

3.3 Freely Falling Objects

STANDARDS

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

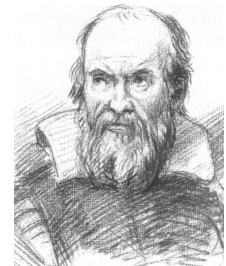
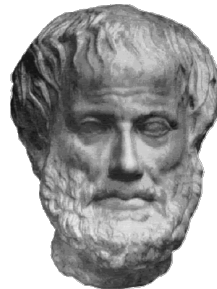


- MECHANICS
- $v_x = v_0 + at$ $a = \text{acceleration}$
 - $x = x_0 + v_0t + \frac{1}{2}at^2$ $A =$
 - $v_x^2 = v_0^2 + 2a(x - x_0)$ $d =$
 - $\bar{a} =$ $E =$
 - $|\vec{F}_j| \leq$ $f =$
 - $a_c =$ $F =$
 - $\vec{p} =$ $I =$
 - $\Delta\vec{p} =$ $K =$
 - $K =$ $k =$
 - $\Delta E =$ $L =$
 - $U =$ $\ell =$
 - $V =$ $m =$
 - $W =$ $P =$
 - $x =$ $p =$
 - $r =$ $T =$
 - $t = \text{time}$
 - $v = \text{speed/velocity}$
 - $W =$
 - $x = \text{position}$

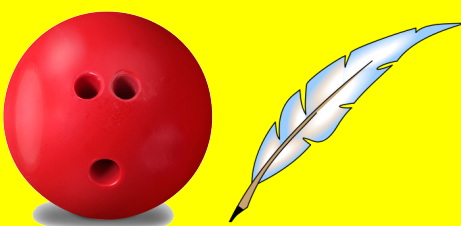
Free Fall is the motion of an object falling freely under the influence of gravity.



Aristotle vs. Galileo



Bowling Ball vs. Feather



13 ☹️

Same.

3

What up "g"?

g → is the acceleration due to gravity

$g = 9.80 \text{ m/s}^2$

Is "g" a constant value everywhere on Earth?



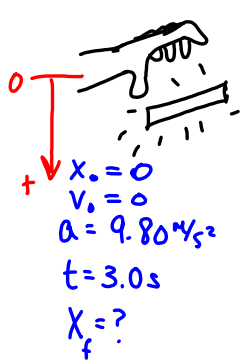
TABLE 2-5 Values of g at Different Locations on Earth (m/s^2)

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

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JOURNEY TO THE CENTER OF THE EARTH

1 2



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

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

$$x = 44 \text{ m}$$

$$1 \text{ m} = 3.281 \text{ ft}$$

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

Equations

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





855 ft

How long will it take to get to the ground and how fast will you be moving?

$x_0 = 0$
 $v_0 = 0$
 $x_f = 855 \text{ ft} \times \frac{1 \text{ m}}{3.281 \text{ ft}} = 261 \text{ m}$
 $a = 9.80 \text{ m/s}^2$
 $t = ?$
 $v_f = ?$

$$X = X_0 + V_0 t + \frac{1}{2} a t^2$$

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

$$\frac{2X}{g} = t^2$$

$$\sqrt{\frac{2X}{g}} = t = 7.30 \text{ s}$$

$$V_f^2 = V_0^2 + 2a(x_f)$$

$$V_f^2 = 2gX_f$$

$$V_f = \sqrt{2gX_f}$$

$$V_f = 71.5 \text{ m/s}$$

PRACTICE

Unit 3 Practice Problems (6-9)