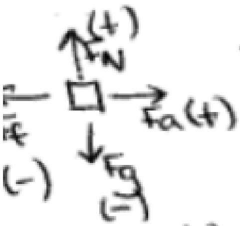
May 17, 2018

1) answers #4-7 WS

2) Review Newton's 3 Laws

3) More practice problems

Test on Forces will be Thurs May 31st



4. $m = 13kg$
$v_i = 3.1m/s$
$v_f = 18.6m/s$
$t = 4.5s$
$\mu = 0.24$

a) $a = \frac{v_f - v_i}{t}$

$a = \frac{18.6m/s - 3.1m/s}{4.5s}$

$a = 3.4 m/s^2$

b) $F_{net} = ma$
$F_{net} = (13)(3.4)$
$F_{net} = 45N$

c) $F_f = ?$

$|F_N| = |F_g|$
$F_g = mg$
$F_g = (13)(9.81)$
$F_g = 127.53N$

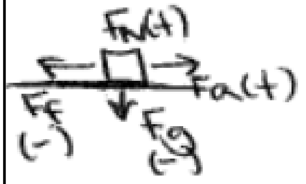
$F_f = \mu F_N$
$F_f = (0.24)(127.53)$
$F_f = 31N$

d) $F_a = ?$

$F_{net} = F_a + F_f$
$45N = F_a + (-31N)$ +31
$31 + 45 = F_a$
$76N = F_a$

Nov 28-2:17 PM

5. $F_a = 400N$
$m = 53kg$
$\mu = 0.29$



a) $F_f = ?$

$|F_g| = |F_N|$

$F_N = mg$

$F_N = (53)(9.81)$

$F_N = 520N$

$F_f = \mu F_N$

$F_f = (0.29)(520)$

$F_f = 151N$

b) $F_{net} = F_f + F_a$

$F_{net} = (-151) + (400)$

$F_{net} = 249N$

c) $F_{net} = ma$

$\frac{249}{53} = \frac{(53)(a)}{53}$

$4.7 m/s^2 = a$

d) $v_f = ?$
$t = 14.5s$
$a = 4.7 m/s^2$

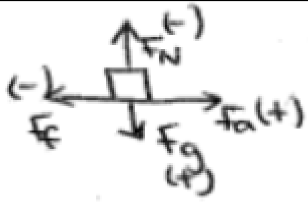
$a = \frac{v_f - v_i}{t}$ •14.5t

$4.7 = \frac{v_f - 0}{14.5}$ • 14.5

$68.15 = v_f$

$68.2 m/s = v_f$

6. $F_a = -2500N$
$m = 250kg$
$v_i = 35 m/s$
$a = -16.7 m/s^2$
$\mu = ?$



$F_{net} = ma$

a) $F_{net} = F_a + F_f$
$(m)(a) = F_a + F_f$
$(250)(-16.7) = (-2500) + F_f$
$-4175 = -2500 + F_f$ +2500 +2500
$-1675 = F_f$

$F_N = mg$

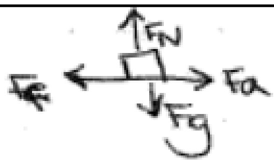
$F_f = \mu F_N$
$-1675 = \mu (m)(g)$
$-1675 = \mu (250)(9.81)$
$\frac{-1675}{2453} = \frac{\mu 2453}{2453}$

$\mu = 0.68$

(6.b) $v_0 = 35 m/s$
$v_f = 0$
$a = -16.7 m/s^2$

$v_f^2 = v_0^2 + 2a(d_f - d_0)$
$0^2 = (35)^2 + 2(-16.7)(d_f)$
$0 = 1225 - 33.4 d_f$ -1225
$\frac{-1225}{-33.4} = \frac{-33.4 d_f}{-33.4}$
$37m = d_f$

7. $\mu = 0.18$
$m = 75kg$
$a = 2.5 m/s^2$
$F_a = ?$



a) $F_{net} = ma$
$F_{net} = (75)(2.5)$
$F_{net} = 187.5 N$

$|F_N| = |F_g|$
$F_g = mg$
$F_g = (75)(9.81)$
$F_g = 736 N$

$F_f = \mu F_N$
$F_f = (0.18)(736)$
$F_f = 132 N$

$+132 \quad F_{net} = F_a + F_f$
$187.5 = F_a + (-132) \quad +132$
$320N = F_a$

b) $\mu = 0.36$
$a = ?$
$F_a = 320 N$
$m = 75kg$
$F_N = 736$

$F_{net} = ma$

$F_f = \mu F_N$
$F_f = (0.36)(736)$
$F_f = 265$

$F_{net} = F_f + F_a$
$F_{net} = (-265) + 320$
$F_{net} = 55N$

$F_{net} = ma$
$\frac{55}{75} = \frac{(75)a}{75}$
$0.73 m/s^2 = a$

Rocket Launches

Take 3-5 minutes and write a few detailed sentences about how all of Newton's 3 Laws applies to rockets from launch to orbit.

Rocket Launches

1st law comes in during the take off. As it just starts to launch, it launches relatively slowly. It has to overcome all of that inertia at first. Newtons 3rd law comes into play for every reaction there is an equal and opposite reaction. The rocket boosters themselves. What makes the rocket go up is the propulsion. The thrust from the rocket is downward the equal and opposite reaction to that is upwards. Is is NOT pushing off the ground. Inside the chamber rocket exhaust is coming out downward and an opposite force inside that chamber is pushing it upwards from each engine. Newtons 2nd law net force is equal to mass times acceleration. When the exhaust boosters and rockets are firing the amount of force from them is the same. The mass of the rocket is constantly changing as it loses fuel and the acceleration is going to increase because of the decrease in mass.

More Combining Dynamics and Kinematics

An applied force of 50 N is used to accelerate an object to the right across a frictional surface. The object encounters 10 N of friction. The mass of the object is 8.0 kg.

- left, + right

1. Calculate the net force.
2. Calculate the acceleration.
3. From the initial push, calculate how far the object will travel if the constant force was applied for 12 seconds.

$F_a = 50$

$F_f = 10\ (-10)$

$m = 8.0\,kg$

1. $F_{net} = \Sigma\,forces$

$F_{net} = F_a + F_f$

$F_{net} = 50 - 10$

$F_{net} = 40\,N$

2. $F_{net} = ma$

$\frac{40}{8} = \frac{8a}{8}$

$a = 5\,m/s^2$

3. $t = 12\,s$

$F_a = 50$

$F_f = -10$

$m = 8$

$a = 5$

$F_{net} = 40$

$d_f = d_0 + v_0 t + \frac{1}{2}at^2$

$d_f = 0 + 0(12) + \frac{1}{2}(5)(12)^2$

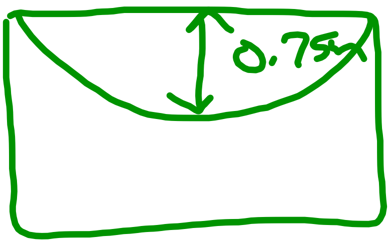
$d_f = \frac{1}{2}(5)(144)$

$d_f = 360\,m$

Combining Dynamics and Kinematics

A 2.5 kg ball falls on an air mattress. Just as it hit the ball had a speed of 19 m/s. The air mattress depressed 0.75 m to stop the ball. Calculate the average stopping force acting on the ball. (602 N)

F_{net}



$v_0 = -19\ m/s$

$m = 2.5\ kg$

$d_0 = 0\ m$

$d_f = 0.75\ m$

$v_f = 0$

$F_{net} = ma$

$a = ?$

$v_f^2 = v_0^2 + 2a(d_f - d_0)$

$0^2 = (-19)^2 + 2(a)(0.75)$

$0 = 361 - 1.5a$

$\frac{-361}{-1.5} = \frac{-1.5a}{-1.5}$

$241\ m/s^2 = a$

$F_{net} = ma$
$= (2.5)(241)$

$F_{net} = 603$

Newtons 2nd Law Practice WS #1-8

Apr 18-9:18 AM