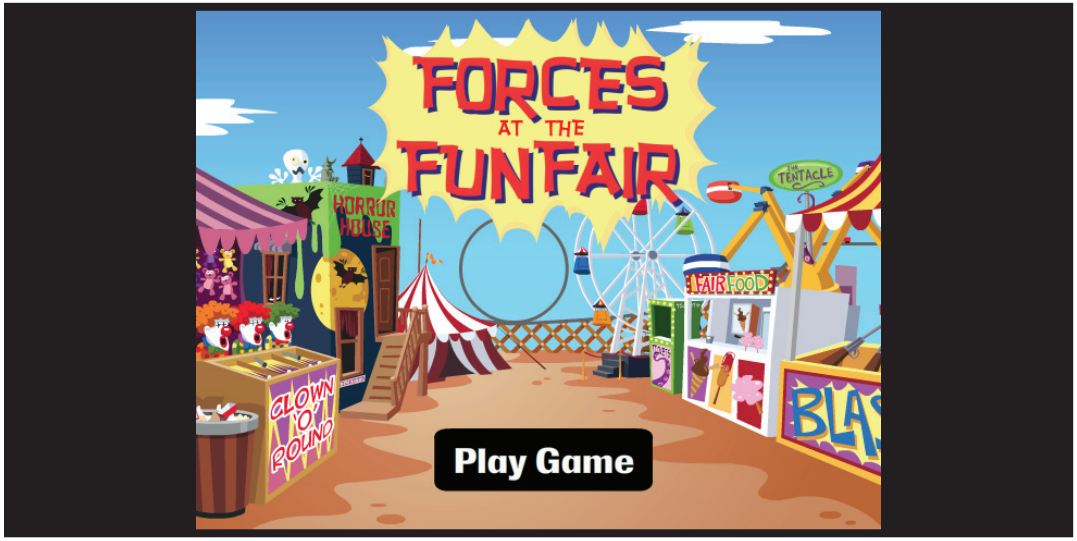
Forces at the Funfair

www.glasgowsciencecentre.org/forcesatthefunfair.aspx

Teacher Guide: Overview

'Forces at the Funfair' is an interactive, investigative computer game that enables pupils to explore the effect of changes in several variables on the motion of a rollercoaster car.

By adjusting the materials used and the design of the rollercoaster car, pupils have the opportunity to investigate the effects of friction (rolling resistance and air resistance) on the motion of the vehicle and use their understanding of forces to improve on the design of the car.



Curriculum Links

'Forces at the Funfair' is curriculum linked to match **'A Curriculum for Excellence'** covering outcomes in:

Science
> Forces & Motion
> SCN 222L, SCN223L, SCN 423L Phys

Designed to appeal to and engage a wide range of pupils, 'Forces at the Funfair' is suitable for pupils from **P4 to S4**. The game provides opportunity to explore various levels of complexity depending on the age/ability of the class - basic concepts can be explored or a more in-depth investigation may be conducted.

Keywords

Forces, Friction, Air Resistance, Rolling Resistance, Streamlining, Aerodynamics, Gravity.

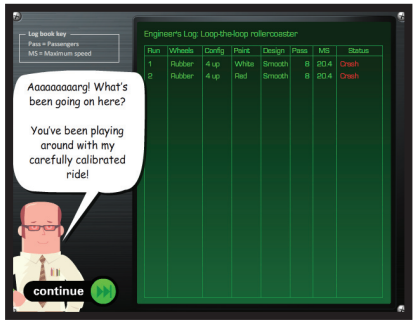
Specific Points for Discussion

- What forces act on a vehicle? How does that apply to a rollercoaster?
- Can you think of a situation where an increase in friction might be a positive thing?
- Why do you think it is beneficial for a rollercoaster to be of a streamlined design?

Assessment is for Learning

'Forces at the Funfair' provides teachers with an opportunity to monitor pupils' leaning and also ensures pupils are given feedback about the quality of their work.

The online Logbook shows each adjustment made by pupils and whether each run was successful. It can be printed so that pupils may look back at their work and consider the accompanying questions.



The accompanying pupil worksheet, available for download from the Glasgow Science Centre website, focuses learning and encourages pupils to evaluate their approach scientifically.

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Teacher Guide: Discussion Points & Answers

At the end of the game players have the opportunity to view their logbook and answers some multiple-choice questions.
The questions, and their answers are outlined here as is some background information concerning the questions contained within the pupil worksheet.

Part 1

The first part of the pupil worksheet gives pupils a starting point for their investigations.

In order to determine whether pupils have reached an accurate conclusion, invite pupils to share their results and input the state of each of their variables. Launch the vehicle as the rest of the class watches the run.

There is no combination of variables that allow three riders to ride together safely.

Discuss the implications of this and what that might mean in a real world design situation.

As pupils consult their logbook they are able to observe the efficiency of their testing.

Issues such as the importance of planning may be highlighted and pupils should be encouraged to consider what would have made their task easier e.g. working as part of team, working methodically etc.

Part 2

The first part of the pupil worksheet gives pupils a starting point for their investigations.

In order to determine whether pupils have reached an accurate conclusion, invite pupils to share their results and input the state of each of their variables. Launch the vehicle as the rest of the class watches the run.

1. Which statement is correct?

a) Friction is a force between two moving surfaces touching each other.
b) An increase in friction can speed things up.
c) Friction is never useful.

2. Which of the following would result in an increase in friction?

a) Changing from steel to rubber wheels.
b) Changing from rubber to steel wheels.
c) Neither a) or b).

3. Air resistance is a form of friction.

a) False – friction only occurs between solid surfaces.
b) True – air rubs against the surface of the object.

4. Which car would encounter the greatest amount of air resistance?

a) Boxy (2 up)
b) Boxy (4 up)
c) Smooth (2 up)
d) Smooth (4 up)

5. Streamlining is the process of shaping an object in order to

a) Minimize air resistance
b) Maximize air resistance
c) Both a) and b

6. Which car design is the most streamlined?

a) Boxy
b) Smooth
c) Both - they are the same.

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Part 1

Your aim is to design a car that can reach the unloading station safely when seven passengers are riding.

Your logbook will keep track of each launch you attempt.

a. Note the specifications of the successful car below.

Wheels	Passenger Layout	Paint	Design

b. Now change one of those variables.

- What did you change?

- What happened?
- Why?

c. Are there any adjustments you can make in order for three people to ride safely together?

d. Click the green button to finish your runs and view your logbook.
How successful was your scientific approach to investigation?
Would you do anything differently if you were to conduct a similar investigation in the future?

Part 2

Tell Hector you have time to tell him more.
Click the green button.
Answer each question and write the correct answers below.

1. Which statement is correct?
2. Which of the following would result in an increase in friction?
3. Air resistance is a form of friction.
4. Which car would encounter the greatest amount of air resistance?
5. Streamlining is the process of shaping an object in order to...
6. Which car design is the most streamlined?

Part 3

Print your logbook and answer the questions at the bottom.