GIANCOLI HOMEWORK SOLUTIONS

Section 4-1 to 4-6, #1 - 17

1. $m = 60.0kg$

   $a = 1.25\,m/s^2$

   Find F

   $F = ma$

   $F = (60)(1.25) = 75.0N$

2. $F = 265N$

   $a = 2.30\,m/s^2$

   Find m

   $F = ma$

   $\frac{F}{a} = m = \frac{(265)}{(2.30)} = 115kg$

3. $m = 960kg$

   $a = 1.20\,m/s^2$

   $F = ma$

   $F = (960)(1.20) = 1152 = 1.15x10^3N$

4. $m = 76kg$

   a. $a = g = 9.81\,m/s^2$

   $F = ma$

   $F_g = mg$

   $F_g = (76)(9.81) = 746 = 7.5x10^2N$

   b. $g = 1.7\,m/s^2$

   $F_g = mg$

   $F_g = (76)(1.7) = 129 = 1.3x10^2N$

   c. $g = 3.7\,m/s^2$

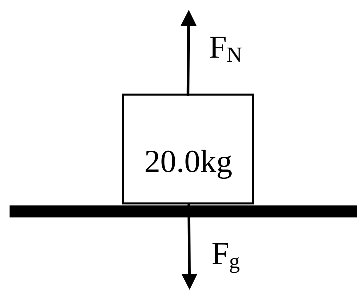
   $F_g = mg$

   $F_g = (76)(3.7) = 281 = 2.8x10^2N$

   d. assume $g = 0\,m/s^2$

   $F_g = mg$

   $F_g = (76)(0) = 0N$

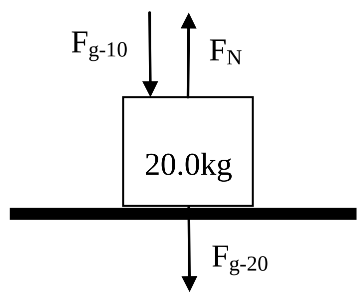


5. $m = 20.0kg$

   a. $\sum F = ma = 0$

   $F_N - F_g = 0$

   $F_N = F_g = mg = (20)(9.81) = 196N$



   b.

   $$\sum F = ma = 0$$

   $F_N - F_{g-20} - F_{g-10} = 0$

   $F_N = F_{g-20} + F_{g-10}$

   $F_N = (20)(9.81) + (10)(9.81) = 294N$

6. $m = 1100kg$

$t = 8.0s$

$v = \frac{95km}{h} x \frac{1h}{3600s} x \frac{1000m}{1km} = 26.4\,m/s$

$\cancel{v} = v_0 + at$

$-at = v_0$

$a = \frac{v_0}{-t} = -\frac{(26.4)}{(8)} = -3.30\,m/s^2$

$F = ma$

$F = (1100)(-3.30) = -3628 = -3.6x10^3N$

Negative sign indicates the force is in the opposite direction to the motion.

7. $m = 7.00g = 0.007kg$

$v = 125\,m/s$

$x = 0.800m$

$v^2 = \cancel{v_0^2} + 2ax$

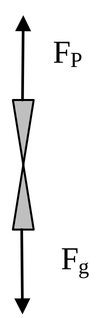
$\frac{v^2}{2x} = a = \frac{(125)^2}{2(0.8)} = 9766\,m/s^2$

$F = ma$

$F = (0.007)(9766) = 68.4N$

8. $F > 22N$

$a = 2.5\,m/s^2$



$\sum F = ma$

$F_P - F_g = ma$

$F_P = ma + F_g$

$F_P = ma + mg$

$F_P = m(a + g)$

$\frac{F_P}{(a + g)} = m > \frac{22}{(2.5 + 9.81)}$

$m > 1.8kg$

A fish larger than 1.8 kg will produce a net force (sum of the weight plus the pull force required to generate the acceleration) greater than the 22 N break point of the line.

9. $m = 0.140kg$

$v = 35\,m/s$

$x = 11cm = 0.11m$

$\cancel{v^2} = {v_0}^2 + 2ax$

$-2ax = {v_0}^2$

$a = \frac{{v_0}^2}{-2x} = \frac{(35)^2}{-2(0.11)} = -5568\,m/s^2$

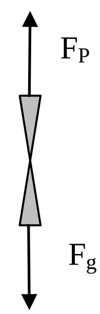
$F = ma$

$F = (0.140)(-5568) = 780N$

Negative sign indicates the force is in the opposite direction to the motion.

10. $m = 1200kg$

$a = 0.80\,m/s^2$



$\sum F = ma$

$F_P - F_g = ma$

$F_P = ma + F_g$

$F_P = ma + mg$

$F_P = (1200)(0.80) + (1200)(9.81)$

$F_P = (1200)(0.80) + (1200)(9.81)$

$F = 1.3x10^4N$

11. $m = 485kg$

$t = 6.40s$

$x = 402m$

$x = \cancel{x_0 + v_0t +} \frac{1}{2}at^2$

$x = \frac{1}{2}at^2$

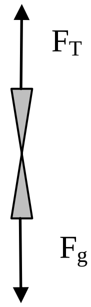
$\frac{2x}{t^2} = a = \frac{2(402)}{(6.4)^2} = 19.6\,m/s^2$

$a = \frac{19.6\,m/s^2}{9.81\,m/s^2} = 2.00g's$

$F = ma$

$F = (485)(19.6) = 9.51x10^3N$

12. $m = 12.0kg$



$F_T = 163N$

$\sum F = ma$

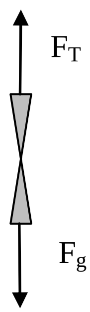
$F_T - F_g = ma$

$\frac{F_T - F_g}{(m)} = a$

$\frac{(163) - (12 * 9.81)}{(12)} = a = 3.8\, m/s^2$

Since acceleration is positive (in the direction of the tension force) the acceleration is upward

13. *Maximum motor force will be experienced when the elevator is going upward (positive acceleration) and minimum motor force when the elevator is going downward (negative acceleration).*



$m = 4850kg$

$a = \pm 0.0680gx \frac{9.81\, m/s^2}{1g} = 0.667\, m/s^2$

$\sum F = ma$

$F_M - F_g = ma$

Max: $F_M = ma + F_g$

$F_M = (4850)(0.667) + (4850)(0.667)$

$F_M = 50{,}814 = 5.08x10^4 N$

Min: $F_M = -ma + F_g$

$F_M = -(4850)(0.667) + (4850)(0.667)$

$F_M = 44{,}344 = 4.43x10^4 N$

14. *The thief will have to accelerate downward quickly enough to offset the lack of strength to support his weight*

$m_{thief} = 75kg$

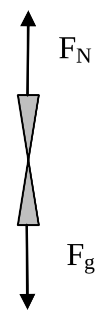
$m_{max} = 58kg$

$F_{g-max} - F_{g-thief} = m_{thief}a$

$\frac{F_{g-max} - F_{g-thief}}{m_{thief}} = a$

$\frac{(58)(9.81) - (75)(9.81)}{(75)} = a = -2.2\, m/s^2$

15. *When the elevator is not moving F_N (the scale reading) will equal the weight (mg). When the elevator is moving upward, F_N equals weight plus mass times acceleration and when the elevator is moving downward F_N equals weight minus mass times acceleration*



Downward: $F_N = F_g - ma$

$F_N = F_g - ma$

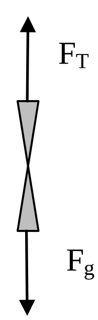
$\frac{F_N - F_g}{-m} = a$

$\frac{(0.75)mg - mg}{-m} = a$

$\frac{-(0.25)\cancel{m}g}{-\cancel{m}} = a = (0.25)(9.81)$

$a = 2.5\, m/s^2$ *down*

16. $m = 2125kg$



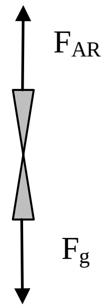
$F_{T-max} = 21750N$

$F_T - F_g = ma$

$\frac{F_T - F_g}{(m)} = a$

$\frac{(21750) - (2125 * 9.81)}{(2125)} = a = 0.43\, m/s^2$

17. *The force of air resistance (AR) opposes the force of gravity.*



a. $m = 132kg$

$F_{AR} = (0.25)mg$

$F_{AR} - F_g = ma$

$\frac{F_{AR} - F_g}{m} = a$

$\frac{(0.25)\cancel{m}g - \cancel{m}g}{\cancel{m}} = a$

$-(0.75)g = a$

$-(0.75)(9.81) = a = -7.4\,m/s^2$

b. *When falling at constant speed, acceleration is zero so the force of air resistance is equal to their weight.*

$F_{AR} - F_g = ma = 0$

$F_{AR} = F_g = mg$

$mg = (132)(9.81) = 1.29x10^3 N$