Serial #

King Fahd University of Petroleum and Minerals, Physics Department

PHYS 101 REC Fall 2018 (181)

SEC # 25, Quiz # 4

Name: ID #

Please show all steps and substitutions.

An elevator cab that weighs 27.8 kN moves upward. What is the tension in the cable if the cab's speed is (a) increasing at a rate of 1.22 m/s^2 and (b) decreasing at a rate of 1.22 m/s^2?

$$m = \frac{W}{g} = \frac{27.8\ \text{kN}}{9.81\ \text{m s}^2} = 2.83 \times 10^3\ \text{kg}.$$

$$T - mg = ma_y,$$

$$T = m(g + a_y).$$

a)

$$T = m(g + a_y) = 2.83 \times 10^3\ (9.81 + 1.22) = 3.13 \times 10^4\ \text{N} = 31.3\ \text{kN}.$$

b)

$$T = m(g + a_y) = 2.83 \times 10^3\ (9.81 - 1.22) = 2.43 \times 10^4\ \text{N} = 24.3\ \text{kN}.$$

Serial #

King Fahd University of Petroleum and Minerals, Physics Department

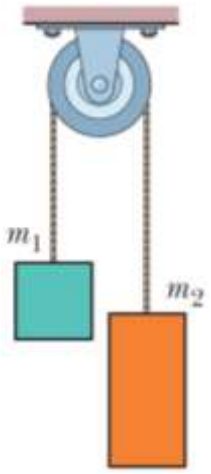
PHYS 101 REC Fall 2018 (181)

SEC # 26, Quiz # 4

Name: ID #

Please show all steps and substitutions.

The figure shows two blocks connected by a cord (of negligible mass) that passes over a frictionless pulley (also of negligible mass). The arrangement is known as Atwood's machine. One block has mass m_1 = 1.30 kg; the other has mass m_2 = 2.80 kg. What is the magnitude of the blocks' acceleration?



The heaver mass (m_2) accelerates downwards while the lighter mass m_1 accelerated upwards.

For m_1,

$$T - m_1 g = m_1 a_{1y} = m_1 a,$$

or

$$T - m_1 g = m_1 a$$

For m_2,

$$T - m_2 g = m_2 a_{2y} = -m_2 a,$$

or

$$T - m_2 g = -m_2 a$$

Solving for a gives

$$a = \left(\frac{m_2 - m_1}{m_2 + m_1}\right) g = \left(\frac{2.80 - 1.30}{2.80 + 1.30}\right)(9.81) = 3.59 \text{ m/s}^2.$$

Serial #

King Fahd University of Petroleum and Minerals, Physics Department

PHYS 101 REC Fall 2018 (181)

SEC # 27, Quiz # 4

Name: ID #

Please show all steps and substitutions.

A block of mass $m_1 = 3.70$ kg on a frictionless plane inclined at angle $\theta = 30.0°$ is connected by a cord over a massless, frictionless pulley to a second block of mass $m_2 = 2.30$ kg. What is the magnitude of the acceleration of the two-block system?

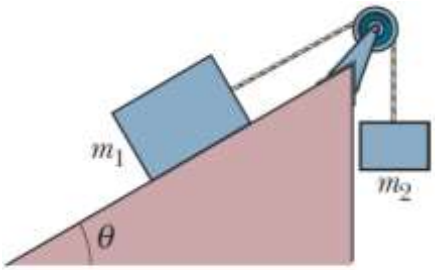


Figure 5-52 Problem 57.

Let us assume that m_2 accelerates downwards while the lighter mass m_1 accelerated upwards.

For m_1,

$$T - m_1 g \sin\theta = m_1 a_x,$$

or

$$T - m_1 g \sin\theta = m_1 a.$$

For m_2,

$$T - m_2 g = m_2 a_y,$$

or

$$T - m_2 g = -m_2 a.$$

Solving for a gives

$$a = \frac{m_2 - m_1 \sin\theta}{m_1 + m_2} g = \left(\frac{2.30 - (3.70)\sin 30.0}{3.70 + 2.30}\right)(9.81) = 0.735 \text{ m/s}^2.$$