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| **Activity title** |
| **Make a zip line** |
| **Stay safe** |
| Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:    • ensuring that any equipment used for this activity is in good working condition  • behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others    Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol:⚠ |
| **Time required** |
| 60-90 minutes |
| **Activity summary** |
| Zip lines are becoming a common sight at theme parks and attractions across the world using clever engineering to keep the passengers safe whilst enjoying the ride! Can you design and make a zip line to get your favourite item/toy down from a high shelf? |
| **What equipment will you need?** |
| * String or thin rope. 10m should be enough. * A ‘passenger’ for the zip Line. * Paper clips or stiff wire. * Sticky tape. * A stopwatch or a stopwatch App on a phone. * A ruler or tape measure * A protractor * Some paper and a pen to take notes |
| **How to do it** |
| **Step 1 – Making the harness**   * Friction is the force that stops things sliding easily. Friction is your enemy! The ‘passenger’ needs to be able to slide well down the zip line. * Make a harness for your passenger out of the paper clip or wire. * The triangle shape means the passenger won’t slip sideways. * Fasten your passenger to the harness safely using sticky tape.   **Step 2 – Attaching the start of the zip line**   * Find a place where you can attach one end of the zip line high up. This is called an ‘anchor point’.   + *You could use a tree or fence post outside.*   + *The top of a wardrobe or a desk works too.* * The anchor point needs to be high enough to give a good steep angle on the zip line, but not so high that you need to climb to get up there. * Attach the string or rope to the anchor point – it needs to be very secure so that it doesn’t slip. You could tie it round something, put weights on it or use sticky tape.   **Step 3 – Attaching the bottom of the zip line**   * Pass the string through the harness on your passenger. * Now find somewhere to attach the bottom end of the zip line. * It needs to give a good angle to the string (line) so that your passenger can slide down under the force of gravity - but not too steep, or the passenger will just fall down the string and crash. That would be no fun at all. * You will need to adjust the end of the line so trap it under something like a chair leg, a rock or a heavy book. The line needs to be tight.   **Step 4 – Trial run**   * Try the Zip line to make sure it works. Take your passenger to the top and let go. * If the passenger ‘stalls’ on the line stops before the bottom:   + *If the string is too slack, tighten the ends.*   + *If the string is too rough and there is too much friction, increase the slope.* * Make your improvement to be ready for testing.     **Step 5 – Testing**   * Measure the angle of your zip line using the protractor (or calculate the angle using Maths!). * Bring your passenger to the top of the zip line. * Using the stopwatch, time how long your passenger takes to get from the top to the bottom. * Make a table and write down the time and the angle. * Repeat the test with different angles. How does the angle affect the time?   **Well done! You have now made your very own zip line!**  **Further activities**   * Can you make a zip line that takes exactly 15 seconds to run? * Can you try a bigger, heavier passenger? How does the weight of the passenger affect the time? What is the heaviest passenger that you can use? * Can you try working out the angle from the height and length? (see below)   **Calculating the angle**   * We can measure two sides: the opposite (height) and adjacent (distance across the floor). * SOHCAHTOA tells us we must use tangent. * Find the angle from your calculator using:   tan-1 (opposite / adjacent) = angle   * The angle can be written into your notes to see what is the most effective angle for the line. |
| **Summer jokes** |
| * **What does the sun drink out of?**   Sunglasses!   * **What do frogs like to drink on a hot summer day?**   Croak-a-cola!   * **Why don’t mummies go on summer holiday?**   They’re afraid to relax and unwind!   * **Where do eggs go on summer holiday?**   New Yolk City! |
| **Fun facts** |
| * Bees can fly up to 60 miles a day. * Ants can carry up to 50 times their own weight. That means if you were an ant and weighed 100 pounds, you would be able to carry a good size car around on your back! * Hummingbirds can fly backwards but they cannot walk. * The heaviest fish in the ocean is the sunfish, which can weigh as much as 5,000 pounds, the same as a 20ft shipping container or a small forklift truck! |
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