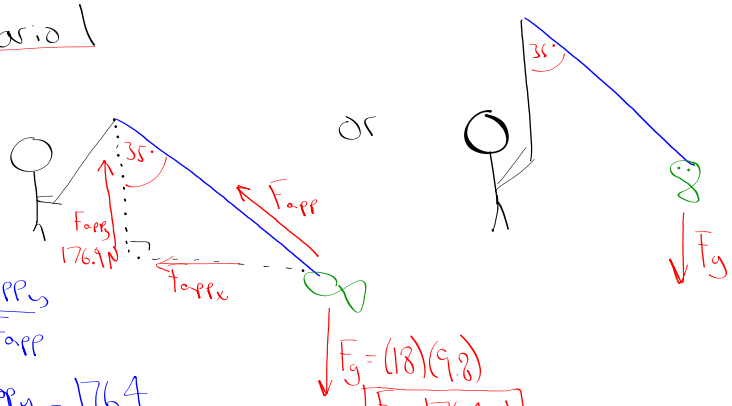
August 01, 2019

Pretest

Scenario 1



$\cos\theta = \frac{F_{appy}}{F_{app}}$

$F_{app} = \frac{F_{appy}}{\cos\theta} = \frac{176.4}{\cos 35}$

$F_{app} = 215.34\,N$

$F_g = (18)(9.8)$

$F_g = 176.4\,N$

The tension of 50N in the line is not strong enough to pull in the fish.

∴ The line will break.

Scenario 2

Total mass

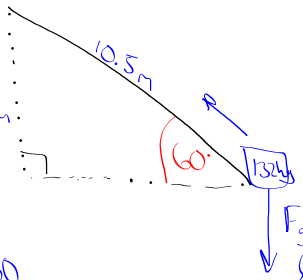
$(5 \times 10) + (2 \times 35) + 10\%$

$50 + 70 + 10\%$

$120 + 10\%$

$120 + 12$

$m = 132\,kg$



$\sin\theta = \frac{h}{10.5}$

$h = 10.5 \sin 60$

$h = 9.09_M$

$F_g = (132kg)(9.8 M/s^2)$

$F_g = 1293.6\,N$

- Lifting objects: Work Against Gravity

$W = mgh$

- Power: $P = \frac{W}{t}$

80% efficient

- 1HP = 746W

$P = \frac{W}{t} = \frac{mgh}{t} = \frac{(132)(9.8)(9.09)}{45s}$

$P = 261.31\,W$

Lifts:

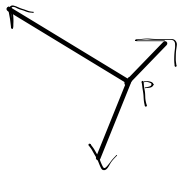
0.2 HP × 746 = 149.2 W × 0.8 = 119.36 W

0.3 HP × 746 = 223.8 W × 0.8 = 174 W

0.7 HP × 746 = 522.2 W × 0.8 = 417 W → 9th Haven lift is the one needed today!

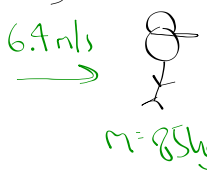
Skill Practice

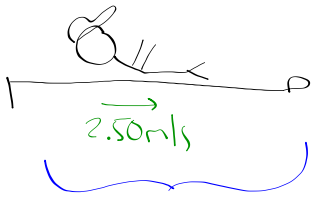
1.)



(I) or (II)

2.)





BEFORE

$TE_1 = KE_1$

AFTER

$TE_2 = KE_2 + W_F$ (friction)

$TE_1 = TE_2$

$KE_1 = KE_2 + W_f$

$\frac{1}{2}mv_1^2 = \frac{1}{2}mv_2^2 + W_f$

$\frac{1}{2}m(v_1^2 - v_2^2) = W_f$

$\frac{1}{2}(85)(6.4^2 - 2.5^2) = W_f$

$W_f = 1475.2\ J$

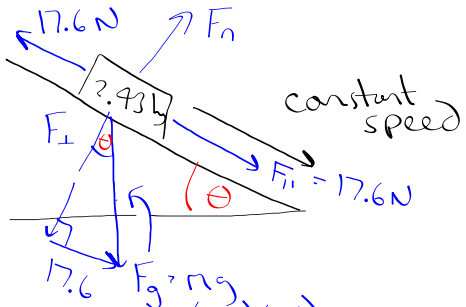
$W_f = F_f \cdot d$

$\frac{W_f}{d} = F_f$

$F_f = \frac{1475.2}{3.15}$

$F_f = 468.3\ N$

3.)



$a = 0 m/s^2$

$F_{net} = 0 N$

$\sin\theta = \frac{17.6}{23.8}$

$\theta = \sin^{-1}\left(\frac{17.6}{23.8}\right)$

$\theta = 47.7°$ (C)

4.) (B)

5.) $P = 30000W$

$m = 5400kg$

$h = 25m$

constant speed

$P = \frac{W}{t}$

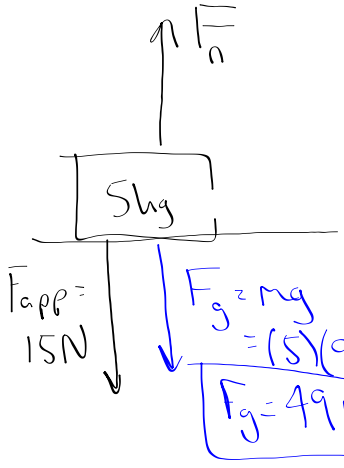
$P = \frac{mgh}{t}$

$t = \frac{mgh}{P}$

$t = \frac{(5400)(9.8)(25)}{30000}$

$t = 44.1s$ (D)

6.)



$F_n = F_{app} + F_g$

$= 15 + 49$

$F_n = 64N$ (D)

7.) $F = \frac{G m_1 m_2}{d^2}$

$m_1 = 150g = 0.15kg$

$m_2 = 350g = 0.35kg$

$d = 57cm = 0.57m$

$F = \frac{(6.67\times10^{-11})(0.15)(0.35)}{(0.57)^2}$

$\boxed{F = 1.08\times10^{-11}\,N}$

8.) (D)

9.) $F_g = m \cdot g$

$160 = m \cdot 9.8$

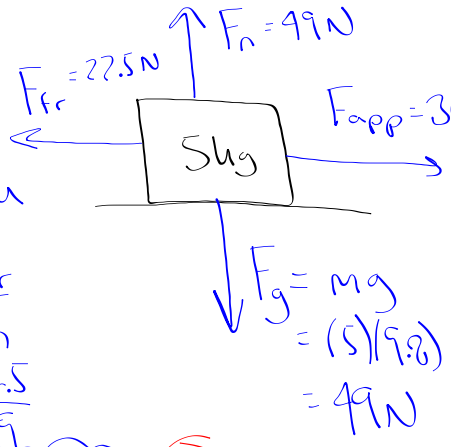
$\boxed{m = 16.32\,kg}$

$F_x = m \cdot g_x$

$600 = 16.32 \cdot g_x$

$\boxed{g_x = 36.76\,m/s^2}$

10.)



$F_{fr} = F_n \cdot \mu$

$\mu = \frac{F_{fr}}{F_n}$

$= \frac{22.5}{49}$

$\boxed{\mu = 0.9592}$ (A)

$a = 1.5\,m/s^2$

$F_{net} = ma$

$= 5(1.5)$

$\boxed{F_{net} = 7.5\,N}$

$F_{net} = F_{app} - F_{fr}$

$F_{fr} = F_{app} - F_{net}$

$= 30 - 7.5$

$\boxed{F_{fr} = 22.5\,N}$

11.) $PE = \frac{1}{2}kx^2$ $\quad F_{spring} = k \cdot x$

① $30 = k \cdot 0.8$

$k = \frac{30}{0.8}$

$k = 37.5\ N/m$

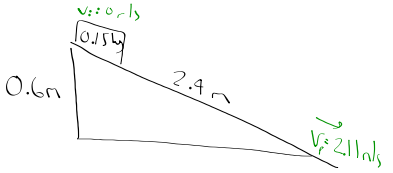
②

$PE = \frac{1}{2}kx^2$

$= \frac{1}{2}(37.5)(0.8)^2$

$PE = 12\ J$

13.)



BEFORE

$TE_1 = PE$

AFTER

$TE_2 = KE + W_f$

$TE_1 = TE_2$

$PE = KE + W_f$

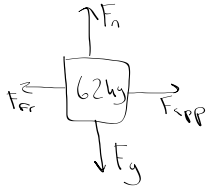
$W_f = PE - KE$

$= mgh - \frac{1}{2}mv^2$

$W_f = (0.15)(9.8)(0.6) - \frac{1}{2}(0.15)(2.11)^2$

$W_f = 0.548\ J$ (B)

13.)



$F_{net} = ?$ $\quad a = \frac{v}{t} = \frac{13.87\ m/s}{1200s}$

$a = 0.012\ m/s^2$

$v = 50\ km/hr$

$= 13.97\ m/s$

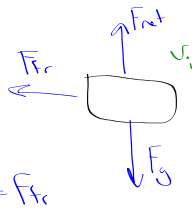
$t = 20\ min = 1200s$

$F_{net} = m \cdot a$

$= (62)(0.012)$

$F_{net} = 0.744\ N$

14.)



$v_i = 80\ km/hr$ $\quad v_f = 0\ m/s$

$v_i = \frac{80 \times 1000}{3600}$

$v_i = 22.22\ m/s$

$F_{net} = F_{fr}$

$v_f = v_i + at$

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

$\frac{-22.22}{30} = a$

$a = -0.74\ m/s^2$

$F_{net} = m \cdot a$

$F_{net} = (3500kg)(0.74\ m/s^2)$

$F_{net} = -2590\ N$