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| **Topic:** P1 Forces: In this topic you will add to the work you did in primary school on the different types if forces. You will be able to discover what forces are and what they do to objects while you investigate how to measure different forces. You will see real life examples of what happens to objects if forces are balanced or unbalanced and use your numeracy skills to calculate resultant forces and draw graphs from your practical lessons. We will then investigate the relationship between speed, distance and time and calculate the speed of everyday objects.  |
| **Core Questions for the Unit** | 1. Identify contact and non-contact forces (Year 3 Magnetism / Year 2 pushes and pulls)
2. What are forces
3. Describe the effect of forces on objects
4. Use force meters to measure force
5. How are forces used to make objects move
6. What are balanced and unbalanced forces
7. What are balanced and un-balanced forces
8. Understand that arrows and their size affect motion
9. Explain forcing of moving objects
10. Understanding and calculating resultant force
11. What is the relationship between average speed, distance and time. I can relate these to speed, distance, time graphs.
12. Calculate speed, distance or time
13. What are the units for distance, speed or time
14. Describe a journey using a distance/ time graph
15. Construct a distance/ time graph (higher)
16. Why does an object in motion changes direction when an opposing force is applied.
17. Describe the motion of an object when force is applied
18. What is the change of direction based on the direction of a force and its size.
19. Predict the motion of an object when force is applied
20. Explain the motion of an object when force is applied
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| **Links to other subjects** | 1. Numeracy – Drawing and analysing graphs, calculating the mean, using an equation, and converting units.
2. Technology – How resultant forces changes the motion of objects and how this helps design.
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| **Scientific skills** | * Hypothesising: use scientific knowledge to predict the trend in results incline or mass affects the speed of an object.
* Making a risk assessment.
* Observations: collecting reliable data, using apparatus given
* Present data in a suitable form i.e. tabulate data, line graph
* Identify patterns in data and write relevant conclusions.
* Use peers data to compare against for evaluation of data.
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| **Development of new knowledge** | * Forces as pushes and pulls, arising from the interaction between two objects
* Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces and explain as.
* Non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity
* **gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only)**
* Speed and the quantitative relationship between average speed, distance and time
* The representation of a journey on a distance-time graph
* Relative motion: trains and cars passing one another
* Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)
* Change depending on direction of force and its size
 | **Strengthening of prior****knowledge** | **Scientific content:**YEAR 5 Is able to describe how some forces act upon stationary and moving objects (e.g. friction, air resistance, water resistance etc.)Is beginning to understand how levers, pulleys and gears allow a small force to have a greater effect. YEAR 3Can demonstrate an understanding of how different surfaces affect how objects move across them.Demonstrates an understanding of friction as a force acting between two objects in contact and magnetic force as a force acting at a distance.YEAR 2Shows an understanding in the difference between push and pull forces.Is able to describe the direction of movement associated with push and pull forces.Shows an understanding of the effect of gravity on objects.Is beginning to understand friction as a force that acts to slow down a moving object.Maths: Using units,rearranging equations and graph skills |
| **Vocabulary:**These are the main words we will be using. | **Tier 2 Words:**BalancedCategoricConclude ContinuousDescribe DistanceExplain ForceGravityMotionPredict SpeedTimePushPull  | **Tier 3 Words:**Resultant force Newtons Newton meterInclineAcceleratingDecelerating  | **Reading Opportunities** | Gravity reading and comprehension task- reading age 12-14. (saved on to the one drive- reading opportunity folder) Writing questions on forces in paragraphs so students have to read through, comprehend and turn this in to a forces diagram Writing questions on graphs in paragraphs so students have to read through, comprehend and turn in to a distance/time graph   |
| * **The activities you are likely to do in lesson.**
 | 1. **Identify contact and non-contact forces**
2. What are forces
* DO IT NOW: Prior knowledge what forces they have heard of and how they know this is force?
* DO IT NOW: Identifying forces from a diagram
* RETIEVAL: Matching forces done in primary to their definition/ image
1. Describe the effect of forces on objects
* Thinking maps: Flow chart of actions and effects/ consequences of different forces. E.g. gravity on an apple in a tree à falling to the ground.
* Modelling of these flow charts and how to process the information of forces
* Practical to try some of the scenarios before they put them in to the thinking map
1. Use force meters to measure force
* Practical to measure the forces of different examples e.g. weight of objects, pull of objects, push of objects
1. How are forces used to make objects move
* Simple examples: balls which have a force and change direction/ speed
* Simple examples: cars which have the breaks/ thrust applied
* Application to rockets lifting off
* Application to the solar system and gravity
1. What are balanced and unbalanced forces
* DO IT NOW: identify whether the forces are unbalanced in images

**2. I can identify balanced and unbalanced forces** 1. Understand that arrows and their size affect motion
* Modelling by the teacher/ WAGOLL to show how arrows are used in different scenarios/ examples
* Students to try their own examples of adding arrows
* Reading opportunity: read the information then turn this in to a forces diagram
1. Explain forcing of moving objects
* Modelling by the teacher/ WAGOLL for motion
* I DO/ WE DO/ YOU DO for examples of how changing the force acts on moving objects (car is a good example with lots of possibilities)
1. Understanding and calculating resultant force
* Teacher demo: trolley on a smooth surface, change the force applied each side, get students to predict what will happen
* Give students different examples to calculate the resultant force in these examples
* Application of resultant forces not just on the ground, also for objects on water (float and sink) and in the air (falling or flying)
* Demo/ practical for students to create a ‘boat’ which floats on the water
* RETIREVAL: balanced and unbalanced forces not just resultant force.
1. **What is the relationship between average speed, distance and time. I can relate these to speed, distance, time graphs.**
2. Calculate speed, distance or time
3. What are the units for distance, speed or time
* Retrieval:
* Spaced retrieval: Units of different concepts covered in primary school/ maths/ every day life e.g. cm, mm, kg, seconds, minutes,
* force and drawing force diagrams (examples on a sheet of varying difficulty) / grid of different examples of the content covered so far
* Modelling use of equation and units
* I do/ we do/ you do – could give frameworks to students who need this
1. Describe a journey using a distance/ time graph
* DO IT NOW: key words for motion and definition e.g. stationary, accelerate, decelerate, constant, resultant
* Modelling the journey of a car and drawing out the graph this would create
* Making certain rules for the graph and what that means for motion
* WAGOLL for modelling a description answer
* Read task: read information and turn in to a sketch graph
1. Construct a distance/ time graph (higher)
* I DO/ WE DO/ YOU DO
* For the YOU DO- Different variations of graph e.g. some with axis, some without, some with some of the graph already drawn
* Spotting the mistakes with a graph and correcting them to WAGOLL
* Thinking map: Graph in the middle, then on the next box describe the graph, then in the next box explain the graph, then in the final box an application of the graph e.g. different scenario or how something else would impact the graph?
* Required practical – ramp/mass of an object. Calculations
* Literacy and scientific literacy skills: hypothesis, risk assessment, table and results graph and conclusion.
1. **I can describe the objects change in motion changes direction when an opposing force is applied.**
* <https://www.youtube.com/watch?v=9kMNtZvYmqQ> BBC bitesize clip (summary of force sand how motion changes using forces)
* DO IT NOW: Recap of balanced and unbalanced forces- identification and description
* Retrieval: what forces act on a certain example (label with force diagram) e.g. car, falling object, floating object
* Written answer to how the motion changes the direction
1. **I can predict the change of direction based on the direction of a force and its size.**
2. Predict the motion of an object when force is applied
* Questions to try regarding different examples
* Required practical – ramp/mass of an object predictions in the method
1. Explain the motion of an object when force is applied
* Retrieval: all the tier 2/3 words used to describe force and motion
* Use these key words to form their answer about forces i.e. give points for tier 2 words, more points for tier 3 words and give sentence starters/ framework to help
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| **How you will be assessed.** | You will be assessed by: * A retrieval quiz during the Do It Now of every lesson.
* Mini quizzes and challenges during lesson.
* A progress assessment in the middle of the unit – Here we will reflect and improve on key areas and complete DIRT work.

An end of unit assessment that assesses your knowledge and skills that you have built in this unit and previous units that we link back to.  |