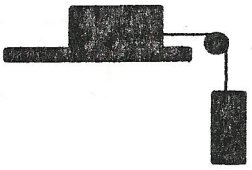
Physics 432
Atwood's Machine Problems

Name: _____
Date: _____ Hr. ___

1. A 2.0 kg mass rests on a frictionless table. It is connected to a hanging 1.0 kg mass by a massless string draped over a frictionless pulley as show. Draw an FBD. Write the Fnet equation for each mass separately.



Fnet of the 2.0 kg mass:

Fnet of the 1.0 kg mass:

Calculate the acceleration, a, of the masses:

Calculate the tension, T, in the string:

2. A 1.0 kg mass and a 0.50 kg mass hang form opposite ends of a massless string supported by a frictionless pulley as shown below. Draw an FBD. Write the Fnet equation for each mass separately.

Fnet of the 1.0 kg mass:

Fnet of the 0.5 kg mass:

The acceleration, a, of the masses:

The tension, T in the string:

3. A 3 kg mass and a 5 kg mass hang form opposite ends of a massless string supported by a frictionless pulley as shown below. Find the acceleration, a, of the masses and the tension, T, in the string,

Fnet of the 3 kg mass:

Fnet of the 5 kg mass:

The acceleration, a, of the masses:

The tension, T in the string:

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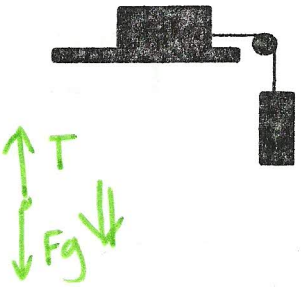
1. A 2.0 kg mass rests on a frictionless table. It is connected to a hanging 1.0 kg mass by a massless string draped over a frictionless pulley as show. Draw an FBD. Write the Fnet equation for each mass separately.



Fnet of the 2.0 kg mass: $F_{net} = T$, $ma = T$, $(2kg)a = T$

Fnet of the 1.0 kg mass: $F_{net} = F_g - T$, $m_2a = m_2(9.8m/s^2) - T$, $(1kg)a = (1kg)(9.8m/s^2) - T$

Calculate the acceleration, a, of the masses:

$1a = 9.8 - T$; $T = 2a$

$1a = 9.8 - 2a$

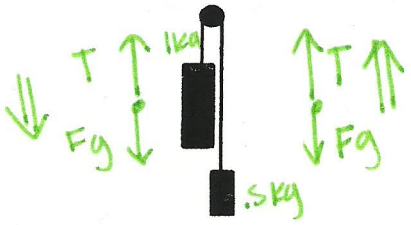
$3a = 9.8$ $\quad a = 3.266 m/s^2$

Calculate the tension, T, in the string:

$T = 2a$

$T = 2(3.266)$ $\quad T = 6.53N$

2. A 1.0 kg mass and a 0.50 kg mass hang form opposite ends of a massless string supported by a frictionless pulley as shown below. Draw an FBD. Write the Fnet equation for each mass separately.



Fnet of the 1.0 kg mass: $F_{net} = F_g - T$, $1a = (1)(9.8m/s^2) - T$, $1a = 9.8N - T$

Fnet of the 0.5 kg mass: $F_{net} = T - F_g$, $m_2a = m_2(9.8m/s^2) - T$, $.5a = T - (.5)(9.8m/s^2)$

The acceleration, a, of the masses:

$1a = 9.8 - T$; $.5a = T - 4.9 \Rightarrow T = .5a + 4.9$

$1a = 9.8 - (.5a + 4.9)$

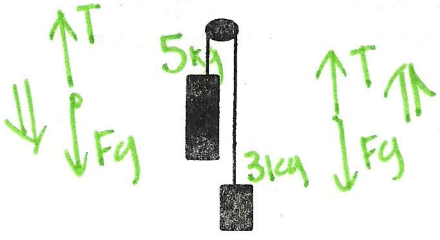
$1.5a = 4.9$ $\quad a = 3.26 m/s^2$

The tension, T in the string:

$T = .5a + 4.9$

$T = .5(3.26m/s^2) + 4.9 \Rightarrow T = 6.53N$

3. A 3 kg mass and a 5 kg mass hang form opposite ends of a massless string supported by a frictionless pulley as shown below. Find the acceleration, a, of the masses and the tension, T, in the string,



Fnet of the 3 kg mass: $F_{net} = T - F_g$, $m_2a = T - m_2(9.8)$, $3a = T - 29.4N$

Fnet of the 5 kg mass: $F_{net} = F_g - T$, $m_1a = m_1(9.8m/s^2) - T$, $5a = 49N - T$

The acceleration, a, of the masses:

$5a = 49 - T$; $3a = T - 29.4N \Rightarrow T = 3a + 29.4N$

$5a = 49 - (3a + 29.4)$

$8a = 19.6N$ $\quad a = 2.4 m/s^2$

The tension, T in the string:

$T = 3a + 29.4$

$T = 3(2.45m/s^2) + 29.4$

$T = 36.75N$