

2.1 Free fall

Free fall is an uniform accelerated motion with no initial speed.

$$\mathbf{h = \frac{1}{2} g t^2, \quad v = g t}$$

where h – height (m)

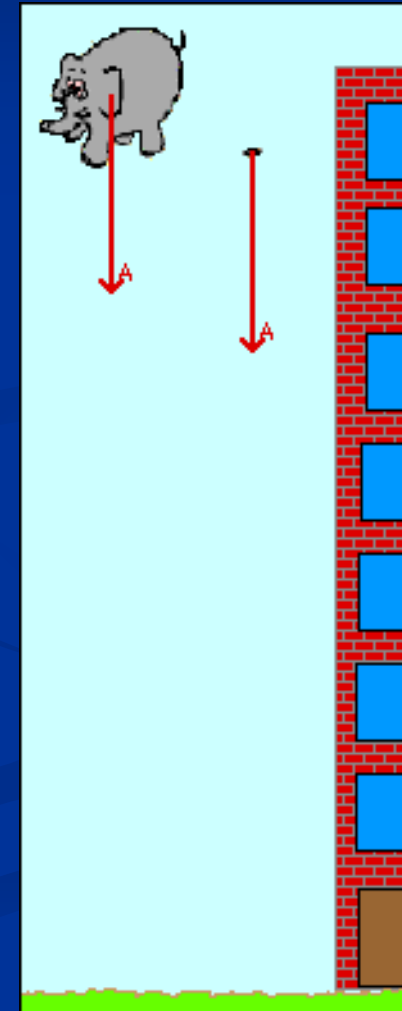
g – acceleration due to gravity (m.s^{-2})

t – time (s)

v – velocity (m.s^{-1})

All bodies accelerate at the same rate of acceleration due to gravity $g = 9,81\text{m.s}^{-2}$.

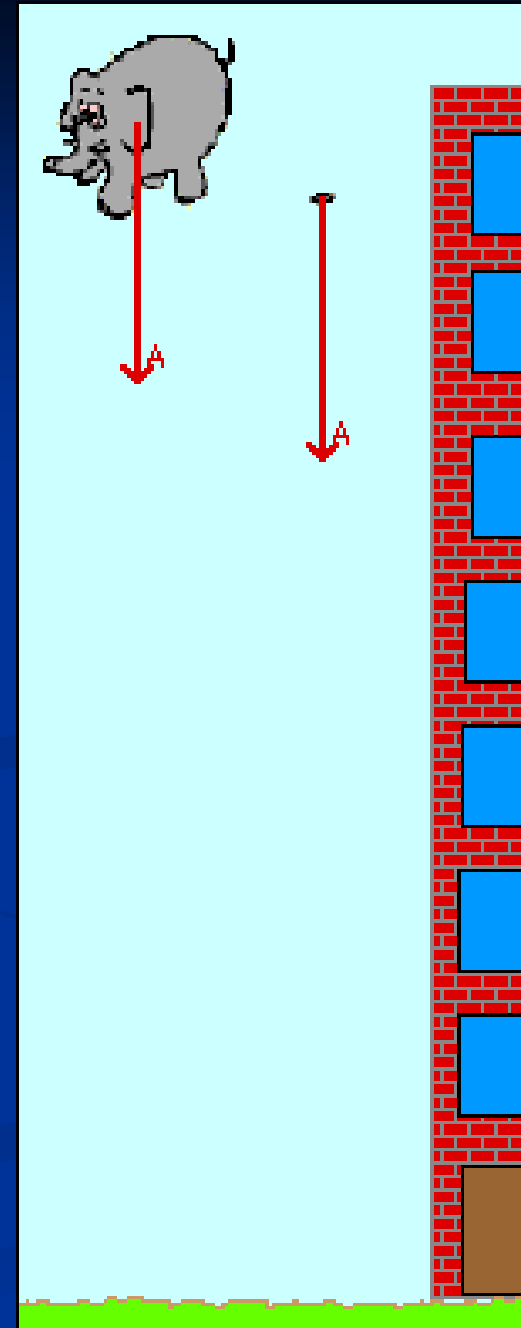
Acceleration of the objects does not depend on the mass of a body.



Elephant and Feather - Air Resistance

Suppose that an elephant and a feather are dropped off a very tall building from the same height at the same time. We will assume the realistic situation that both feather and elephant encounter air resistance. Which object - the elephant or the feather - will hit the ground first?

The animation depicts this situation. The motion of the elephant and the feather in the presence of air resistance is shown. Further, the acceleration of each object is represented by a vector arrow.



Question:

What is the height of the window, when a ball dropped out from it reaches the ground in 10 seconds. What is the final speed of the ball? Neglect the air resistance!

Homework: (on a paper)

What is the height of the window, when a ball dropped out from it reaches the ground in 5 seconds. What is the final speed of the ball? Neglect the air resistance!