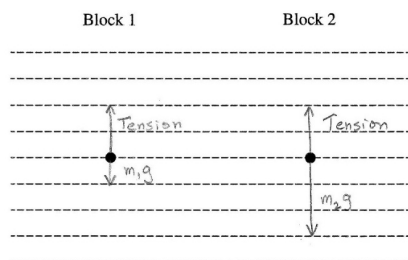


2015 SCORING GUIDELINES

Question 1

7 points total

(a) 2 points

Distribution
of points

For drawing two vectors starting on the dots that point upward, have the same length and are labeled as the tension force

1 point

For drawing two vectors starting on the dots that point downward, where the vector for block 1 is smaller than the vector for block 2 and both are labeled as the gravitational force

1 point

One earned point is deducted for drawing any extraneous vectors.

One earned point is deducted for vector lengths that do not allow the system to accelerate in the proper direction.

(b) 3 points

For writing an equation for Newton's second law for block 1

1 point

$$m_1 a = T - m_1 g$$

For writing an equation for Newton's second law for block 2

1 point

$$m_2 a = m_2 g - T$$

For eliminating T to obtain an equation that can be solved for the acceleration

1 point

$$T = m_1 a + m_1 g$$

$$m_2 a = m_2 g - m_1 a - m_1 g$$

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

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

2015 SCORING GUIDELINES

Question 1 (continued)

Distribution
of points

(b) (continued)

*Alternate solution**Alternate points*

The system of two blocks must move as a unit, so the acceleration of the system is the acceleration of block 2.

For writing an equation showing that the net force acting on the system is the difference in masses times the acceleration of gravity

1 point

$$F_{\text{net}} = (m_2 - m_1) g$$

For writing an equation that relates the net force to the sum of the masses and the acceleration of the system

1 point

$$F_{\text{net}} = (m_2 + m_1) a$$

For writing an equation that can be solved for the acceleration in terms of the variables used in the summation of forces equations

1 point

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

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

(c) 2 points

The acceleration of the new system, and thus of block 2, is smaller.

For indicating that the mass of the system is larger

1 point

For a clear indication that the tension on block 2 is greater

1 point

*Alternate solution**Alternate points*

For indicating that the mass of the system is larger

1 point

For indicating that the net force exerted on the system stays the same

1 point

Notes:

No points are earned for a correct prediction without a reasonable attempt at an explanation.

No points are earned for an incorrect prediction, regardless of the explanation.