An example in Potential Energy

Ex.

A book ($m = 15\ kg$) located on the floor ($h = 0$) is picked up and moved to the top row of a bookshelf ($h = 2\ m$).

a) How much PE was stored in the book as a result of its new position?
b) How much work was done in moving the book?
c) If the book falls, what will its speed be just before it hits the ground?
d) What is the change in KE of the book just before it hits the ground?

a & *b*) $W = Fd$

$W = mgh = PE$

Therefore, the work done is the same as the energy stored:

$$W = (15kg)\left(9.8\frac{m}{s^2}\right)(2m)$$

$W = 294J$ NOTE: *At this point, KE* = 0 (*since v* = 0)

c) *Initially, the book is at rest* ($v_i = 0$).

Given	Needed
v_i, a, d	v_f

➔ *Use Equation # 2:* $v_f^2 = v_i^2 + 2ad$

$$v_f = \sqrt{v_i^2 + 2ad}$$

$$v_f = \sqrt{2\left(9.8\frac{m}{s^2}\right)(2m)}$$

$$v_f \approx 6.26\frac{m}{s^2}$$

d) Using $KE = ½\ mv^2$

$$\Delta KE = \frac{1}{2}mv_f^{\ 2} - \frac{1}{2}mv_i^{\ 2}$$

$$\Delta KE = \frac{1}{2}(15kg)\left(6.26\frac{m}{s}\right)^2 - 0$$

$$\Delta KE = 294J$$

NOTE:

Now that the book is near the ground, $h = 0$ and there is no more PE ($PE = mgh = 0$). **All** of the stored mechanical energy has been converted to KE.