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| **ADVENT TERM 2**  **SCIENCE – Year 5 - Medium Term Planning – PHYSICS: FORCES** | | |
| **LESSON  1** | **LESSON  2** | **LESSON  3** |
| **LEARNING INTENTION:**    To know that a force is a push or a pull that makes something move, change speed or change shape. (Y3 recap)  To know that gravity is a force of attraction.  Skills:  Take increasingly accurate measurements in standard units, using a range of chosen equipment.  Aim:  Develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them. | **LEARNING INTENTION:**  To know that friction is a contact force which opposes motion and slow objects down.  Skills:  Compare and describe the effects of friction.  Aim:  Develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them. | **LEARNING INTENTION:**  To know that air resistance is a type of friction.  Skills:  Within a group, decide which observations to make, when and for how long, and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.  Aim:  Are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future. |
| **Key Vocabulary:**  Force, contact force, non-contact force, gravity, mass, weight, forcemeter, Newton, measurement, investigation | **Key Vocabulary:**  Force, friction, movement, opposite, increased, decreased | **Key Vocabulary:**  Air resistance, friction, air, particles, increase, decrease, streamlined, large, small, surface area |
| **Recap & retrieval:** | **Recall & retrieval:**   * Gravity is a force of attraction. * All objects have gravity because all objects have mass. * Gravity keeps objects on the surface of the Earth and pulls all unsupported objects to the ground. | **Recall & retrieval:**   * Gravity is a force of attraction. * All objects have gravity because all objects have mass. * Gravity keeps objects on the surface of the Earth and pulls all unsupported objects to the ground. * Friction is in all places where two surfaces meet. * It acts in the opposite direction to movement and always slows an object down. |
| **Key Knowledge:**  **Child:**   * A force is a push or a pull that makes something move, change speed or change shape. * A contact force is a force that acts between two objects that touch. * A non-contact force acts between two objects that do not touch. * Gravity is a force of attraction. * All objects have gravity because all objects have mass. * Earth’s gravity pulls objects towards its centre. Earth’s gravitational force is strong because Earth has a large mass. * Gravity keeps objects on the surface of the Earth and pulls all unsupported objects to the ground. * Gravity is a non-contact, pulling force which attracts two objects that have mass.   **Teacher:**   * Forces act in pairs that oppose each other. * A force can be either a contact force or a non-contact force. * Contact forces include friction, air resistance and water resistance. * Non-contact forces include magnetism and gravitational force. * Usually, the gravitational force between two objects is very weak because the objects are small. Gravitational force becomes larger as an object’s mass increases. * Gravity gives an object weight. * Mass is the amount of matter that an object or substance contains. * It can never be zero and is the same wherever it is, even in space. * Mass is measured in grams (g) or kilograms (kg) using a scale or the kg scale on a force meter. * Weight is a measure of gravitational force. * The weight of an object can vary depending on where it is. * For example, gravitational force on the Moon is less than that on Earth, so an object weighs less on the Moon. * Weight is measured in newtons (N) using a force meter. | **Key Knowledge:**  **Child:**   * Friction is in all places where two surfaces meet. * It acts in the opposite direction to movement and always slows an object down. * Smooth, flat surfaces exert a smaller frictional force than rough, bumpy surfaces. * Moving objects will travel further on surfaces with less friction.   **Teacher:**   * Different surfaces create different amounts of friction. * The amount of friction depends on the materials from which the surfaces are made. * Friction can be increased by adding tread patterns to tyres and the soles of shoes. * Friction can be decreased by smoothing surfaces or using a lubricant, such as oil. | **Key Knowledge:**  **Child:**   * Air resistance is a type of friction that always acts against the direction of movement. * It is a contact force that acts when an object moves through air. * It is caused by air particles hitting an object and slowing it down. * Some objects are designed to increase air resistance. * Some objects are designed to decrease air resistance.   **Teacher:**   * Objects with a large surface area will hit more particles, and therefore have more air resistance, than objects with a smaller surface area. * Parachute canopies have a large surface area, which increases air resistance and slows down the parachutist’s descent. * A fighter jet has a small surface area and a streamlined shape which decreases air resistance and allows the plane to move quickly through the air. |

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| **LESSON  4** | **LESSON  5** | **LESSON  6** |
| **LEARNING INTENTION:**  To know that water resistance is a type of friction.  Skills:  Compare and describe, using a range of toys, models and natural objects, the effects of water resistance.  Aim:  Are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future. | **LEARNING INTENTION:**  To know that levers and pulleys are mechanisms which give a mechanical advantage.  Skills:  Describe and demonstrate how simple levers and pulleys assist the movement of objects.  Aim:  Are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future. | **LEARNING INTENTION:**  To know that gears are mechanisms which give a mechanical advantage.  Skills:  Describe and demonstrate how, gears assist the movement of objects.  Aim:  Are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future. |
| **Key Vocabulary:**  Water resistance, water, particles, increase, reduce, streamlined | **Key Vocabulary:**  Lever, pulley, mechanism, arm, fulcrum, load, effort force, mechanical advantage | **Key Vocabulary:**  Gears, linked, interlinked, toothed, wheels, rotate, mechanical advantage |
| **Recall & retrieval:**   * Gravity is a force of attraction. * All objects have gravity because all objects have mass. * Gravity keeps objects on the surface of the Earth and pulls all unsupported objects to the ground. * Friction is in all places where two surfaces meet. * It acts in the opposite direction to movement and always slows an object down. * Air resistance is a type of friction that always acts against the direction of movement. * It is caused by air particles hitting an object and slowing it down. | **Recall & retrieval:**   * Gravity is a force of attraction. * All objects have gravity because all objects have mass. * Gravity keeps objects on the surface of the Earth and pulls all unsupported objects to the ground. * Friction is in all places where two surfaces meet. * It acts in the opposite direction to movement and always slows an object down. * Air resistance is a type of friction that always acts against the direction of movement. * It is caused by air particles hitting an object and slowing it down. * Water resistance is a type of friction that always acts against the direction of movement. * It is caused by water particles hitting an object and slowing it down. | **Recall & retrieval:**   * Gravity is a force of attraction. * All objects have gravity because all objects have mass. * Gravity keeps objects on the surface of the Earth and pulls all unsupported objects to the ground. * Friction is in all places where two surfaces meet. * It acts in the opposite direction to movement and always slows an object down. * Air resistance is a type of friction that always acts against the direction of movement. * It is caused by air particles hitting an object and slowing it down. * Water resistance is a type of friction that always acts against the direction of movement. * It is caused by water particles hitting an object and slowing it down. * Levers are pulleys are simple machines that can be used to make it easier to lift a load. |
| **Key Knowledge:**  **Child:**   * Water resistance is a type of friction that always acts against the direction of movement. * It is caused by water particles hitting an object and slowing it down.   **Teacher:**   * Objects with a large surface area will hit more particles, and therefore have more water resistance, than objects with a smaller surface area. * Scuba flippers have a large surface area to increase water resistance as the diver pushes against the water to move forward. * The front of a submarine has a small surface area and is streamlined to reduce water resistance. * Decreasing the surface area at the front of an object reduces the amount of water resistance. The more streamlined an object, the faster it will fall through water. | **Key Knowledge:**  **Child:**   * Levers are pulleys are simple machines that can be used to make it easier to lift a load. * Pulleys consist of a lever arm, a fulcrum, a load to lift and an effort force. * Pulleys consist of one or more grooved wheels and a rope.   **Teacher:**   * A mechanical advantage is a measurement of how much a simple machine multiplies the force that we put in. * The bigger the mechanical advantage, the less force we need to apply. * For example, if the distance between the fulcrum and the effort is double the distance between the fulcrum and the load, the effort needed will be halved. * Pulleys make it easier to lift a load. For example, when two wheels are used in a pulley, the force needed to lift the load halves. * At the same time, the length of rope needed to lift the load 1m off the ground doubles to 2m. | **Key Knowledge:**  **Child:**   * Gears are toothed, interlocking wheels that can be place together to make a mechanism that provides a mechanical advantage. * They can also be connected by a chain to turn in the same direction. * Linking gears of the same size does not provide a mechanical advantage. * Linking different sized gears does create a mechanical advantage   **Teacher:**   * In a mechanism made with a large gear with 12 teeth and a small gear with 6 teeth, the small gear will rotate twice as fast as the large gear but with half the amount of force. * Smaller gears rotate more quickly and are easier to turn but do not provide much force. * Larger gears rotate more slowly and are harder to turn but provide more force. * Gears are used in bicycles to make it easier to cycle uphill and faster to cycle on the flat. |
| **Assessment**   Cumulative quiz. Retrieval practice. | | |