Projectiles

Q5 Model motion under gravity in a vertical plane using vectors; projectiles.

E9 Use trigonometric functions to solve problems in context, including problems involving vectors, kinematics and forces.

For a brief commentary on this content go to the MEI outline SoW.

Pre-requisites

- Constant acceleration ideas from AS level mechanics.
- Resolving vectors into two components.

Common student errors

- Assuming that a projectile always lands on the same level it started from.
- Failing to appreciate that the force which gives the projectile its initial velocity does not affect the subsequent motion (i.e. we are only interested in $t > 0$).
- Inconsistently identifying positive and negative directions (e.g. using -9.8 and 9.8 within the same solution for an projectile moving upwards and downwards).
- Failing to consider both horizontal and vertical components of velocity when determining speed.

Teaching it!

- A series of videos designed to support students on this topic. (Coming soon)
- A projectile simulator from the PhET Colorado project.
- A simple GeoGebra version of the above, designed to model a shot put.
- Free kick: A modelling activity taken from the Teaching Mechanics 1 course.
- Model solutions: A projectiles activity from NRICH that focuses on modelling assumptions.
- A short activity challenging students to create questions to fit a given scenario.

Getting them thinking

- What is the direction of the resultant force on a projectile?
- What shape does the trajectory of a projectile take, and *why* does it have this shape?
- What angle of projection gives the maximum range? Does this angle change if the point of release is at a different height to the landing level, and if so how?
- How much further could you hit a golf ball on the Moon? How much higher?