

Kinetic Analysis

- Determine what object (system) you are interested in analyzing motion of.
- Identify all the forces acting ON the object (system).
 - Reaction to forces caused BY the system
- Apply Newton's 2nd Law

$$\Sigma F_{ON} = ma_{object}$$
- Break analysis down to specific directions
- The Kinetics are directly related to the Kinematics
 - Magnitude
 - Direction

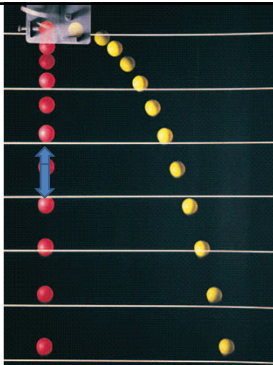
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Vertical Motion

- Acceleration = -9.8 m/s^2
- Velocity is constantly changing



Horizontal Motion

- Acceleration = 0 m/s^2
- Velocity is constant

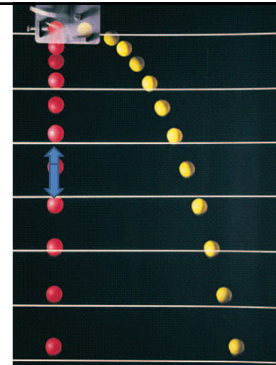
Forces acting on the projectile:

- Gravity
- Air resistance

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Both balls fall vertically at the same rate.

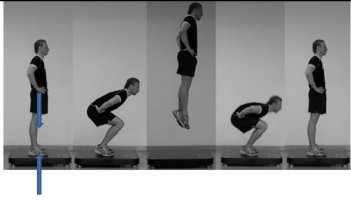
Yellow ball moves horizontally at constant velocity.



Forces acting on the projectile:

- Gravity
- Air resistance

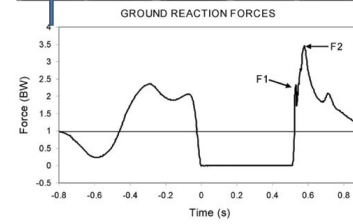
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Forces acting on the jumper:

- Gravity
- Ground reaction force
- Air resistance

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Forces acting on the jumper:

- Gravity
- Ground reaction force
- Air resistance

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Forces acting on the **runner**:

- Gravity
- Ground reaction force
 - Vertical, anterior-posterior, medial-lateral
- Air resistance

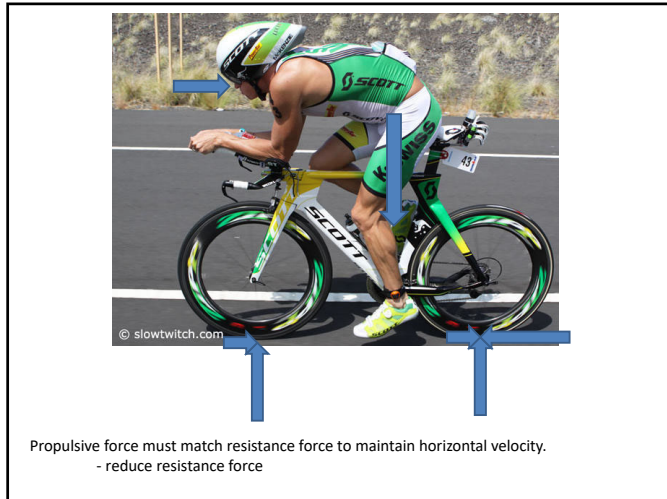
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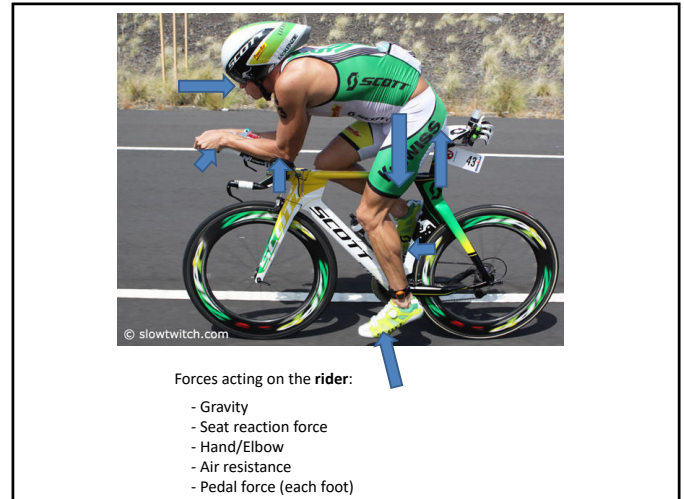
Forces acting on the **bike/rider** system:

- Gravity
- Ground reaction force (each wheel)
- Air resistance
- Propulsive force

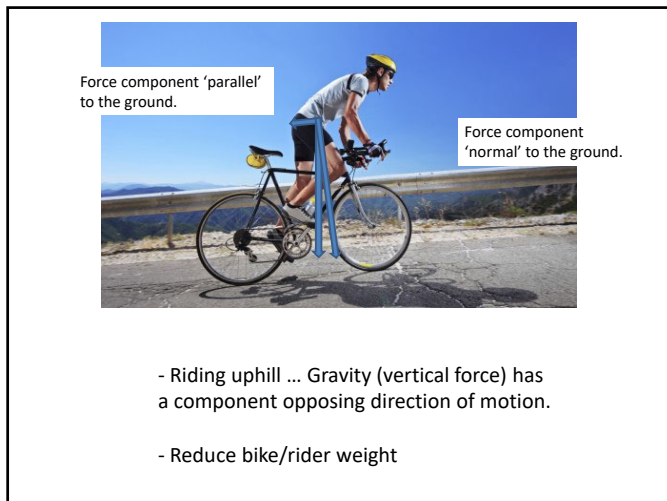
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Forces acting on the **lifter/weight system**:

- Gravity
- Ground reaction force

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Forces acting on the **weight**:

- Gravity
- Hands

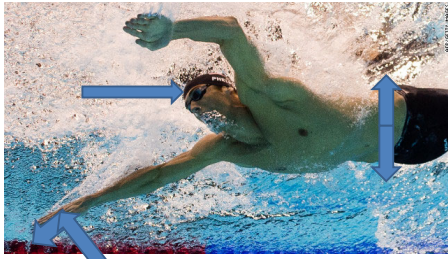
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Forces acting on the swimmer:

- Gravity
- Buoyancy
- Drag (hands / legs)
- Lift
- Water resistance

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- Reduce resistance force.
- Swim suit, goggles, cap, skin
- position

- Maximize propulsive force.
- drag

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- Apply Newton's 2nd Law
 - $\Sigma F_{ON} = ma_{object}$
- Break analysis down to specific directions
 - e.g., horizontal, vertical, medial-lateral
 - If I am interested in horizontal motion, I need to identify all the horizontal forces acting on the system.
 - Sometimes, you need to break a 3D force into components.
- The Kinetics are directly related to the Kinematics
 - Magnitude
 - Direction

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