Honors Physics

Name Key

Force Classwork #1

Date

1. A girl weighs 280 N. She is standing on a scale in an elevator that is moving. She looks down and sees that her weight has jumped to 300 N. What is the acceleration of the elevator?

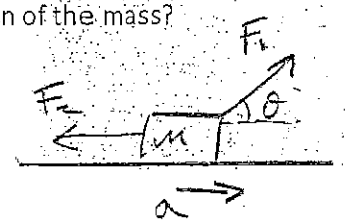
a. 1.07 m/s^2 b. 4.905 m/s^2 c. 0.7 m/s^2 d. 1.7 m/s^2

$W = mg$ $m = \frac{W}{g} = \frac{280}{9.81} = 28.54\ kg$

$F_s = mg + ma$ $\quad 300 - 280 = 28.54$

$a = (F_s - mg)/m$ $\quad a = 1.7\ m/s^2$

2. Below is a 2 kg mass acted upon by two forces as shown. What is the equation to calculate the acceleration of the mass?



$$\frac{F_1 \cos\theta - F_2}{m} = a$$

3. A mass is released on an incline of 60 degrees. Calculate the acceleration of the mass on the incline.

a. .866 m/s^2 b. 4.906 m/s^2 c. 9.81 m/s^2 d. 8.5 m/s^2

$a = g \sin\theta = 8.5\ m/s^2$

4. Use problem #3. If the incline is 2.2 meters long, calculate the velocity of the mass at the bottom of the incline.

a. 2.4 m/s b. 6.12 m/s c. 10.5 m/s d. 4.905 m/s

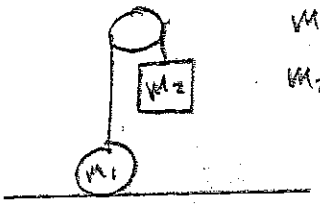
$V_0 = 0$

$V^2 - V_0^2 = 2ad$

$V = \sqrt{2ad}$

$V = 6.11\ m/s$

5. Calculate the acceleration of the Atwood machine shown below...



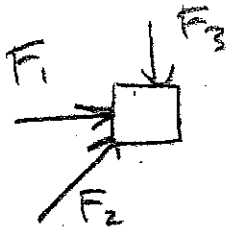
$m_1 = 50g$

$m_2 = 60g$

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

$9.81\left(\frac{60-50}{60+50}\right) = 1.89\ m/s^2$

6. You are standing directly over three forces that act on a 2.0 kg mass. Calculate the net force (include direction!) on the mass.



$F_1 = 8\ N @ \theta = 0°$

$F_2 = 10\ N @ \theta = 45°$

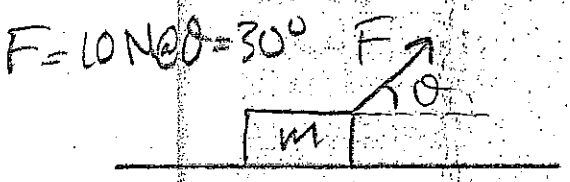
$F_3 = 5\ N @ \theta = 270$

x	y
8	0
7.07	7.07
0	-5
15.07	2.07

$r = 15.21\ N$

$@\ \theta = 7.8°$

7. A 2.0 kg mass is pulled by a force shown below. The mass accelerates along a horizontal surface. Calculate the distance traveled by the mass after 3 seconds.

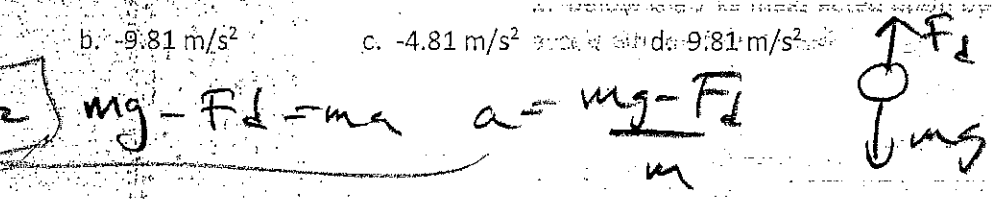


$a = \frac{F\cos\theta}{m} = \frac{10\cos 30}{2} = 4.33\ m/s^2$

$d = v_0 t + \frac{1}{2}at^2 = \frac{1}{2}(4.33)(3)^2 = 19.49\ m$

8. A 2kg mass falls while experiencing an upward force (air resistance) of 10 N. What is the acceleration of the mass?

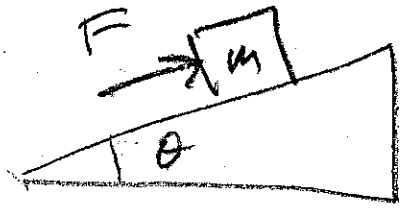
a. -4.905 m/s² b. -9.81 m/s² c. -4.81 m/s² d. 9.81 m/s²



4.81 m/s² $mg - F_d = ma$ $a = \frac{mg - F_d}{m}$

9. A 2kg mass is at rest on an incline of 40 degrees. A force of F Newtons acts as shown to stabilize the mass so that it does not move. Calculate F.

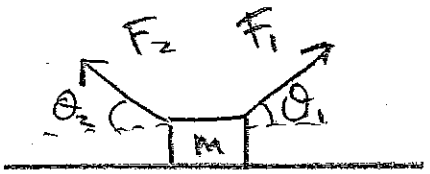
a. 17 N b. 9.81 N c. 12 N d. 34 N



$F = mg_x = mg\sin\theta$

12.61 N

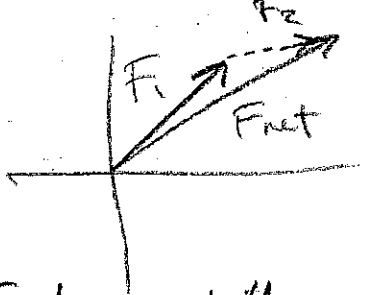
10. Two forces F1 and F2 act on the mass below. What expression will correctly calculate the acceleration of the mass?



$a = \frac{F_1\cos\theta_1 - F_2\sin\theta_2}{m}$

11. Two forces act on a 1 kg mass: F_1 = 10 Newtons at an angle of 45 degrees and an unknown force F2. When added together both forces give a resultant force of 14.88 N at an angle of 40 degrees. Determine the unknown force F_2. (Draw a picture)

a. 6.2 N @ Ø = 120°
b. 10.2 N @ Ø = 62°
c. Not enough information given
d. 5 N @ Ø = 30°



$F_{1x} = 7.07$
$F_{1y} = 7.07$

x	y
7.07	7.07
x	y
11.4	9.56

$F_{2x} = 4.33$
$F_{2y} = 2.49$

$r = \sqrt{(11.4)^2 + (9.56)^2}$

$F_{net_x} = 11.4$
$F_{net_y} = 9.56$