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| **Lesson Number: 21.4** |
| **Lesson Title: Planetary Fields** |
| **Specification Reference** | **3.7.2.1, 3.7.2.2, 3.7.2.3, 3.7.2.4** |
| **Learning Objectives** |
| Magnitude of force between point masses: where *G* is the gravitational constant.*g* as force per unit mass as defined by Understanding of definition of gravitational potential, including zero value at infinity.Understanding of gravitational potential difference.Work done in moving mass *m* given by Δ*W* = *m*Δ*V**V* in a radial field given by Significance of the negative sign.Graphical representations of variations of *g* and *V* with *r*.*V* related to *g* by: Escape velocity. |
| **Opportunities for Assessment** |
| Page 350 questions |
| **Starter:** | Slides #1 and #2 are a recap of gravitational fields and the formula to describe them |
| **Main:** | Slide #3 recaps the work done so far on calculating the gravitational field strength at different locations above the surface of a planetSlide #4 extends this idea and enables pupils to think about the graph to represent this formula. The next step is to consider the gravitational field strength below the surface of the Earth – Consider first the gravity in the centre of the Earth. An extension can be to calculate or prove the formula from “Inside a planet” on page 347 of the text bookSlides #5 and #6 enable the calculation of the gravitational potential on Earth’s surface (a nice extension here is to repeat this for the moon or Mars) and link to escape velocity calculations (Pupils can calculate the escape velocity of Earth and consider why rockets are always launched in the same direction that Earth is rotating)Slide #7 explains the differences in graph shapes between gravitational field strength and potential gradients, with distance from a planet’s surface |
| **Plenary:** | Slide #8 is a summary |

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| **Homework:** | Page 350 questions |
| **Differentiation / Extension / S&C** |
| Sketching graphs of different equations e.g. (1/r2) and (1/r) |
| **Numeracy / Literacy** | **SMSC / Fundamental British Values** |
| Use of formulae, sketches of graphs | Use of physics to design multi-stage rockets and the problems / limitations with re-useable systems like the shuttle program |
| **RESOURCES:** |
| None |
| **Risk Assessment** e.g. CLEAPSS card reference |
| None |
| **Working Scientifically (HSW)** |
| See “Inside a planet” page 347 and “Multi-stage rockets” page 350 |