

Motion at constant acceleration

- Acceleration:

$$a = \frac{\text{change in velocity}}{\text{change in time}} = \frac{\Delta v}{\Delta t}$$

- If there were no air resistance, all objects in Earth gravity would fall with the same acceleration, $g=9.8 \text{ m/s}^2$

- For motion at constant acceleration a , with no initial speed, the displacement after time t is:

$$Dx = v_{\text{average}} t = \left(\frac{0 + at}{2} \right) \times t = \frac{at^2}{2}$$

Homework

Problem 1.

Suppose that you are trying to reproduce an experiment of Galileo by dropping a rock from certain tower. The time of its free fall turns out to be $t=5.0$ seconds.

- a) How tall is the tower?
- b) What will be the time of the rock's fall if it is dropped from half the tower's height?
- c) Imagine that instead of simply releasing the rock with no initial speed, you throw it horizontally with speed $V=6$ m/s. How far from the tower will it land?

Problem 2.

The largest passenger airplane, Airbus A380, has acceleration $a=2$ m/s² during its take-off.

- a) How much time it needs to reach the take off speed $v= 280$ km/hr?
- b) How long the runway should be?