Name _____ Date _____

FREE FALL ENERGY

answer key

For each of the following, a complete solution will consist of:
a) a well-labeled diagram of the situation
b) a list of all motion variables with givens, labeled with appropriate algebraic signs (+, –)
c) a clear presentation by showing the equation used before producing a numerical answer

A body falls freely from rest on Earth.

a) Find its displacement from t = 0 to t = 3s.

$v_i = 0$
$v_f =$
$a = -9{,}8\ m/s^2$
$\triangle y =$
$t = 3s$

$\triangle y = v_o t + 1/2\ gt^2$
$\triangle y = 1/2\ gt^2$
$= 1/2\ (-9{,}8)3^2$
$= -44{,}1m$

b) if it falls 2 xs longer (for 6 s), how much farther will it fall?

Need the relationship between t and $\triangle y$ without any other variables that would be affected by increasing t.
Then isolate $\triangle y$ since you want to know what happens to 4y: The relationship is boxed above

$$\triangle y = 1/2\ gt^2$$

If time of fall is doubled, Ay will be increased by 4xs

c) Find the time for it to reach a speed of 25 m/s

$v_i = 0$
$v_f = 25\ m/s$
$a = 9{,}8\ m/s^2$
$\triangle y =$
$t =$

$\triangle y = v_o + gt^2$
$\triangle y = gt$
$25 = 9{,}8t$
$t = 2{,}55s$

d) Find the time to reach double the speed (50 m/s)

Need relationship between v and t without any variables that would be affected by changing the speed (see boxed equation above):

$$v = gt$$

if final velocity is doubled, t will be increased by 2xs

e) Find the time required for it to fall 300 m

$v_i = 0$
$v_f =$
$a = -9{,}8\ m/s^2$
$\triangle y = -300m$
$t =$

$\triangle y = v_o t + 1/2gt^2$
$\triangle y = 1/2gt^2$
$-300 = 1/2\ (-9{,}8)t^2$
$t = 7{,}82s$