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| **Lesson Number: 21.3** | | | | |
| **Lesson Title: Newton’s Law of Gravitation** | | | | |
| **Specification Reference** | | | **3.7.2.1, 3.7.2.4** | |
| **Learning Objectives** | | | | |
| Gravity as a universal attractive force acting between all matter.  Magnitude of force between point masses: where *G* is the gravitational constant.  Orbital period and speed related to radius of circular orbit; derivation of *T*2 ∝ *r*3 | | | | |
| **Opportunities for Assessment** | | | | |
| Page 345 questions | | | | |
| **Starter:** | Slide #1 enables pupils to think about planning experiments and data collection – they may be surprised by how little data they need and that the mass of the planets and sun are not needed for this question | | | |
| **Main:** | Slide #2 is an optional mathematical investigation; using logs the students can find the straight line of the relationship and hence find the missing powers. An alternative approach is to use excel to produce a graph and then use trial and error on the powers until a straight line appears  Slide #3 is an opportunity to discuss how all great scientists build their knowledge on the discoveries of those that came before them. Note the time it took to go from Kepler to Newton!  Slide #4 describes the main points of Newton’s Law of Gravitation and gives pupils the opportunity to create a formula from ideas and relationships  Slide #5 states the Gravitational Constant (discussions here could evolve into rotational speeds of galaxies and the search for Dark Matter) | | | |
| **Plenary:** | Slide #6 is a summary | | | |
| **Homework:** | | Page 345 questions; research Isaac Newton and his theory of Gravitation | | |
| **Differentiation / Extension / S&C** | | | | |
| Research of Kepler’s Laws and their predictions | | | | |
| **Numeracy / Literacy** | | | | **SMSC / Fundamental British Values** |
| * Use of formulae and relationships * Understanding the inverse square law | | | | Understanding the relative sizes of the planets and why Earth can be considered a point mass in calculations. Building on the ideas of scientists that have come before you. |
| **RESOURCES:** | | | | |
| None | | | | |
| **Risk Assessment** e.g. CLEAPSS card reference | | | | |
| None | | | | |
| **Working Scientifically (HSW)** | | | | |
| See page 345 “Cavendish’s measurement of *G*” | | | | |

Photo on slide #1 courtesy of <https://www.flickr.com/photos/11304375@N07/2818891443>