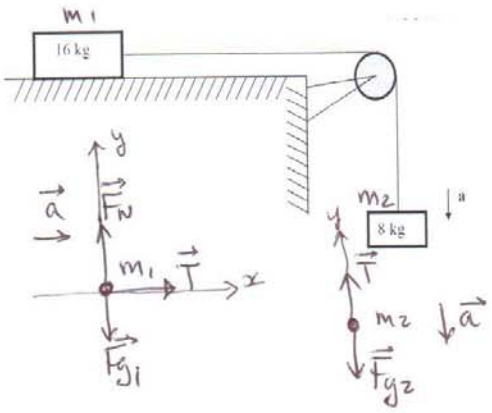
QUIZ#5- CHAPTER5
DATE: 08/10/18

Name: Key Id#: Sect.#:

A 16-kg block and an 8-kg block is connected by a string as shown in the figure. The pulley is massless and the surface is frictionless.

(a) Calculate the magnitude of the acceleration of the blocks.



mass m_1:

x-axis: $T = m_1 a$ —①

y-axis $F_N - F_{g_1} = 0$

mass m_2:

y-axis $T - F_{g_2} = -m_2 a$ —②

$m_1 a - m_2 g = -m_2 a$

$a(m_1 + m_2) = m_2 g \rightarrow a = \frac{m_2}{m_1 + m_2} g = \frac{8}{24} \times 9.8$

$\boxed{a = 3.3 \text{ m/s}}$

(b) Calculate the tension in the string.

$T = m_1 a = 16 \times 3.3 = \boxed{52.8 \text{ N}}$

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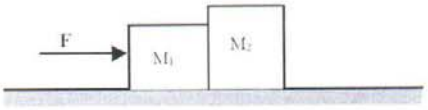
Two blocks of masses $M_1 = 2.0$ kg and $M_2 = 4.0$ kg are in contact with each other and move on a frictionless surface under the action of a horizontal force F = 60 N (see the figure).

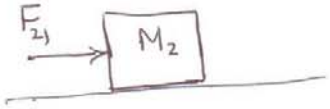
(a) Calculate the acceleration of the two blocks.



$F = (m_1 + m_2)\, a$

$$a = \frac{F}{m_1 + m_2} = \frac{60}{6} = \boxed{10\ m/s^2}$$

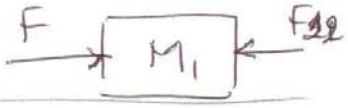
(b) Find the magnitude and direction of the force that M_1 exerts on M_2.



$F_{21} = M_2 a = 4 \times 10 = \boxed{40N}$

direction: to the right.

(c) Find the magnitude and direction of the force that M_2 exerts on M_1.



$F - F_{12} = M_1 a \quad F_{12} = F - M_1 a$

$F_{12} = 60 - 20 = \boxed{40N}$

direction: to the left.

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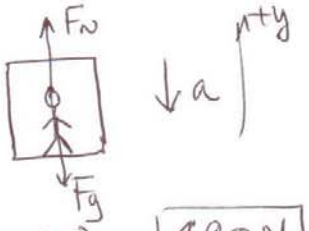
A 70-kg man stands on a spring scale in an elevator. Calculate the apparent weight of the man if:

(a) The elevator is accelerating downward with magnitude of acceleration of 2.8 m/s^2.



$$F_N - F_g = -ma$$

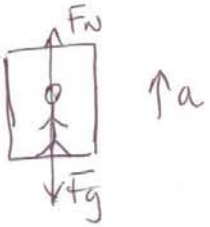
$$F_N = F_g - ma = mg - ma$$

$$= m(g-a) = 70 \times (9.8 - 2.8) = \boxed{490\,N}$$

(b) The elevator is decelerating downward with magnitude of acceleration of 2.8 m/s^2.

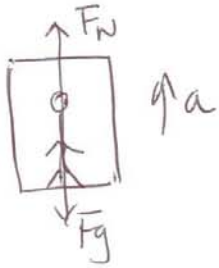
$$F_N - F_g = ma$$

$$F_N = F_g + ma = mg + ma = m(g+a) = \boxed{882\,N}$$



(c) The elevator is accelerating upward with magnitude of acceleration of 2.8 m/s^2.

$$F_N - F_g = ma \Rightarrow \boxed{F_N = 882\,N}$$



(d) The elevator is decelerating upward with magnitude of acceleration of 2.8 m/s^2.

$$F_N - F_g = -ma$$

$$F_N = F_g - ma \qquad \boxed{F_N = 490\,N}$$