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| **Subject Science - Year 8 Physics Medium Term Plan/SOW** | **The Academy of St Francis of Assisi** |
| **Year 8 Unit 1** | **Title : Big Idea Forces 2** | **Number of lessons in sequence** | **10 lessons** |
| **Overarching Curricular Goals (Aims)** Big Questions1. Why is there so little friction on some surfaces, like ice, but not others, like wood?
2. Why do you get put on weighing scales before you do a bungee Jump.
3. Why don't earthmovers sink?
 | **By the end of this unit students will:** **Topic 1.3 Contact forces**In the unit contact forces students will gain an understanding of the effect of frictional forces on speed and how design features can reduce these forces. Students will know about elastic deformation and how to investigate the extension of a spring; be able to describe the relationship between force and extension and suggest if it obeys Hooke’s law. Students will know what levers and pivots are and how they are useful in different situations. Students will practice calculating moments and be able to describe how to increase the moment of a force. They will be introduced to clockwise and anticlockwise moments and investigate how to change the moment of a force to balance an object. **Topic 1.4 Pressure**Students will explore pressure in liquids and deepen their understanding of liquid pressure using the particle model. They will be introduced to hydraulics and how they work. They will develop an understanding of the phenomena of atmospheric pressure including how atmospheric pressure is caused. They will know how stress is applied to solids (pressure) and calculate pressure from an equation and apply this to everyday situations. | **Links to National Curriculum****Links to & building upon prior learningIncluding KS2 if Yr7** | **KS2 Links** Identify the effects of air resistance, water resistance and friction that act between moving surfaces. Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.**KS3 Links** Forces as pushes or pulls, arising from the interaction between 2 objects. Using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces. Moment as the turning effect of a force. Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. Forces measured in newtons, measurements of stretch or compression as force is changed. Force-extension linear relation; Hooke’s Law as a special case. Work done and energy changes on deformation. Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface. Atmospheric pressure, decreases with increase of height as weight of air above decreases with height. Pressure in liquids, increasing with depth; up thrust effects, floating and sinking. Pressure measured by ratio of force over area – acting normal to any surface. **KS4 / GCSE Links**Work done against frictional forces and the effects of work done. Braking distances in terms of friction. Elastic and inelastic behaviour, and the work done in stretching a spring. Simple model to explain the variation of pressure with the height of the atmosphere. How to calculate the pressure of a liquid and how that pressure varies with the density of the fluid. Moments and levers.  |
| **Outcomes/****Success Criteria** | **Knowledge** **Topic 1.3 Contact forces**When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object’s form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied.**Topic 1.4 Pressure**Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an up thrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the up thrust. Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces.**Skills** **Topic 1.3 Contact forces**Explain whether an object in an unfamiliar situation is in equilibrium. Describe factors which affect the size of frictional and drag forces. Describe how materials behave as they are stretched or squashed. Describe what happens to the length of a spring when the force on it changes. Evaluate how well sports or vehicle technology reduces frictional or drag forces. Describe the effects of drag and other forces on falling or accelerating objects as they move. Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality. Explain how turning forces are used in levers.**Topic 1.4 Pressure**Use diagrams to explain observations of fluids in terms of unequal pressure. Explain why objects either sink or float depending upon their weight and the up thrust acting on them. Explain observations where the effects of forces are different because of differences in the area over which they apply. Given unfamiliar situations, use the formula to calculate fluid pressure or stress on a surface. Use the idea of pressure changing with depth to explain underwater effects. Carry out calculations involving pressure, force and area in hydraulics, where the effects of applied forces are increased. Use the idea of stress to deduce potential damage to one solid object by another. |
| **2/3 tier vocabulary.** | **Differentiation/Scaffolding/Support.** | **Stretch and challenge opportunities in class, enrichment and home learning.** | **Opportunities for wider reading/Listening/watching.** |
| friction, contact force, newton,drag force, water resistance,air resistance, resultant force,equilibrium, streamlined,lubrication, deformation,compression, tension, reaction,extension, elastic limit, Hooke'sLaw, linear relationship. pivot, moment, newton metres. lawof moments, centre of gravity,centre of mass, fluid, pressure, gaspressure, atmospheric pressure,liquid pressure, incompressible,upthrust, stress, newtons permetre squared | **Knowledge Support:** Big Idea Forces 2 Knowledge organiser.Exit quizzes. Homework quizzes. **Reading support**:Big Idea Forces 2 Student book. Literacy tasks**Skills support:** Homework quizzes.Scaffolds Writing templates  | **Scholarship:**<https://teachers.thenational.academy/lessons/case-study-sir-isaac-newton-e9jp6g><https://teachers.thenational.academy/lessons/avicenna-and-the-story-of-inertia-6cwker><https://teachers.thenational.academy/lessons/robert-hooke-and-uses-of-elastic-objects-6rvp6e> | Forces <https://classroom.thenational.academy/lessons/forces-an-introduction-cgwk0d>Forces and elasticity <https://classroom.thenational.academy/lessons/forces-and-elasticity-part-1-6tjp8c>Moments and levers<https://classroom.thenational.academy/lessons/moments-and-levers-cmrk4r>Pressure<https://classroom.thenational.academy/lessons/pressure-6xgkgc>Pressure in fluids<https://classroom.thenational.academy/lessons/pressure-in-fluids-64t6ar>Atmospheric pressure<https://classroom.thenational.academy/lessons/atmospheric-pressure-74upct> |

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| **Unit Title** | **Sequence of learning Lesson title, theme, big question.** |  **Key concepts/outcomes/knowledge and skills.**  | **Assessment/ including specific content/ knowledge/skills tested.** **Green=assess/Blue=improve**  | **HWK. Add** **Hyperlink****To be in books clearly marked** | **Furthering Cultural Capital.****&****Opportunities for reading** | **Recall of prior or future topics –**  | **Lesson resources including or hyperlink to supporting websites/resources/books/texts & individual lessons.** **5xT+L essentials to be included in individual lessons,** |
| Topic 1.3 Contact forces | Friction and dragWhy is there so little friction on some surfaces, like ice, but not others, like wood?friction, contact force, newton, drag force, water resistance, air resistance, resultant force, equilibrium, streamlined, lubrication | **Know**- Identify examples of drag forces and friction. - Describe how drag forces and friction arise. - Write down two things an object can do when the resultant force on it is zero. - Carry out an experiment to test a prediction of friction caused by different surfaces.**Apply**- Describe the effect of drag forces and friction. - Explain why drag forces and friction arise. - Describe what happens to a moving object when the resultant force acting on it is zero.- Plan and carry out an experiment to investigate friction, selecting suitable equipment.**Extend**- Explain the effect of drag forces and friction in terms of forces. - Explain why drag forces and friction slow things down in terms of forces. - Interpret the motion of objects subject to drag forces and friction. - Plan and carry out an experiment, stating the independent, dependent, and control variables | Revision - Big Ideas Forces 1 Entrance quizFriction and drag assessment task.Differentiated questionsProgress check - Friction and drag exit quiz. | Home learning links.<https://classroom.thenational.academy/lessons/factors-that-affect-speed-c4u66d>Friction and Drag homework  | Forces – KS4[**h**ttps://classroom.thenational.academy/lessons/forces-an-introduction-cgwk0d](https://classroom.thenational.academy/lessons/forces-an-introduction-cgwk0d)Sir Isaac Newton<https://teachers.thenational.academy/lessons/case-study-sir-isaac-newton-e9jp6g> | Big Ideas Forces 1 revision deepening knowledge. KS3 Revision guide and Knowledge organiser.  | Big Idea Forces 1 revision quiz word and PPT.Friction and Drag PPT.Forces student book.Friction and Drag assessment task word and PPT.Friction and Drag exit quiz – word and PPTPractical: InvestigatingFriction.Friction and Drag homeworkContact forces check list. Forces Knowledge organiser |
| Topic 1.3 Contact forces | Squashing and stretching | **Know**- State an example of a force deforming an object. - Recognise a support force. - Use Hooke’s Law to identify proportional stretching. - State how you know from a graph that a relationship is linear, present data in a line graph, and identify a pattern.**Apply**- Describe how forces deform objects. - Explain how solid surfaces provide a support force. - Use Hooke’s Law to predict the extension of a spring. - Present data in a graph and identify a quantitative relationship in the pattern.**Extend**- Explain how forces deform objects in a range of situations. - Explain how solid surfaces provide a support force, using scientific terminology and bonding.- Apply Hooke’s Law to make quantitative predictions with unfamiliar materials. - Present data in a graph and recognise quantitative patterns and errors. | Knowledge Retention - Friction and drag - Entrance quizSquashing and stretching assessment task.Differentiated questionsProgress check - Squashing and stretching exit quiz.  | Home learning links<https://classroom.thenational.academy/lessons/investigating-elastic-objects-60wket><https://classroom.thenational.academy/lessons/hookes-law-crr6at>Squashing and stretching homework  | Forces and elasticity – KS4<https://classroom.thenational.academy/lessons/forces-and-elasticity-part-1-6tjp8c>Robert Hooke<https://teachers.thenational.academy/lessons/robert-hooke-and-uses-of-elastic-objects-6rvp6e> | Entrance quiz.Friction and drag | Friction and drag - Entrance quizSquashing and stretching PPT.Forces student book.Squashing and stretching assessment task word and PPT.Squashing and stretching exit quiz – word and PPTPractical:Investigating elasticSquashing and stretching homework  |
| Topic 1.3 Contact forces | Turning forces | **Know**- State the law of moments. - State the equation to calculate a turning force. - Identify questions from results with help.**Apply**- Describe what is meant by a moment. - Calculate the moment of a force. - Independently identify scientific questions from results.**Extend**- Apply the concept of moments to everyday situations. - Use calculations to explain situations involving moments. - Suggest relevant, testable questions. | Knowledge Retention - Squashing and stretching - Entrance quizTurning forces assessment task.Differentiated questionsProgress check – Turning forces exit quiz. | Home learning links<https://classroom.thenational.academy/lessons/levers-and-pivots-ctjpcd><https://classroom.thenational.academy/lessons/moments-and-balance-part-1-60rkcr><https://teachers.thenational.academy/lessons/moments-and-balance-part-2-60v3cd>Turning forces Homework | Moments and levers – KS4<https://classroom.thenational.academy/lessons/moments-and-levers-cmrk4r> | Entrance quiz.Squashing and stretching | Squashing and stretching - Entrance quizTurning forces PPTForces student book.Turning forces assessment task.Practical: Just a moment!Turning forces exit quiz. |
| Topic 1.4 Pressure | Pressure in gases | **Know**- Describe the motion of particles in a fluid. - Calculate fluid pressure with support. - State the cause of atmospheric pressure.**Apply**- Explain why fluids exert a pressure. - Calculate fluid pressure. - Describe how atmospheric pressure changes with height.**Extend**- Explain a range of observations in terms of fluid pressure. - Calculate fluid pressure in a range of situations. - Predict the changes to the effects of atmospheric pressure at different altitudes or temperatures. | Knowledge Retention – Turning forces - Entrance quizPressure in gases assessment task.Differentiated questionsProgress check –Pressure in gases exit quiz. | Home learning links<https://classroom.thenational.academy/lessons/atmospheric-pressure-6ww36c>Pressure in Gases HomeworkFor homework, students write a paragraph on ‘Atmospheric pressure at work’. | Atmospheric pressure – KS4<https://classroom.thenational.academy/lessons/atmospheric-pressure-74upct>Robert Brown<https://teachers.thenational.academy/lessons/robert-brown-71hp2r> | Entrance quiz. Turning forces  | Pressure in gases PPTForces student book.Activity:Investigating gas pressurePractical / Democollapsing bottle / can Pressure in gases assessment task.Pressure in gases exit quiz.Pressure in gases homework. |
| Topic 1.4 Pressure | Pressure in liquids | **Know**- State simply what happens to pressure with depth. - Describe characteristics of some objects that float and some that sink. - Write down the equation for calculating fluid pressure.**Apply**- Describe how liquid pressure changes with depth. - Explain why some things float and some things sink, using force diagrams.- Use the equation for calculating fluid pressure.**Extend**- Explain why liquid pressure changes with depth. - Explain why an object will float or sink in terms of forces or density. - Use the equation for calculating fluid pressure to explain how hydraulic machines work. | Knowledge Retention – Pressure in gases- Entrance quizPressure in liquids assessment task.Differentiated questionsProgress check –Pressure in liquids exit quiz. | Home learning links<https://classroom.thenational.academy/lessons/pressure-in-liquids-6xk6ce>Pressure in liquids Homework | Pressure in fluids – KS4<https://classroom.thenational.academy/lessons/pressure-in-fluids-64t6ar> | Entrance quiz.Pressure in gases | Pressure in gases entrance quiz. Pressure in liquids PPTForces student book.Activity: Liquidsat workDemo / practical: drinks bottle with holes at various heights.Pressure in liquids assessment task. Pressure in liquids exit quizPressure in liquids homework.  |
| Topic 1.4 Pressure | Stress on solids | **Know**- State the equation of stress. - Use ideas of stress to describe familiar situations qualitatively. - Predict qualitatively the effect of changing area and/or force on stress.**Apply**- Calculate stress. - Apply ideas of stress to different situations. - Predict quantitatively the effect of changing area and/or force on stress.**Extend**- Calculate stress in multistep problems. - Compare stress in different situations, explaining the differences in pressure using scientific knowledge.- Predict quantitatively the effect of changing area and/or force on stress in a range of situations. | Knowledge Retention –Pressure in liquids - Entrance quizStress on Solids assessment task.Differentiated questionsProgress check –Stress on solids exit quiz. | Home learning links<https://teachers.thenational.academy/lessons/pressure-crw3cd>Stress in Solids Homework | Pressure – KS4<https://classroom.thenational.academy/lessons/pressure-6xgkgc> | Entrance quiz.Pressure in liquids | Pressure in liquids entrance quiz. Stress on solids PPTForces student book.Practical:Investigating stressStress on solids assessment task.Stress on solids exit quiz |
| Topic 1.4 PressureTopic 1.3 Contact forces | Big Idea Forces Checkpoint  |  |  | End of Bid Idea Summary Questions. |  | Entrance quiz.Stress on solidsFriction and dragSquashing and stretching | Contact forces entrance quiz.Pressure entrance quiz. Forces: Checkpoint / progress task.Forces exit quiz. Forces student book.End of big idea summary questions / homework.  |
| Topic 1.4 PressureTopic 1.3 Contact forces | Big Idea Forces Revision  |  |  | End of Big Idea Forces Revision grid.  |  | Entrance quiz Pressure in gasesPressure in liquidsStress on solids | Forces student book.Forces Revision grid.Forces revision guide. Forces revision questions |
| Topic 1.4 PressureTopic 1.3 Contact forces | Big Idea Forces End of Topic Assessment  |  |  | N/A |  |  | **Forces EOTT** |