Physics 122 Name: _____
Ch 10 section 2 T1 Date: _____

1. An Atwood Machine consists of masses of 3.8 kg and 4.2 kg. What is the acceleration of the masses? What is the tension in the rope?

2. A 3.0 kg counterweight is connected to a 4.5 kg window that freely slides vertically in its frame. How much force must you exert to start the window opening with an acceleration of 0.25 m/s^2?

3. The smaller mass on an Atwood machine is 5.2 kg. If the masses accelerate at 4.6 m/s^2, what is the mass of the second object? What is the tension in the rope?

4. The smaller mass on an Atwood machine is 45 kg. If the tension in the rope is 512 N, what is the mass of the second object? What is the acceleration of the objects?

Formulas $F = ma$ $F_T = Fg + Fa$ $g = 9.81\ m/s^2$

Jun 11-8:19 PM

1. $m_1 = 3.8\,kg$
$m_2 = 4.2\,kg$
$a = ?$
$F_T = ?$

$F_1 = m_1 g$
$F_1 = (3.8\,kg)(9.81\,m/s^2)$
$F_1 = 37.278\,N$

$F_2 = m_2 g$
$F_2 = (4.2\,kg)(9.81\,m/s^2)$
$F_2 = 41.202$

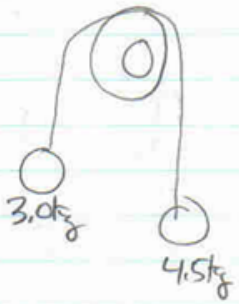
$F_{net} = F_2 + F_1 = 41.202N + -37.278N = 3.924N$

$F_{net} = ma$
$3.924N = (3.8\,kg + 4.2\,kg)\,a$
$3.924N = (8.0\,kg)(a)$
$a = 0.4905\,m/s^2$

$F_T = m_1 g + m_1 a$
$F_T = (3.8\,kg)(9.81\,m/s^2) + (3.8\,kg)(0.4905\,m/s^2) = 39.14N$

$F_T = m_2 g + -m_2 a$
$F_T = (4.2\,kg)(9.81\,m/s^2) - (4.2\,kg)(0.4905\,m/s^2) = 39.14N$

2 $m_1 = 3.0\,kg$
$m_2 = 4.5\,kg$
$a = 0.25\,m/s^2$



$F_T = m_1 g_1 + m_1 a$
$F_T = (3.0\,kg)(9.8\,m/s^2) + (3.0\,kg)(0.25\,m/s^2)$
$F_T = 30.18\,N$

$F_T = m_2 g - m_2 a$
$F_T = (4.5\,kg)(9.8\,m/s^2) - (4.5\,kg)(0.25\,m/s^2)$
$F_T = 43.02\,N$

$F_1 = m_1 g_1 = (3.0\,kg)(9.8\,m/s^2) = 29.43\,N$

$F_2 = m_2 g_2 = (4.5\,kg)(9.8\,m/s^2) = 44.145\,N$

$F_{net} = 44.145\,N + -29.43\,N = 14.715\,N$

$F_{net} = m_T a$
$14.715\,N = (3.0\,kg + 4.5\,kg)\,a$
$14.715\,N = (7.5\,kg)\,a$
$a = 1.962\,m/s^2$

$F_{net} = m_{Tot} a$
$F_{net} = (3.0\,kg + 4.5\,kg)(0.25\,m/s^2)$
$F_{net} = 1.875\,N$

3. $m_1 = 5.2\,kg$
$a = 4.6\,m/s^2$
$m_2 = ?$
$F_T = ?$

$F_T = m_1 g + m_1 a$
$F_T = (5.2\,kg)(9.81\,m/s^2) + (5.2\,kg)(4.6\,m/s^2)$
$F_T = 74.932\,N$

$F_T = m_2 g + - m_2 a$
$74.932\,N = m_2 (g - a)$
$74.932\,N = m_2 (9.81\,m/s^2 - 4.6\,m/s^2)$
$74.932\,N = 5.21 m_2$
$m_2 = 14.38\,kg$

4. $m_1 = 45\,kg$
$F_T = 512\,N$
$m_2 = ?$
$a = ?$

$F_T = m_1 g + m_1 a$
$512\,N = (45\,kg)(9.81\,m/s^2) + (45\,kg)(a)$
$512\,N = 441.45\,N + 45a$
$70.55 = 45a$
$a = 1.57\,m/s^2$

$F_T = m_2 g + - m_2 a$
$F_T = m_2 (g - a)$
$512\,N = m_2 (9.81\,m/s^2 - 1.57\,m/s^2)$
$512\,N = 8.24 m_2$
$m_2 = 62.12\,g$