



## 1 Hour Pre-Visit Lesson Plan

# Quarry

Date:

Years 7 - 9

Teacher:

Lesson Objectives		<ul style="list-style-type: none"><li>• To excite the students about their trip.</li><li>• To recall the names of forces and their effect upon moving and stationary objects.</li><li>• To learn how balanced and unbalanced forces affect the motion of an object.</li><li>• To calculate the size and direction of the resultant force on an object.</li></ul>
Starter Activities	10 mins	<ul style="list-style-type: none"><li>• PowerPoint Slides 1 - 2: Explain that you will be travelling to Zip World and explore the website, building up excitement through the online videos and information.</li><li>• Explain that we will only experience all these exciting things at Zip World because of forces – most rides are gravity fuelled! Today will be about making sure we understand the forces that will be acting on us during our trip.</li><li>• Slides 3 – 4: Revise previous learning on forces. Recap that forces can cause objects to change direction, speed or shape and that we show their size and direction through force arrows. Encourage the students to ask questions, chat to their partners and involve themselves in discussion.</li></ul>
Main Activity	15 mins	<ul style="list-style-type: none"><li>• Slide 5: If facilities/room allow, choose a few sensible volunteers to come to the front and take part in a gentle Tug of War game. Put a marker at the centre and on the floor. With two students either side, encourage them to gently pull so that the mark stays in the centre. Both sides are exerting a pulling force...so why isn't this causing any change in direction/speed/shape? Establish that the opposing forces are <b>balanced</b> so there is no change.</li><li>• Now encourage both sides to pull as hard as they can so that one wins. Establish that as soon as one force is greater than the other, there is change - only <b>unbalanced</b> forces lead to a change in speed, direction or shape.</li></ul>



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Main Activity cont.	20 mins	<ul style="list-style-type: none"><li>• If more detail is required, use <u>slides 6 – 7</u> to prompt discussion.</li><li>• <u>Slides 8 - 9</u>: Stand up/sit down game - show the pictures one by one at speed; if the students think the forces are balanced, they must stand up. If unbalanced, they must sit down. At the end of each slide pause to discuss the forces acting in each picture, which force is the greatest and what effect this has on the moving and stationary objects. Encourage the students to explain why they stood up/sat down. Discuss the forces acting on the riders of the zip wires – the pull of their weight versus air resistance and friction between the pulley and the wire. Discuss the compression force of the spring that stops movement on Quarry Flyer.</li><li>• <u>Slide 10</u>: Split the class into small groups. Give each group a straw and a ping pong ball. Can they create a scenario to show balanced forces and a scenario to show unbalanced forces with their equipment? Let them use their imaginations, but most will suck the ball at the end of the straw; when the upward sucking force equals the gravitational force on the ball, the ball will not fall. Some more able pupils may realise that when dropped from a great enough height, the ball will eventually reach its terminal velocity (where its weight is balanced by air resistance) all on its own without need for the straw to show balanced forces.</li><li>• If time allows - Activity sheet 1: Can the students draw diagrams with arrows and labels to show the forces on their ball?</li></ul>
Extension Work	-	<ul style="list-style-type: none"><li>• <u>Slide 11/ Activity sheet 2</u>: students need to establish whether forces are balanced or unbalanced. More able students can calculate the resultant force and create their own questions to quiz their friends.</li></ul>
Plenary	10 mins	<ul style="list-style-type: none"><li>• <u>Slides 12 – 13</u>: Go through the diagrams on the board showing balanced and unbalanced scenarios with the straw and ball; encourage pairs to show what they came up with.</li><li>• Game - can the class use their straws to pass the ball between each other? Ask for volunteers to stand in a line or circle and pass the ball along (could have two lines for a competition; which group can finish the fastest?). They may find this very difficult – why? Establish that the force needed to lift the ball must be upward to balance the force of gravity. Balanced forces must be opposing forces.</li><li>• <u>Slide 14</u>: Encourage the students to share what they have learned/what they are looking forward to learning on their trip/what questions they might have when they are there.</li></ul>



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AfL	-	Observing, contributions to discussion, written work and verbal responses to questions.
Key Skills	-	Collaboration, communication, problem solving, questioning.
Key Words	-	Force, gravity, friction, air resistance/drag, motion, balanced, unbalanced, resultant force, tension, compression.
Differentiation and Success Criteria	-	<p>Group students in mixed ability groupings to provide peer support. Offer more guidance and focus on practical examples for lower ability students. Encourage more able students to consider not just the forces in play but their effect on movement and the resultant forces.</p> <p>All students will know that there are balanced forces, where opposing forces are equal, and unbalanced forces, where one force is greater than another. Most children will understand that unbalanced forces lead to a change in motion (in speed or direction). Some children will understand how to calculate the resultant force when forces are unbalanced.</p>
Resources/ Preparation Needed	-	<ul style="list-style-type: none"><li>• PowerPoint</li><li>• Rope with centre marked</li><li>• Enough ping pong balls per pair/small group</li><li>• Enough straws per student</li><li>• Worksheet 1 per student</li><li>• Worksheet 2 for extension task if required</li></ul>
Evaluation	-	For teacher to complete:

Note: Please amend PowerPoint and Activity sheets to suit your cohort and year group.

Safety Notes: Ensure there is enough space for the Tug of War so as not to put the volunteers or spectators in danger. For hygiene reasons, a straw per student is recommended.

