# Acceleration

- **Acceleration:**

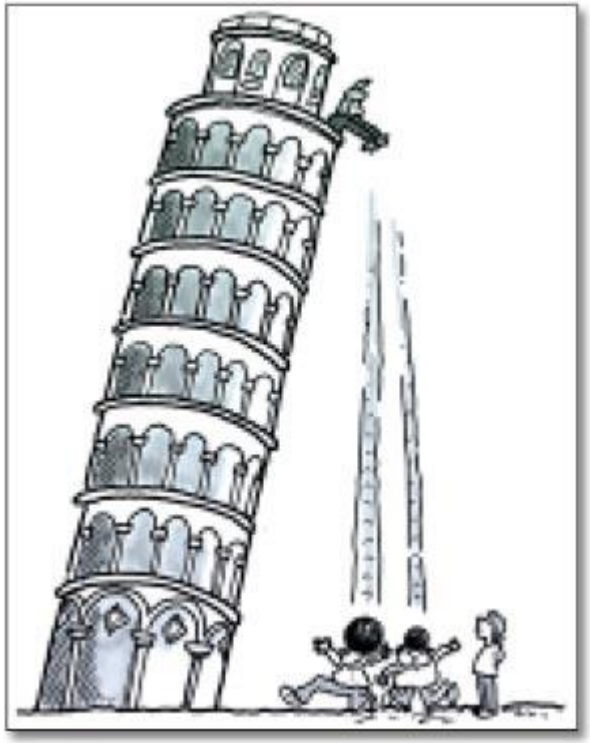
$$a = \frac{\text{change in velocity}}{\text{time}} = \frac{\Delta v}{t}$$

Standard units of acceleration : $m/s^2$

- **If there were no air resistance, all objects in Earth gravity would fall with the same acceleration,**

**$g=9.8\ m/s^2$**

**(directed downward)**



**Galileo Galilei's experiment in Pisa (possibly, a legend)**

# Homework 7

**Problem 1.**

NASA wants to measure free fall acceleration precisely. To do that, they perform an experiment in which they measure how speed of a falling object changes with time during free fall in vacuum. The results are provided in the table. Find the acceleration during each segment.

| t(s) | 0 | 2 | 5 | 10 | 15 |
|---|---|---|---|---|---|
| **v(m/s)** | 0 | 19.62 | 49.05 | 98.10 | 147.15 |

**Problem 2.**

A car starts at rest at $t = 0\ s$. The car accelerates at $\mathrm{a} = 6\ {}^{m}/_{s^2}$ until it reaches a velocity of $\mathrm{v} = 42\ {}^{m}/_{s}$. **(a)** How long did it take for the car to reach this velocity? The car kept this speed for $5s$, until the driver saw a police car in the horizon. The driver slammed the brakes bringing the speed of the car down to $v = 27\ {}^{m}/_{s}$ in just $3s$. **(b)** What was the acceleration of the car during the braking process?

See problem 3 on the next page.

**Problem 3.**

In the following graph of $v$ vs. $t$, draw the behavior of the velocity of the car in the previous problem.