Honors Physics
Force Sims

Name Key
Date

1. A 2 kg mass experiences a force of 8 N and a force of -4 N. Calculate the time it takes to travel 7 meters and the velocity after 7 meters.

$F_1 - F_2 = ma$ $\quad a = 2 m/s^2$

$8 - 4 = 2(a)$

$d = v_0 t + \frac{1}{2} a t^2$

$\frac{2d}{a} = t^2$ $\quad t = 2.64$

$v = v_0 + at$

$= 2(2.64) = 5.29 m/s$

2. A mass is on an incline of 30 degrees. Calculate the acceleration of the mass and the velocity of the mass after 3.0 seconds.

$a = g \sin\theta$

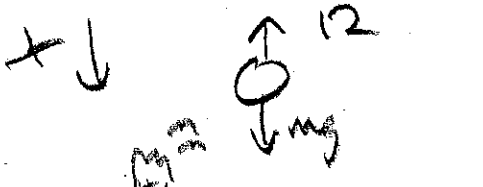
$= 9.81(\sin 30) = 4.905 m/s^2$

$v = v_0 + at$

$= 4.905(3)$

$= 14.72 m/s$

3. A 2.0 kg mass is at a height of 25 meters. The mass experiences a resistance of 12 N as it falls. How long does it take the mass to fall the 25 m?



$\Sigma F = ma$

$mg - 12 = ma$

$\frac{19.62 - 12}{2} = a = 3.81 m/s^2$

$d = v_0 t + \frac{1}{2} a t^2$

$\sqrt{\frac{2d}{a}} = t$

$3.62 sec$

4. A 1.5 kg mass experiences an upward force of 25 N. Calculate the velocity and position of the mass at 5 seconds.

$\Sigma F = ma$

$25 - mg = ma$

$a = 6.86 m/s^2$

$v = v_0 + at = 34.28 m/s$

$d = v_0 t + \frac{1}{2} a t^2$

$= 85.75 m$

5. A 16 kg mass is held by two ropes making an angle of 45 degrees. Calculate the T in each rope.

$T = \frac{mg}{2 \sin\theta} = 110.99 N$

6. A 25 kg mass is held by a rope (theta = 45 degrees) and a rod (theta = 0). Calculate the tension in the rope and the thrust force in the rod.

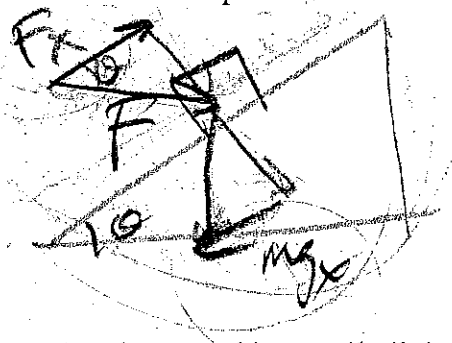
$T_c = \frac{mg}{\sin\theta}$ = 346.8 N

$F_R = T_c \cos\theta$ = 245.25 N

7. An Atwood machine is made with two masses 50 grams and 58 grams. Calculate the acceleration of the Atwood machine.

$a = \frac{g(m_2 - m_1)}{(m_2 + m_1)} = \frac{9.81(58-50)}{(58+50)}$ = 1.73 m/s²

8. A 1 kg mass is at rest on a 30 degree incline. What force acting directly along the x axis will keep the mass at rest on the incline.



$F_x = mg_x$

$F\cos\theta = mg\sin\theta$

$F = mg\tan\theta$ = 5.66 N

9. Three machines are built in the simulation. For each machine calculate the acceleration of one of the masses.

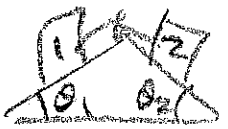
$\theta_2 = 55.7$

$a = \frac{m_2 g}{(m_1 + m_2)}$

6.54 m/s²

$a = \frac{m_2 g - m_1 g \sin\theta}{(m_1 + m_2)}$

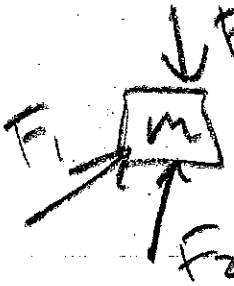
4.23 m/s²



$a = \frac{m_2 g \sin\theta_2 - m_1 g \sin\theta}{(m_1 + m_2)}$

1.32 m/s²

10. Three forces act on a mass, calculate the net force acting on the mass.



F_1 = 12 N @ θ = 30°

F_2 = 15 N @ θ = 80°

F_3 = 10 N @ θ = 270°

component method

16.87 N @ θ = 39.6°