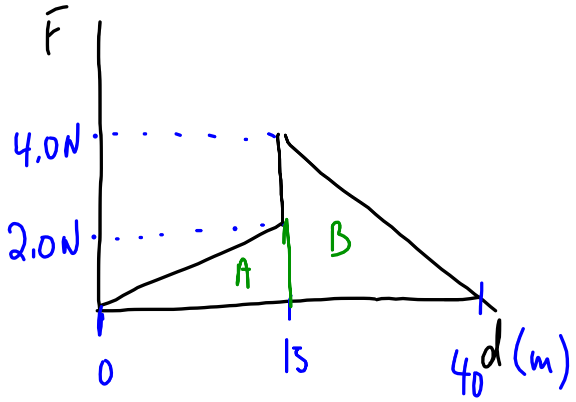
PP|229

11 b



A

$\text{Area} = \frac{1}{2}bh$

$\text{Area} = \frac{1}{2}(15m)(2.0N)$

$W = 15J$

B

$\text{Area} = \frac{1}{2}bh$

$\text{Area} = \frac{1}{2}(25m)(4.0N)$

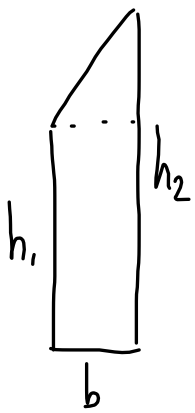
$W = 50J$

TOTAL WORK = 15J + 50J
= 65J

Rectangles: $A = l \times w$

Triangle: $A = \frac{1}{2}bh$

Trapezoid: $A = \frac{1}{2}(h_1 + h_2)b$



§6-2 Kinetic Energy + the Work-Energy Theorem

Any moving object object has kinetic energy.

$$E_k = \frac{1}{2}mv^2$$

where E_k is the kinetic energy (J) $N \cdot m$ $kg \cdot \frac{m^2}{s^2}$

m is the mass (kg)

v is the speed (m/s)

* E_k is a scalar quantity

MP|237

$m = 0.200\,kg$

$v_1 = 0\,m/s$

$v_2 = 27.0\,m/s$

a) $E_{k_1} = ?$

b) $E_{k_2} = ?$

a) If the puck is at rest, then the kinetic energy is zero.

b) $E_k = \frac{1}{2}mv^2$

$E_k = \frac{1}{2}(0.200\,kg)(27.0\,m/s)^2$

$E_k = 72.9\,J$

Since the kinetic energy of the hockey increased, there must have been work done on the puck by some force (i.e. the hockey stick)

How is work related to kinetic energy?

$$W = F_{\parallel} \Delta d$$

$$W = ma\Delta d \qquad (F = ma)$$

$$W = m\frac{\Delta v}{\cancel{\Delta t}} V_{ave} \cancel{\Delta t}$$

$$V_{ave} = \frac{\Delta d}{\Delta t}$$

$$\Delta d = V_{ave} \Delta t$$

$$W = m(V_2 - V_1)(V_1 + V_2)\frac{1}{2}$$

$$W = \frac{1}{2}m(\cancel{V_1 V_2} + V_2^2 - V_1^2 - \cancel{V_1 V_2})$$

$$W = \frac{1}{2}m(V_2^2 - V_1^2)$$

$$W = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2$$

$$W = E_{K_2} - E_{K_1}$$

$$W = \Delta E_K$$

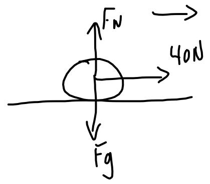
Work - Energy Theorem

The work done by a force on an object is equal to the object's change in kinetic energy.

MP|242

$m = 2.5\,kg$
$v_1 = 0$
$F = 4.0 \times 10^1\,N$
$\Delta d = 1.5\,m$

a) $W = ?$
b) $v_2 = ?$



a) $W = F_{\parallel} \Delta d$

$W = (40N)(1.5m)$

$W = 60J$ $(6.0 \times 10^1 J)$

b) $W = \Delta E_k$

$W = E_{k_2} - \cancel{E_{k_1}}$ 0 (at rest)

$W = \frac{1}{2} m v_2^2$

$60J = \frac{1}{2}(2.5\,kg) v_2^2$

$\frac{J}{kg} = \frac{\cancel{kg} \cdot \frac{m^2}{s^2}}{\cancel{kg}}$

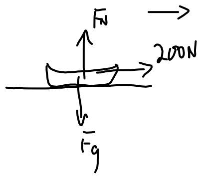
$\frac{120J}{2.5\,kg} = v_2^2$

$v_2 = 6.9\,m/s$

MP|244

$m = 75\,kg$
$v_1 = 8.0\,m/s$
$F = 2.0 \times 10^2\,N$
$\Delta d = 5.0\,m$

$E_{k_2} = ?$



$W = F_{\parallel} \Delta d$

$W = (2.0 \times 10^2 N)(5.0m)$

$W = 1.0 \times 10^3 J$

increasing the KE by 1000J

$W = \Delta E_k$

$W = E_{k_2} - E_{k_1}$

$W = E_{k_2} - \frac{1}{2} m v_1^2$

$1.0 \times 10^3 J = E_{k_2} - \frac{1}{2}(75\,kg)(8.0\,m/s)^2$

$1.0 \times 10^3 J = E_{k_2} - 2400J$

$E_{k_2} = 3400J$
$(3.4 \times 10^3 J)$

Now figure out how fast the skateboarder is going

TO DO

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PP|245-246