

Military Training - Bent Knees #2

An 80.0 kg person steps off a 4.0 m wall and land on firm ground. If he bends his legs 40.0 cm to stop himself after impact what if the impulse on him and the force on him by the ground?

$v_i^2 = 0 + 2(9.81)(-4)$
 $v_i = -8.89 \frac{m}{s}$

$\text{Impulse} = \Delta p = (80)(0) - (-8.89)$
 $= +708.7 \text{ kg}\cdot\text{m/s}$

$708.7 \text{ kg}\cdot\text{m/s} = F\Delta t$
 $F = \frac{708.7}{0.0895}$
 $F = 7962 \text{ N}$

Find time

$v_{\text{ave}} = \frac{d}{t} = \frac{v_i + v_f}{2}$
 $\frac{d}{t} = \frac{-8.89 + 0}{2}$
 $t = \frac{0.40}{-4.45} = 0.0895 \text{ s}$
 $\frac{0.40}{t} = -4.45 \frac{m}{s}$

$\% \text{ increase} = \frac{\text{increase}}{\text{Reg } F_g} \times 100$
 $= \frac{7962}{(80)(9.81)} \times 100 = 10.14 \times 100$
 $= 1014\%$

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