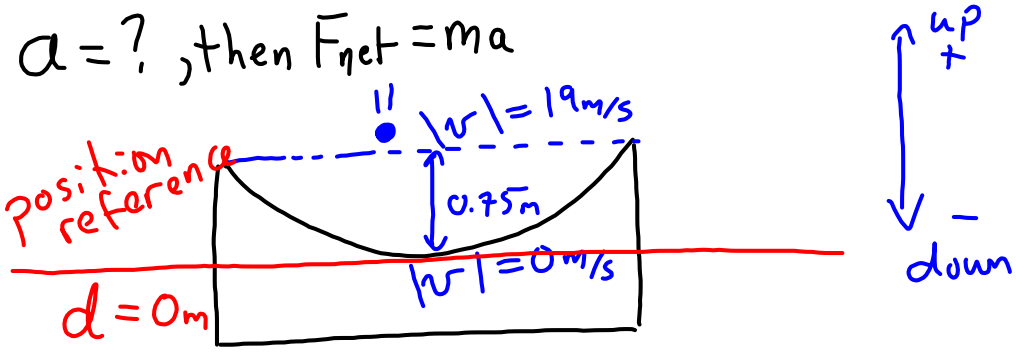
Combining Dynamics and Kinematics

A 2.5 kg ball falls on an air mattress. Just as it hit the ball had a speed of 19 m/s. The air mattress depressed 0.75 m to stop the ball. Calculate the average stopping force acting on the ball. (602 N)



$d_o = 0.75\,m$

$v_o = -19\,m/s$ $\quad d_f = 0m$ $\quad \vec{a} = ?$

$v_f = 0\,m/s$

$$v_f^2 = v_o^2 + 2a(d_f - d_o)$$

$$0^2 = (-19)^2 + 2a(0 - (0.75))$$

$$0 = 361 + 2a(-0.75)$$

$$-361 = -1.5a$$

$$\frac{-361}{-1.5} = a \qquad +241\,m/s^2 = a$$

$$F_{net} = (2.5\,kg)(+241)$$

$$= +602\,N$$

Your Turn:

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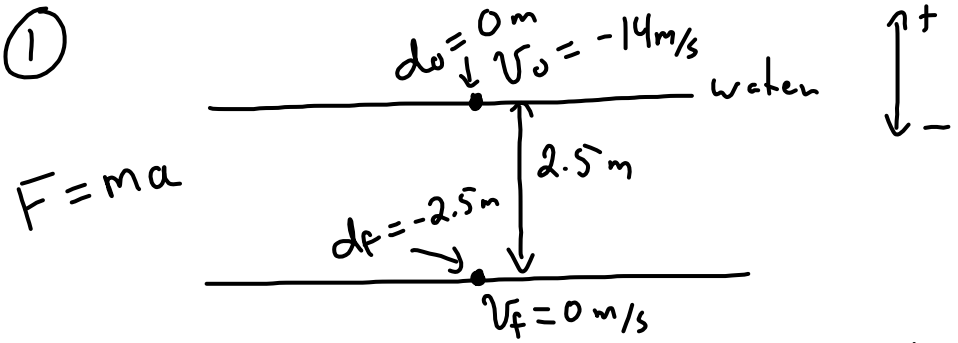
A a 45 kg diver enters the water with a speed of 14 m/s.

1. Calculate the average stopping force of the water if she comes to rest at a depth of 2.5 m.
2. Calculate how high the diving platform is above the surface of the water (assume no jumping and initial velocity was zero).

(1)



$F = ma$

$v_f = 0 m/s$

$v_0 = -14 m/s$

$d_0 = 0m$

$d_f = -2.5m$

$a = ?$

$v_f^2 = v_0^2 + 2a(d_f - d_0)$

$0^2 = (-14)^2 + 2a(-2.5 - 0)$

$0 = 196 - 5a$

$\frac{-196}{-5} = a$ $\quad 39.2 m/s^2 = a$

$F = ma$

$= (45)(39.2)$

$= 1764 N$

Pg 19-20 of Problem Set

for #17 do a+b only

Attachments

forces-and-motion-basics_all.jar

forces-1d_all.jar