


SPH3U

UNIVERSITY PHYSICS

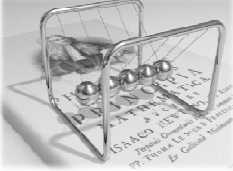
FORCES

 Action-Reaction Problems
 (P.142-147)

Newton's Third Law & Action-Reaction Problems

When more than one object is being accelerated, Newton's third law must be used to determine how the applied force affects each of the accelerating objects. The solution is always a 2-step process. forces.

1. Consider all the objects to be one mass. Use this single mass to determine the acceleration of the system.

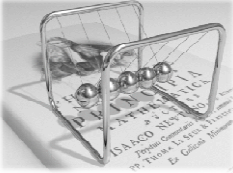


November 24, 2012 3U2 - Action-Reaction Problems 1

Newton's Third Law & Action-Reaction Problems

When more than one object is being accelerated, Newton's third law must be used to determine how the applied force affects each of the accelerating objects. The solution is always a 2-step process. forces.

2. Consider the masses as individual objects, all of which are accelerating at the same rate (step 1). Draw a FBD of each mass and then analyze each to determine the action-reaction

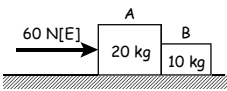


November 24, 2012 3U2 - Action-Reaction Problems 2

Newton's Third Law & Action-Reaction Problems

PRACTICE

1. A force of 60 N[E] acts on a combination of two boxes that are sitting next to each other on a frictionless surface. Find:



(a) the acceleration of the boxes.

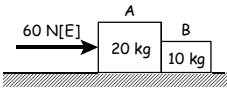
(a) $a = 2.0 \text{ m/s}^2[\text{E}]$

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Newton's Third Law & Action-Reaction Problems

PRACTICE

1. A force of 60 N[E] acts on a combination of two boxes that are sitting next to each other on a frictionless surface. Find:



(b) the force exerted by box A on B.

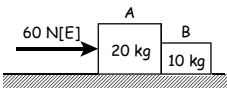
(b) $F_{AB} = 20 \text{ N}[\text{W}]$

November 24, 2012 3U2 - Action-Reaction Problems 4

Newton's Third Law & Action-Reaction Problems

PRACTICE

1. A force of 60 N[E] acts on a combination of two boxes that are sitting next to each other on a frictionless surface. Find:



(c) the force exerted by box B on A.

(c) $F_{BA} = 20 \text{ N}[\text{E}]$

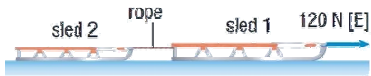
November 24, 2012 3U2 - Action-Reaction Problems 5

Newton's Third Law & Action-Reaction Problems

PRACTICE

2. Two sleds are tied together and pulled east across an icy surface with an applied force of 120 N[E]. The mass of sled 1 is 12 kg and the mass of sled 2 is 8.0 kg. Assume that no friction acts on the sleds.

(a) Determine the acceleration of the sleds.



(a) $a = 6.0 \text{ m/s}^2[\text{E}]$

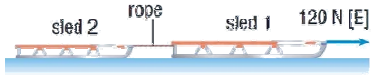
November 24, 2012 3U2 - Action-Reaction Problems 6

Newton's Third Law & Action-Reaction Problems

PRACTICE

2. Two sleds are tied together and pulled east across an icy surface with an applied force of 120 N[E]. The mass of sled 1 is 12 kg and the mass of sled 2 is 8.0 kg. Assume that no friction acts on the sleds.

(b) Calculate the magnitude of the tension in the rope.



(b) $F_T = 48 \text{ N}$

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Check Your Learning

TEXTBOOK

P.147 Q.6
P.149 Q.2 (PJ: Galileo, Newton, and Hawking)

November 24, 2012 3U2 - Action-Reaction Problems 8
