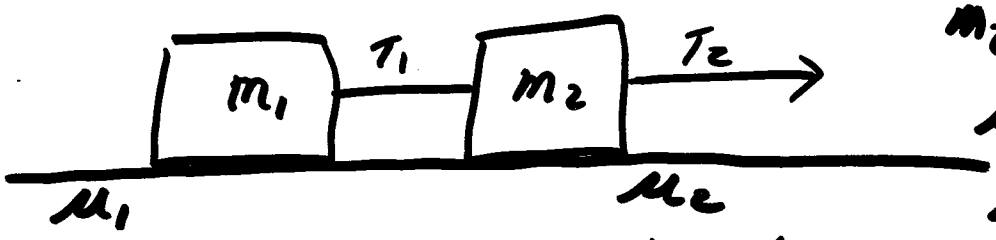
H.W #4 AVAILABLE

NO READING assignment
should have finished
chapter 4

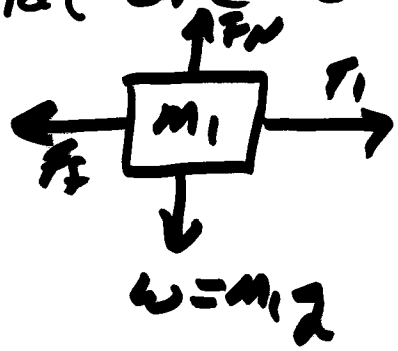
Place sideways

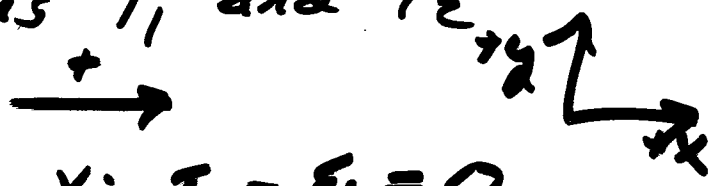


$m_1 = 2kg$
$m_2 = 3kg$
$\mu_1 = .2$
$\mu_2 = .1$

move at constant velocity.

what are tensions T_1 and T_2



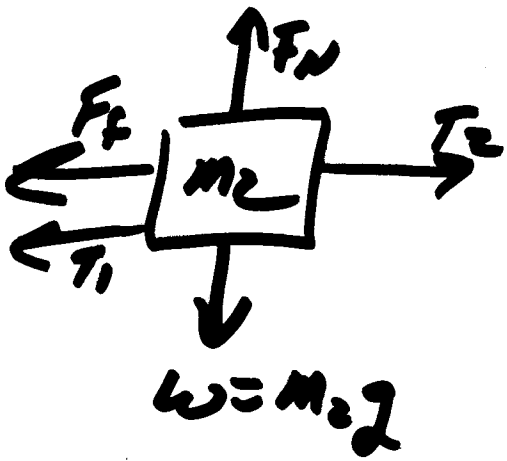


$X: T_1 - F_f = 0$

$y: F_N - \omega = 0$

$X: T_1 = F_f = \mu_1 F_N = \mu_1 m_1 g = .2 \cdot 2kg \cdot 9.8 m/s^2$

$= \boxed{3.9N}$



$X: T_2 - F_f - T_1 = 0$

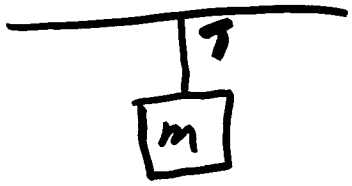
$T_2 = T_1 + F_f$

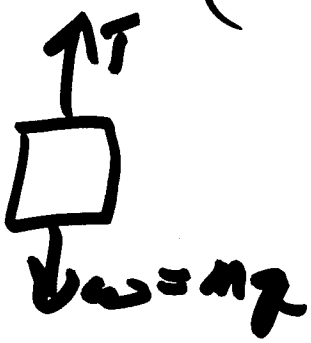
$= 3.9N + \mu_2 m_2 g$

$= 3.9N + (.1 \times 3kg \times 9.8 m/s^2)$

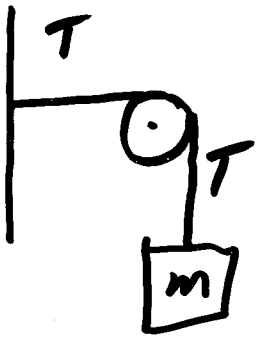
$= \underline{6.8N}$

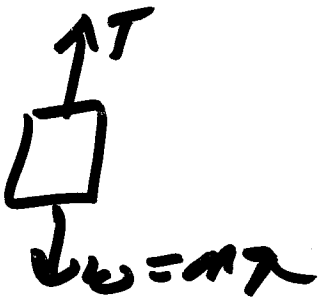
Pulleys (massless frictionless)



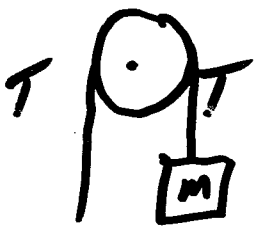


$T = mg$



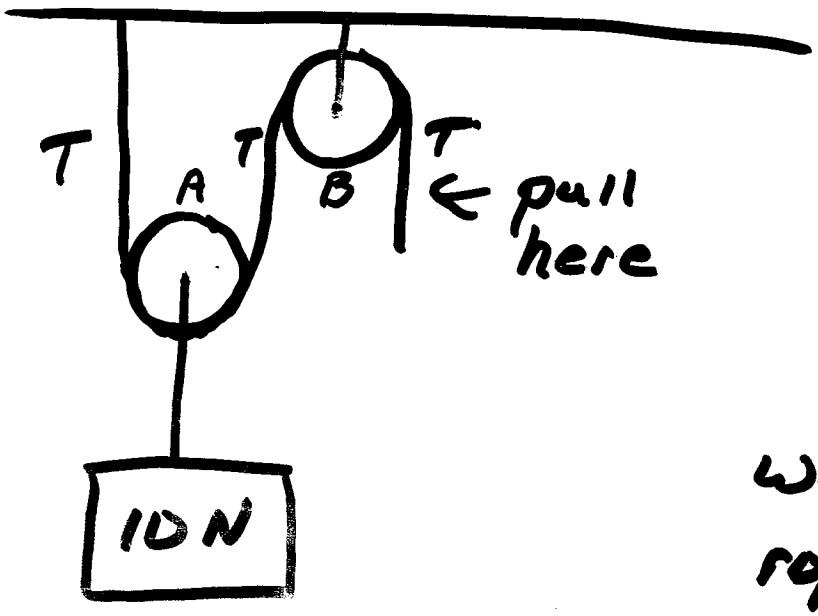


$T = mg$



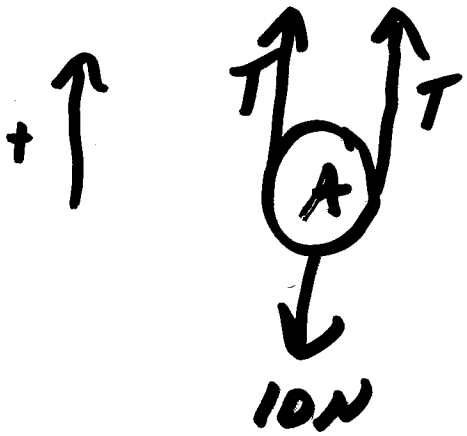
$T = mg$

2 pulleys



what force is required to hold weight?

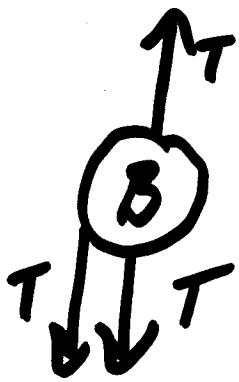
what is tension on rope holding pulley B?



$T + T - 10N = 0$

$2T = 10N$

$T = 5N$



$T' - T - T = 0$

$T' = 2T$

$T' = 10N$

Interactive Question

How does the tension in the string in Figure (a) compare with the tension in the string in Figure (b)?

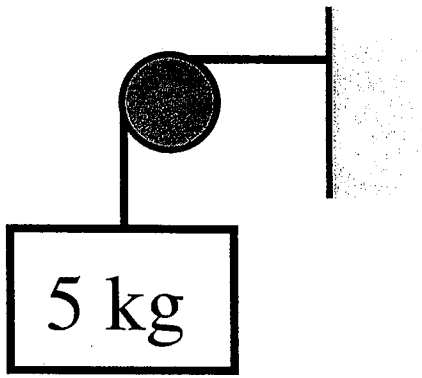


Figure (a)

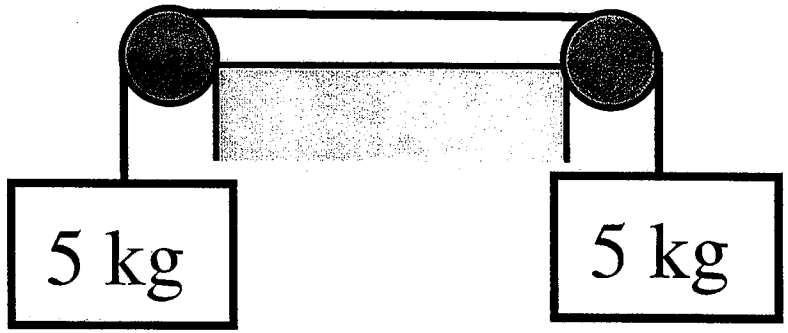


Figure (b)

A) They are the same
B) Figure (a) is greater
C) Figure (b) is greater
D) It is impossible to tell

SO FAR ONLY LOOKING at cases where $\vec{v}$ = SO (constant) so $\vec{a}=0$

so $\vec{F}_{net} = 0$

Now Look at cases where

$\vec{a} \neq 0$

Newton's 2nd Law

$$\vec{F}_{net} = m\vec{a}$$

Look at cases where $\vec{a} \neq 0$

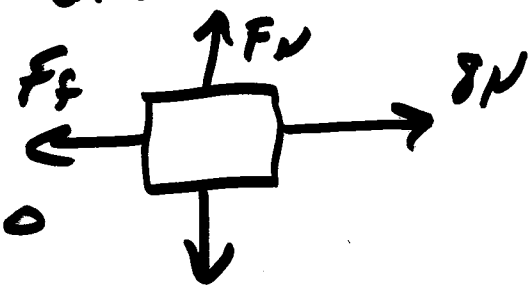
To solve

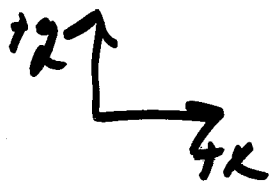
1) DRAW FREE Body Diagram
2) Add/subtract forces shown on FBD
3) Do NOT put #'s in until end of problem
4) make sure answer is reasonable

Block of $w = mg = 10N$ on a horizontal surface. $\mu_s = 0.5$; $\mu_k = 0.1$

a) I apply a force of 8 N. What is the acceleration of the block?

b) If I apply force = 4 N, is acceleration $\frac{1}{2}$ of that found in a)?





$F_N - w = 0$

$F_N = w = mg$

x: $8N - F_f = ma$ $\Rightarrow$ $8N - 1N = ma$

$7N = ma$

$a = \frac{7N}{m}$

$a = \frac{7N}{1.02kg} = 6.86\ m/s^2$

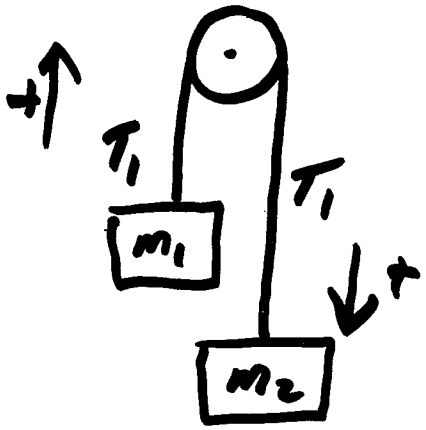
$F_f = \mu_k F_N$

$= .1 \cdot 10N = \underline{1N}$

$F_{max} = \mu_s F_N = .5 \cdot 10N = \underline{5N}$

$mg = 10N$ $\quad m = \frac{10N}{g} = \underline{1.02kg}$

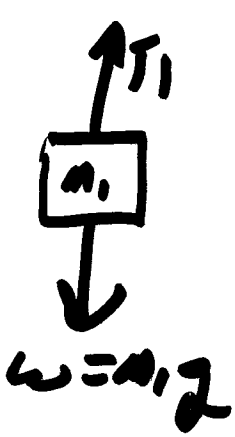
$\vec{F}_{net} = m\vec{a} \qquad \vec{a} \neq 0$

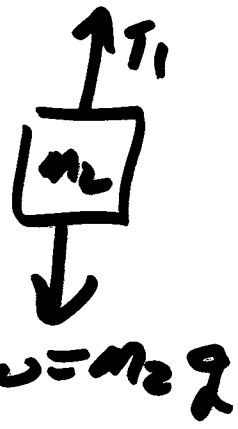


$m_1 = 10\,kg$

$m_2 = 14\,kg$

Determine $\vec{a}$





$+T_1 - m_1 g = m_1 a$ $\qquad -T_1 + m_2 g = m_2 a$

$T_1 = m_1 a + m_1 g$ $\qquad T_1 = -m_2 a + m_2 g$

set equal $\Rightarrow m_1 a + m_1 g = -m_2 a + m_2 g$

$a(m_1 + m_2) = g(m_2 - m_1)$

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

$m_2 = m_1 \quad a = 0$

$m_2 > m_1 \quad a > 0$

$m_1 > m_2 \quad a < 0$

$m_2 >>> m_1$

$$a = g\left(\frac{m_2}{m_2}\right) = 1$$

if $m_2 >> m_1$

$m_2 - m_1 \approx m_2$

$m_1 + m_2 \approx m_2$

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

$$= 9.8\ m/s^2\left(\frac{14\ kg - 10\ kg}{14\ kg + 10\ kg}\right)$$

$$= 1.6\ m/s^2$$

Interactive Question

Consider a person standing in an elevator that is moving upward at a constant velocity. The upward normal force N exerted by the elevator floor on the person is

A) larger than
B) identical to
C) smaller than

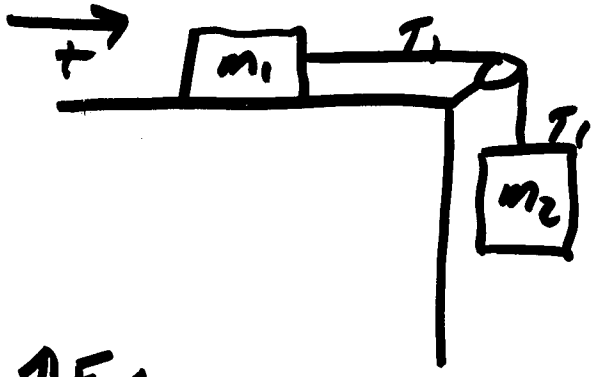
the downward weight W of the person

Interactive Question

Consider a person standing in an elevator that is *accelerating upward.* The upward normal force N exerted by the elevator floor on the person is

A) larger than
B) identical to
C) smaller than

the downward weight W of the person



$m_1 = 50\,kg$

$m_2 = 100\,kg$

$\mu_k = 0.3$

Determine $\vec{a}$