

Box 1: Keywords

Word	Definition
Projectile Motion	Refer to the movement of an object or a human body as it travels through the air.
Horizontal Displacement	The shortest distance from the starting point to the finishing point in a straight line, parallel to the ground.
True Parabola	A uniform curve that is symmetrical at its highest point, (it has matching left and right sides).
Distorted Parabola	A non-uniform curve that is asymmetrical at its highest point, (its left and right side do not match).
Air Resistance	An external force exerted in the opposite direction of motion on a projectile as it travels through the air.
Weight	The gravitational force exerted on a projectile as it travels through the air.
Vector Components	Horizontal Component – refers to the horizontal motion of an object. Vertical Component – refers to the vertical motion of an object.

Box 2: Key skills

Calculate biomechanical equations using units of measurement; make observations and draw conclusions from data.

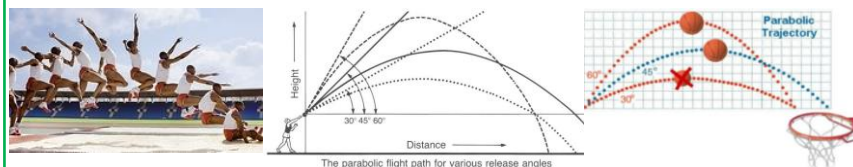
Box 3: Factors Affecting Horizontal Displacement of Projectiles

Angle of Release

Speed of Release

Height of Release

Angle of Release – The optimum angle of release is dependent on: 1. Release Height and 2. Landing Height.



When:

1. The release height and landing height are equal, the optimum angle of release is 45 degrees. Eg. Long Jump
2. The release height is below the landing height, the optimal angle of release is greater than 45 degrees. Eg. Shooting in basketball.
3. The release height is higher than the landing height, the optimal angle of release is less than 45 degrees. Eg. Shot Put

Speed of Release – The greater the release velocity, the greater the horizontal displacement of the projectile.

Height of Release – The greater the release height of the projectile, the greater the horizontal displacement will be. Releasing the projectile at the highest possible point above the ground will increase the horizontal displacement.

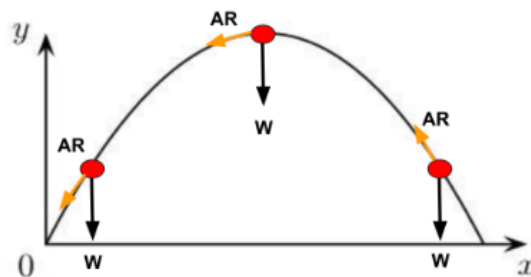
Box 4: Factors Affecting Flight Paths of Different Projectiles

Free Body Diagrams The forces acting on a projectile in flight can be represented with a free-body diagram that shows which forces are acting, where the forces originate and the relative size and direction of each force.

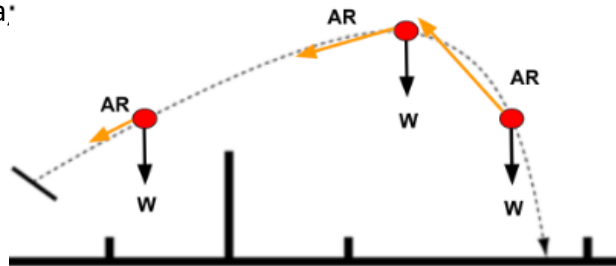
Forces acting on a projectile: weight and air resistance

Shot Put Projectiles with a large weight force, such as a shot put, have a small air resistance force and follow a true parabolic flight path.

↓ = Weight force
 ↓ = Air resistance
 (this force is so small, its **negligible**).



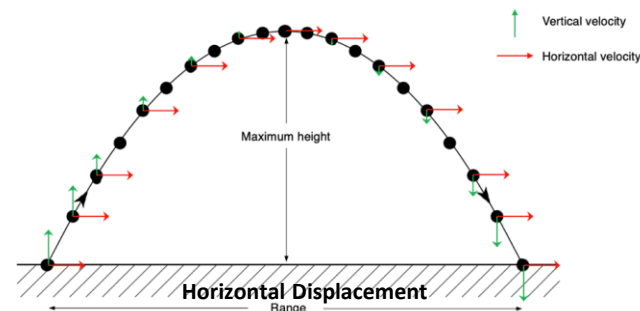
Badminton Shuttle Projectiles with a small weight force, such as a badminton shuttlecock, are more greatly affected by air resistance. The effects of air resistance results in a flight path that deviates from a true parabola.



Box 5: Vector Components of Parabolic Flight

Vector Diagrams A vector is drawn as an arrow to show its magnitude (size) and direction. A larger arrow means there is more magnitude. A smaller arrow means there is less magnitude.

A shot put follows a parabolic flight path because air resistance is negligible. The horizontal component is therefore unaffected by air resistance and remains constant during flight. There is a large positive vertical component on release, zero at the highest point, and large negative vertical component before landing due to the effects of gravity.



Box 6: Pathway

Previous knowledge: from teaching sequence

Future links: from teaching sequence

Careers: from curriculum narratives

Box 7: Cross curricular links