following diagram to identify where tension and compression forces affect the structure of the ride.



15. [8-S2.5] State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

QUESTIONS

16. [8-S3.3,2.5] What do you think engineers have done in the ergonomic design of the seating compartments to accommodate people of different weight, height and age?
17. Estimate the length of one cart. Show your calculations.
18. [7-S2.3,2.4,3.2,3.3] State the location(s) on the ride where the train has the most:
- a) potential energy due to gravity
 - b) kinetic energy
 - c) centripetal force acting on it
 - d) deceleration

QUESTIONS

19. Conduct your CONSUMER SURVEY or complete the 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.

FOR GRADE EIGHT ONLY

1. **[8-M3.6]** Use your understanding of viscosity to predict how the temperature of the day in the Park might affect the speed of the ride.
2. **[8-S2.5]** Use your understanding of the relationship between mass and weight to explain why even though your mass stays constant you feel less heavy when falling.
3. **[8-M3.4]** Pneumatic braking systems are used in the roller coaster rides at Canada's Wonderland. Why is air a better substance to use than oil to operate these systems? (Use words such as compressibility and incompressibility to explain your answer)



GRADE 7 & 8

OTHER ACTIVITIES

PARK EXPLORATIONS

CONSUMER SURVEY

RIDE SAFETY EXERCISE

EXPLORING AMUSEMENT PARK CAREERS

JOB SEARCH

BUILDING PROJECT

BUILDING PROJECT RUBRIC

PARK EXPLORATION

1. 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.

Amusement Ride	Type of Mechanical System
The Bat	
Drop Tower	
Vortex	
Riptide	
Mighty Canadian Minebuster	
Flight Deck	

2. Refer back to the question where you identified areas on the rides where you felt a greater g-force. Since the car and passengers are heavier at those areas, the structures that hold the track need to be stronger. Observe and describe the thing that engineers have done in those areas to create a stronger structure. (Look for thickness of piers, number of support wires, use of trusses, and number of track ties)

PARK EXPLORATION

3. As you make your way through Canada’s Wonderland, observe objects that have been designed using symmetry. In the chart below, list four (4) symmetrical objects and describe the function of symmetrical design.

Object Observed	Symmetrical Function
<i>e.g. roller coaster car seats (left & right)</i>	<ul style="list-style-type: none"> - <i>maintain balance</i> - <i>gives equal seating space</i>

4. While walking past the attractions at Canada’s Wonderland, make a list of all the moving objects that you observe. Across from each moving object, identify the force that causes the movement. (*e.g. roller coaster train falling from top of hills – force of gravity*)

JOURNAL QUESTION

In a journal entry, reflect on all of the structure and design elements that are taken into account when creating an amusement ride.

CONSUMER SURVEY

Canada's Wonderland conducts many consumer surveys, which are designed to gain an understanding of consumer expectations about safety and excitement. 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 function and effectiveness 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 about safety and excitement. 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: A) Amusement Ride Excitement B) Amusement Ride Safety

- 1) Choose a survey topic.
- 2) 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., boys age 12)
- 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 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.

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?		

EXPLORING AMUSEMENT PARK CAREERS

Just like the real world, a theme or amusement park offers many career opportunities. In fact, an amusement park is a microcosm, a community regarded as a miniature world.

Your job here is to identify at least one Park career/job for each occupational cluster listed below. After you identify the career/job, you will need to complete the chart by listing a few basic skill requirements and the education necessary to be successful in that particular job.

Good luck on your job search!

Occupational Cluster & Identified Job	Job Description	Necessary Education
1. Agri-business/ Natural Resources		
2. Manufacturing		
3. Business/ Office		
4. Health		
5. Public Service		
6. Environment		
7. Communications/ Media		
8. Hospitality/ Recreation		
9. Marketing/ Distribution		
10. Personal Services		
11. Marine Science		
12. Construction		
13. Transportation		
14. Consumer/ Homemaking		
15. Fine Arts/ Humanities		

JOB SEARCH

To build an amusement park like Canada’s Wonderland, to keep it going and to keep it growing, involves many people with different educational backgrounds doing lots of different things.

Take a break or use some of the time you might be waiting in line to do a little thinking about what jobs must be filled to successfully operate Canada’s Wonderland. Divide your jobs into two categories: jobs easily observed and those that must take place behind the scenes. You may discover a job you might like to have in the future!

a) Jobs easily observed:

1 _____ 2 _____ 3 _____
4 _____ 5 _____ 6 _____
7 _____ 8 _____ 9 _____
10 _____ 11 _____ 12 _____

b) Jobs behind the scenes:

1 _____ 2 _____ 3 _____
4 _____ 5 _____ 6 _____
7 _____ 8 _____ 9 _____
10 _____ 11 _____ 12 _____

c) Select one of the jobs that you identified that might be of interest to you in the future.

1. What job did you select? _____

2. Write a job description for your job _____

3. What education is necessary for your job? _____

4. What do you expect is the annual salary of your job? \$ _____

BUILDING PROJECT

CANADA'S WONDERLAND

GRADE 7 / 8 BUILDING PROJECT

TOPIC Roller Coaster

Your task will be to build a roller coaster before your trip to Canada's Wonderland. Roller coasters will be judged within your school and the top four coasters from your grade within your school may be submitted in the Canada's Wonderland Wonder Coaster Contest. Winning entries at this contest will be displayed in the amusement park and winning builders will receive a prize. See the contest rules in the DOWNLOADS section at www.canadaswonderland.com

BUILDING PROJECT REPORT

A report will accompany this building project and will be submitted to your teacher. The design / build process has many components which act like a formula for constructing an effective project. In your project report, you will include the following components:

- a) Design diagrams and notes
- b) Building process journal
- c) Materials used and suggested ways of conserving them in the future
- d) Modifications made and problem solving process involved in improving the performance and aesthetic appeal of the project
- e) Safety factors taken into consideration when building
- f) Charts and tables displaying results of devices that you have tested based on judging criteria
- g) An oral or written presentation to communicate the results of your investigation using media works, written notes, diagrams and descriptions

CATEGORY	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
<p>Understanding of Concepts</p> <p>Demonstrates an understanding of the relationship between the effectiveness of structural forms & the forces that act on & within them</p>	- gives explanations that show limited understanding of ways in which different forces can affect the stability of a structure	- gives partial explanations of ways in which different forces can affect the stability of a structure	- gives complete or nearly complete explanations of ways in which different forces can affect the stability of a structure	- gives complete explanations of ways in which different forces can affect the stability of a structure
<p>Inquiry and Design Skills</p> <p>Designs and makes a roller coaster, and investigates the relationship between the design and function of this structure and the forces that act on it</p>	- with assistance compiles data gathered throughout the design/build process & reports the results of design modifications on the outcome of the building project using a graphic organizer, i.e. a chart, table, or labelled graph	- with limited assistance compiles data gathered throughout the design/ build process & reports the results of design modifications on the outcome of the building project using a graphic organizer, i.e. a chart, table, or labelled graph	- independently compiles data gathered throughout the design / build process and reports the results of design modifications on the outcome of the building project using a graphic organizer such as a chart, table, or labelled graph	- independently & consistently compiles data gathered throughout the design/ build process & reports the results of design modifications on the outcome of the building project using a graphic organizer, i.e. a chart, table, or labelled graph
<p>Communication</p> <p>Uses 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>Demonstrates an understanding of the factors that must be considered in the designing and making of products</p>	- shows limited understanding of the function of symmetrical design in the structural and mechanical systems of a roller coaster	- shows some understanding of the function of symmetrical design in the structural and mechanical systems of a roller coaster	- shows understanding of the function of symmetrical design in the structural and mechanical systems of a roller coaster	- shows thorough understanding of the function of symmetrical design in the structural and mechanical systems of a roller coaster

BUILDING PROJECT REPORT RUBRIC

GRADE 8

CATEGORY	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
<p>Understanding of Concepts</p> <p>Demonstrates an understanding of the factors that contribute to the efficient operation of mechanics and systems</p>	- investigates and measures forces (e.g. friction) that affect the movement of a marble on the roller coaster track and gives explanations that show limited understanding	- investigates and measures forces (e.g. friction) that affect the movement of a marble on the roller coaster track and gives partial explanations	- investigates and measures forces (e.g. friction) that affect the movement of a marble on the roller coaster track and gives complete or nearly complete explanations	- investigates and measures forces (e.g. friction) that affect the movement of a marble on the roller coaster track and gives complete explanations
<p>Inquiry and Design Skills</p> <p>Designs and makes a roller coaster system of structures and mechanisms, and investigates the efficiency of the mechanical devices that it is comprised of</p>	- with assistance compiles data gathered throughout the design / build process and reports the results of design modifications on the outcome of the building project using a graphic organizer, i.e. a chart, table, or labelled graph	- with limited assistance compiles data gathered throughout the design/ build process and reports the results of design modifications on the outcome of the building project using a graphic organizer, i.e. a chart ,table, or labelled graph	- independently compiles data gathered throughout the design / build process and reports the results of design modifications on the outcome of the building project using a graphic organizer, i.e. a chart ,table, or labelled graph	- independently and consistently compiles data gathered throughout the design/ build process and reports the results of design modifications on the outcome of the building project using a graphic organizer, i.e. a chart ,table, or labelled graph
<p>Communication</p> <p>Uses 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>Demonstrates an understanding of the factors that can affect the manufacturing of a product</p>	- shows limited understanding of how the components and subsystems of their roller coaster enable it to function efficiently	- shows some understanding of how the components and subsystems of their roller coaster enable it to function efficiently	- shows understanding of how the components and subsystems of their roller coaster enable it to function efficiently	- shows thorough understanding of how the components and subsystems of their roller coaster enable it to function efficiently