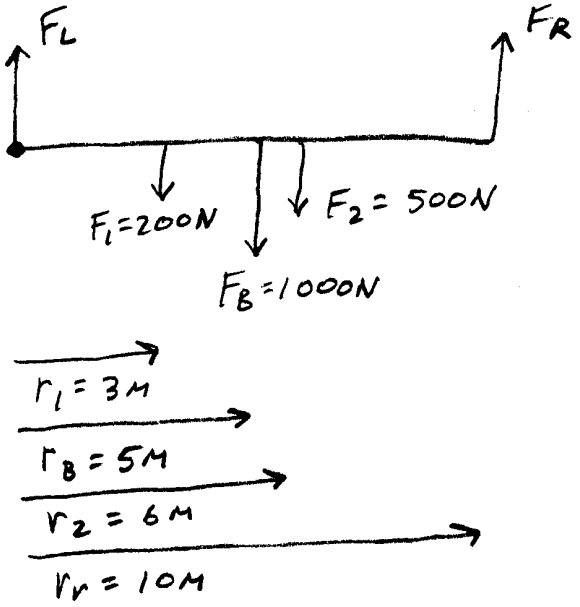
Honors Physics - Ch. 8 Test – 04-15-05

Name WARD Period 1, 3

1. Draw a large, well-labeled diagram for this problem. The ends of a 1000 N beam sit on two supports that are 10 m apart. A weight of 200 N is hanging from the beam 3 m from the left end. Another weight of 500 N is hanging 4 m from the right end. What force does each of the supports exert?



$$\Sigma \vec{\tau} = 0$$

$$-r_1 F_1 - r_B F_B - r_2 F_2 + r_R F_R = 0$$

$$F_R = \frac{r_1 F_1 + r_B F_B + r_2 F_2}{r_R}$$

$$= \frac{3m(200N) + 5m(1000N) + 6m(500N)}{10M}$$

$$\boxed{\vec{F}_R = 860N, \text{ UP}}$$

$$\Sigma \vec{F} = 0$$

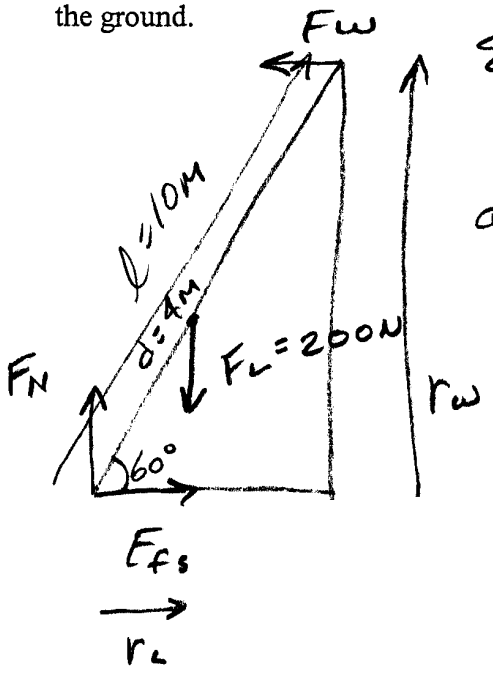
$$F_L - F_1 - F_B - F_2 + F_R = 0$$

$$F_L = F_1 + F_B + F_2 - F_R$$

$$= 200N + 1000N + 500N - 860N$$

$$\boxed{\vec{F}_L = 840N, \text{ up}}$$

2. Draw a large, well-labeled diagram for this problem. A 10 m long 200 N ladder leans against a frictionless wall at an angle of 60°. Its center of mass is located 4 m from the base of the ladder. (a) What vertical and horizontal forces does the ground exert on the base of the ladder? (b) What are the vertical and horizontal forces exerted on the ladder by the wall? (c) What coefficient of friction must exist between the ladder and the ground.



$\sum \vec{F}_y = 0$

$F_N - F_L = 0$

a) $\boxed{F_N = 200N}$

$\sum \vec{\tau} = 0$

$-r_L F_L + r_w F_w = 0$

$F_w = \frac{r_L F_L}{r_w}$

$= \frac{2m\,(200N)}{8.66m}$

$r_L = d\cos\theta$

$= 4m \cos 60°$

$r_L = 2m$

$r_w = l \sin\theta$

$= 10m \sin 60°$

$r_w = 8.66m$

b) $\boxed{F_{wx} = 46.2N}$ $\boxed{F_{wy} = 0N}$

$\sum \vec{F}_x = 0$

$F_{fs} - F_w = 0$

a) $\boxed{F_{fs} = 46.2N}$

$F_{fs} = \mu_s F_N$

$\mu_s = \frac{F_{fs}}{F_N}$

$= \frac{46.2N}{200N}$

c) $\boxed{\mu_s = 0.231}$

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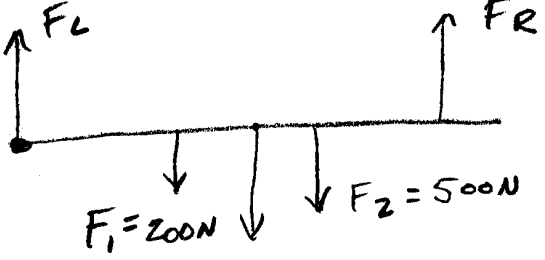
Name WARD Period 8

. Draw a large, well-labeled diagram for this problem. A 10 m long 1000 N beam hangs from two cables. One cable is attached at the left end of the beam and the other is attached 1 meter in from the right end. A weight of 200 N is hanging from the beam 3 m from the left end. Another weight of 500 N is hanging 4 m from the right end of the beam. What force does each of the cables exert?



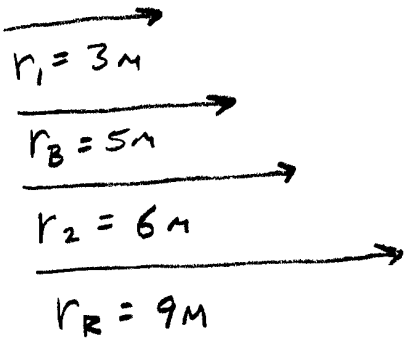
$\Sigma \vec{\tau} = 0$

$-r_1 F_1 - r_B F_B - r_2 F_2 + r_R F_R = 0$

$F_R = \dfrac{r_1 F_1 + r_B F_B + r_2 F_2}{r_R}$

$= \dfrac{3m(200N) + 5m(1000N) + 6m(500N)}{9m}$

$\boxed{\vec{F}_R = 956N, up}$



$\Sigma \vec{F} = 0$

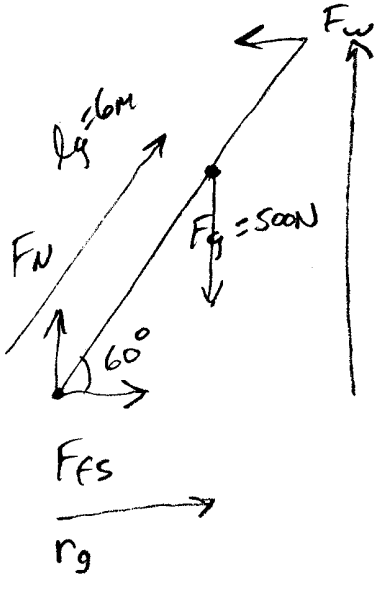
$F_L - F_1 - F_B - F_2 + F_R = 0$

$F_L = F_1 + F_B + F_2 - F_R$

$= 200N + 1000N + 500N - 956N$

$\boxed{\vec{F}_L = 744N, up}$

2. Draw a large, well-labeled diagram for this problem. A 10 m long uniform massless ladder leans against a frictionless wall at an angle of 60°. A 500 N guy is standing on the ladder 6 m up from the base of the ladder. (a) What vertical and horizontal forces does the ground exert on the base of the ladder? (b) What are the vertical and horizontal forces exerted on the ladder by the wall? (c) What coefficient of friction must exist between the ladder and the ground.



$\Sigma \vec{F}_y = 0$

$F_N - F_g = 0$

a) $\boxed{F_N = 500N}$

$r_g = d \cos\theta$

$= 6m \cos 60°$

$\underline{r_g = 3m}$

$r_w = l \sin\theta$

$= 10m \sin 60°$

$\underline{r_w = 8.66m}$

$\Sigma \vec{\tau} = 0$

$-r_g F_g + r_w F_w = 0$

$F_w = \frac{r_g F_g}{r_w}$

$= \frac{3m(500N)}{8.66m}$

b) $\boxed{F_{wx} = 173N}$ $\boxed{F_{wy} = 0N}$

$\Sigma \vec{F}_x = 0$

$F_{fs} - F_{wx} = 0$

a) $\boxed{F_{fs} = 173N}$

$F_{fs} = \mu_s F_N$

$\mu_s = \frac{F_{fs}}{F_N}$

$= \frac{173N}{500N}$

c) $\boxed{\mu_s = 0.346}$