

BLUEWATER HISTORY! Circle True or False:

1. Bluewater has always been a shopping centre. True / **False**
2. The area where Bluewater is now used to be a chalk quarry. **True** / False
3. The lakes at Bluewater were created after the quarry was filled with water. **True** / False
4. Bluewater first opened in the 1980s. True / **False**

FORCES AND MOTION:

5. Fill in the gaps below –

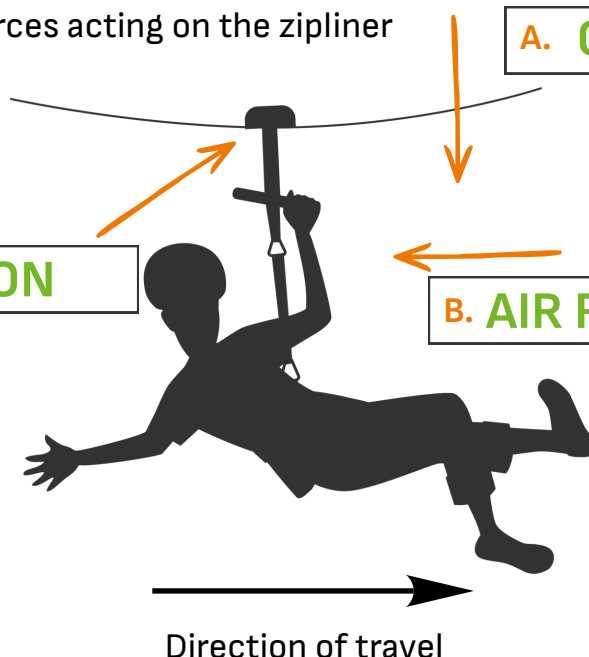
- a. Gravity is a force that pulls objects towards the **CENTRE** of the Earth.
- b. Air resistance acts in the opposite direction to an object's **MOTION**.
- c. Friction is a force that occurs when two surfaces move **AGAINST/PAST** each other and slows motion down.
- d. At Hangloose Adventure, a person on a zip wire speeds up because of the force of **GRAVITY**, but slows down because of **AIR RESISTANCE**.
- e. On a giant swing, air resistance and **GRAVITY** act on the rider and can affect how smoothly they move through the air.

6. Label the forces acting on the zipliner

C. FRICTION

A. GRAVITY

B. AIR RESISTANCE



ENERGY!

8. At Hangloose, a person on a zip wire has the most kinetic energy when they are:

- a) At the highest point before moving ☐
- b) Moving fastest along the wire ☒
- c) Standing still at the start ☐

9. Explain how a rider's kinetic energy changes during a zip wire ride at Hangloose.

Kinetic energy depends on speed. On a zip wire at Hangloose Adventure, the rider has the most kinetic energy when they are moving fastest because that is when their speed is highest.

10. A rider on a giant swing at Hangloose has the most potential energy when they are:

- a) At the highest point before being released ☒
- b) Moving fastest at the bottom of the swing ☐
- c) Slowing down at the end ☐

11. Explain what gravitational potential energy is and how it changes as someone moves on a ride like a giant swing.

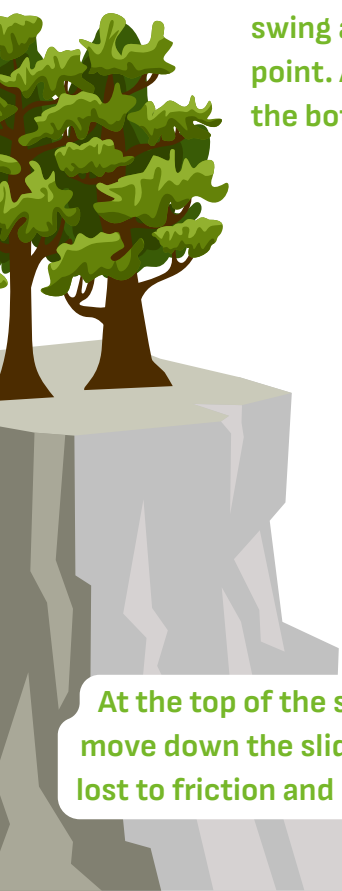
Gravitational potential energy is the energy an object has because of its height. On a giant swing at Hangloose Adventure, the rider has the most potential energy at the highest point. As they swing down, this energy is changed into kinetic energy (movement), and at the bottom they have the least potential energy and the most kinetic energy.

12. During a Hangloose zip wire ride, energy is mainly transferred from:

- a) Electrical energy to sound energy ☐
- b) Gravitational potential energy to kinetic energy ☒
- c) Electrical energy to sound energy ☐

13. At an Aqua Park, a person slides down an inflatable slide into the water. Describe how energy is transferred from the start of the slide to when they reach the water.

At the top of the slide, the person has gravitational potential energy because they are high up. As they move down the slide, this energy is transferred into kinetic energy as they speed up. Some energy is also lost to friction and heat between the slide and the person, and to sound in the water when they splash in.



WORKING SCIENTIFICALLY

Scenario: Creating England's longest zipline

Riders experience different speeds depending on factors such as their weight and wind conditions.

HYPOTHESIS:

Rider weight and wind conditions affect the speed of a zipline ride, with heavier riders and favourable wind conditions resulting in higher speeds.

VARIABLES:

Independent Variable: Rider weight / Wind conditions (e.g. headwind, tailwind, still air)

Dependant Variable: Speed of the zipline rider

Control Variables:

- Length of the zipline
- Height/drop angle of the zipline
- Type of harness and equipment
- Rider position (sitting posture)
- Same zipline route/line
- Same starting point
- Weather conditions other than wind (e.g. rain, temperature if possible)
- Timing method (same stopwatch or sensor)

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RESULTS:

In this section answer:

- What pattern do you notice between rider weight and completion time?

There is a pattern that as rider weight increases, completion time decreases, meaning heavier riders tend to complete the zipline faster. This suggests that increased mass may lead to greater gravitational force, resulting in higher speeds.

- Why might trail 1 and 2 have different results?

Trail 1 and 2 may have different results because of changing wind conditions or environmental factors.

For example:

- One trail may have had a tailwind, helping riders go faster
- The other may have had a headwind, slowing riders down
- There could also be small differences in timing accuracy or rider position

Even small changes in weather or setup can affect speed on a zipline.

- Do the results fit your hypothesis?

The results (generally / mostly / fully) support the hypothesis because they show that rider weight and wind conditions affect speed. Heavier riders and favourable wind conditions tended to result in faster completion times, which matches the prediction.

EVALUATION:

In this section answer:

- How reliable do you think your results are? Why?

The results are fairly reliable because the same zipline and method were used each time, but they may not be fully reliable due to changing wind conditions and possible timing inaccuracies.

- Was your method good at testing the effect of rider weight on speed? Why?

The method was partly good because it allowed comparison of rider weights, but it was not fully fair since wind conditions and other environmental factors were not completely controlled.

- What could you improve about the investigation to make it more accurate?

You could improve accuracy by:

- Repeating each test multiple times and taking an average
- Testing in the same wind conditions or indoors (if possible)
- Using electronic timing instead of a stopwatch
- Controlling rider position more strictly
- Testing a wider range of rider weights