

Acceleration Due to Gravity

Gravity causes all objects to continually accelerate towards the centre of the Earth. As objects are in free fall, they continue to gain velocity.

Regardless of mass, all objects accelerate at the same rate.

At the surface of the Earth, the acceleration of gravity is accepted to be:

$$a = g = 9.8 \text{ m/s}^2$$

When we use this acceleration in kinematic equations, we will use

$$g = - 9.8 \text{ m/s}^2$$

(down is the negative direction and up is the positive direction)

Other facts about free fall:

- Objects thrown upward decelerate until they come to rest at the maximum height, and then accelerate on the way down.
- At the max. height, $v = 0 \text{ m/s}$.
- In reality, objects reach a velocity where the air resistance force equals the force of gravity and they no longer gain speed. This is called the terminal velocity.

ex.

A bullet is fired upwards with a velocity of 125 m/s.

- a.) To what height will it rise?
- b.) How long will it take to reach that height?
- c.) How long will it take to strike the ground again?
- d.) What is its velocity after 18 seconds?
- e.) What velocity will it strike the ground with?