3.3 Freely Falling Objects

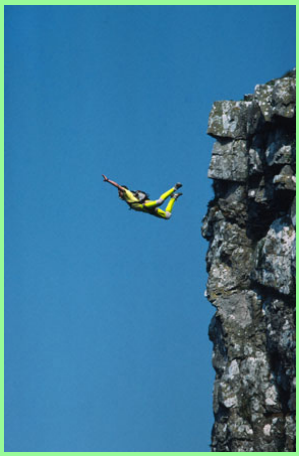
STANDARDS

3.1 I can interpret and analyze the motion of an object in free fall.

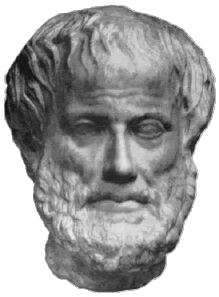
MECHANICS

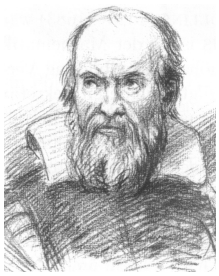
$v_x = V_{x0} + a_x t$ $a =$ acceleration
$x = x_0 + V_{x0} t + \frac{1}{2} a_x t^2$ $A =$
$v_x^2 = V_{x0}^2 + 2a_x(x - x_0)$ $d =$
$E =$
$f =$
$\vec{a} =$ $F =$
$I =$
$K =$
$k =$
$|\vec{F}_f| \leq$ $L =$
$\ell =$
$m =$
$a_c =$ $P =$
$p =$
$\vec{p} =$ $r =$
$T =$
$\Delta\vec{p} =$ $t =$ time
$U =$
$K =$ $V =$
$v =$ speed/velocity
$\Delta E =$ $W =$
$x =$ position

Free Fall is the motion of an object falling freely under the influence of gravity.

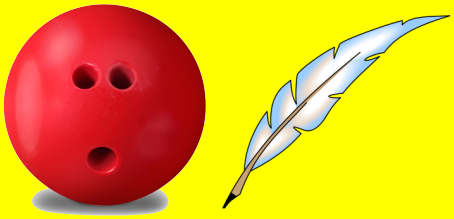


Aristotle vs. Galileo





Bowling Ball vs. Feather



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Same

What up "g"?

g ⟶ is the acceleration due to gravity

$g = 9.80\ m/s^2$

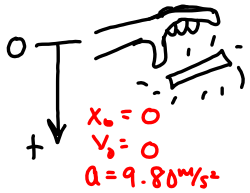
Is "g" a constant value everywhere on Earth?

TABLE 2–5 Values of g at Different Locations on Earth (m/s^2)

Location	Latitude	g
North Pole	90° N	9.832
Oslo, Norway	60° N	9.819
Hong Kong	30° N	9.793
Quito, Ecuador	0°	9.780

JOURNEY TO THE CENTER OF THE EARTH

1 2



$x = x_0 + v_0 t + \frac{1}{2} a t^2$

$x = \frac{1}{2} g t^2$

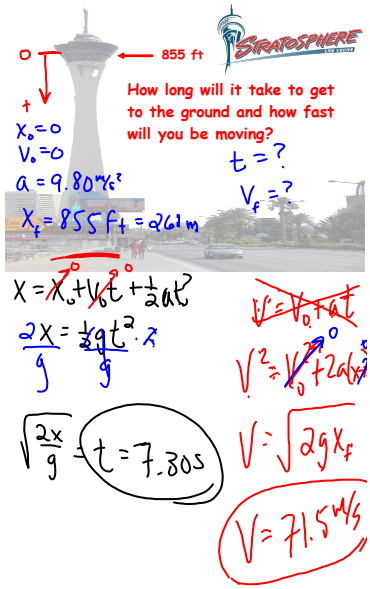
$x = 44\ m$

$1\ m = 3.281\ ft$

$44\ m \times \frac{3.281\ ft}{1\ m} = 150\ ft$

Equations

Equation
$v = v_i + g\,t$
$x = x_i + v_i t + \frac{1}{2} g\,t^2$
$v^2 = v_i^2 + 2\,g\,\Delta x$



PRACTICE

Unit 3 Practice Problems

(10-13)