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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 appearsSlide #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 relationshipsSlide #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*” |

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