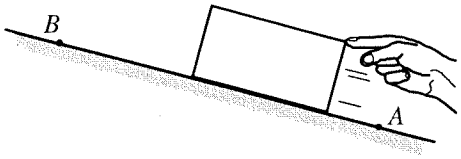
AP Physics - Unit 4 - Energy

Tippen #1 - Unit 4

#1

B4-LMCT18: BLOCK PUSHED ON INCLINE—WORK DONE

A block is pushed so that it moves up a ramp at constant speed.



Identify from choices (i)–(iv) below the appropriate description for the work done by the specified force while the block moves from point *A* to point *B*.

(i) is *zero*.
(ii) is *less than* zero.
(iii) is *greater than* zero.
(iv) could be ***positive or negative*** depending on the choice of coordinate systems.
(v) ***cannot*** *be determined.*

(a) The work done on the block by the hand. _____
Explain your reasoning.

(b) The work done on the block by the normal force from the ramp. _____
Explain your reasoning.

(c) The work done on the block by friction. _____
Explain your reasoning.

(d) The work done on the block by the gravitational force. _____
Explain your reasoning.

(e) The net work done on the block. _____
Explain your reasoning.

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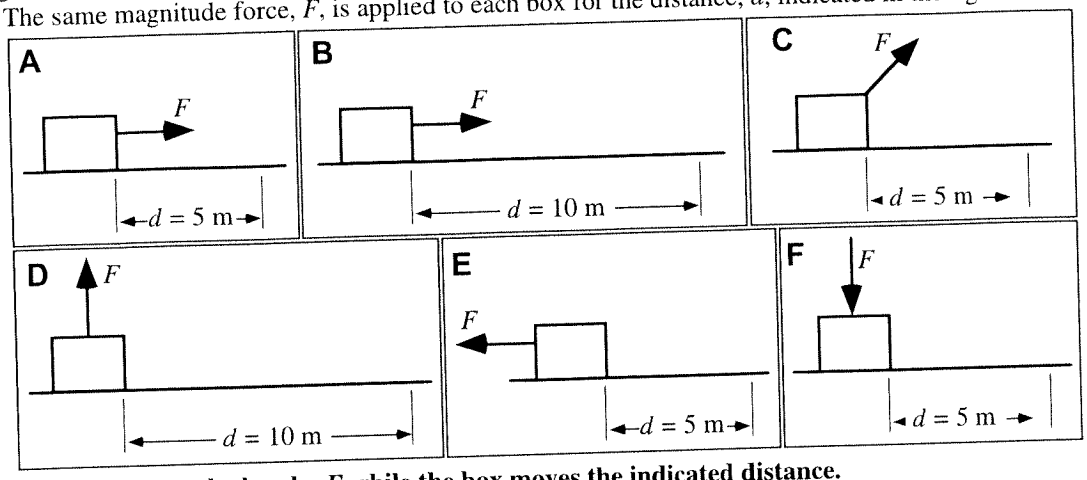
#2

B4-RT08: EQUAL FORCES ON BOXES—WORK DONE ON BOX

In the figures below, identical boxes of mass 10 kg are moving at the same initial velocity to the right on a flat surface. The same magnitude force, F, is applied to each box for the distance, d, indicated in the figures.



Rank the work done on the box by F while the box moves the indicated distance.

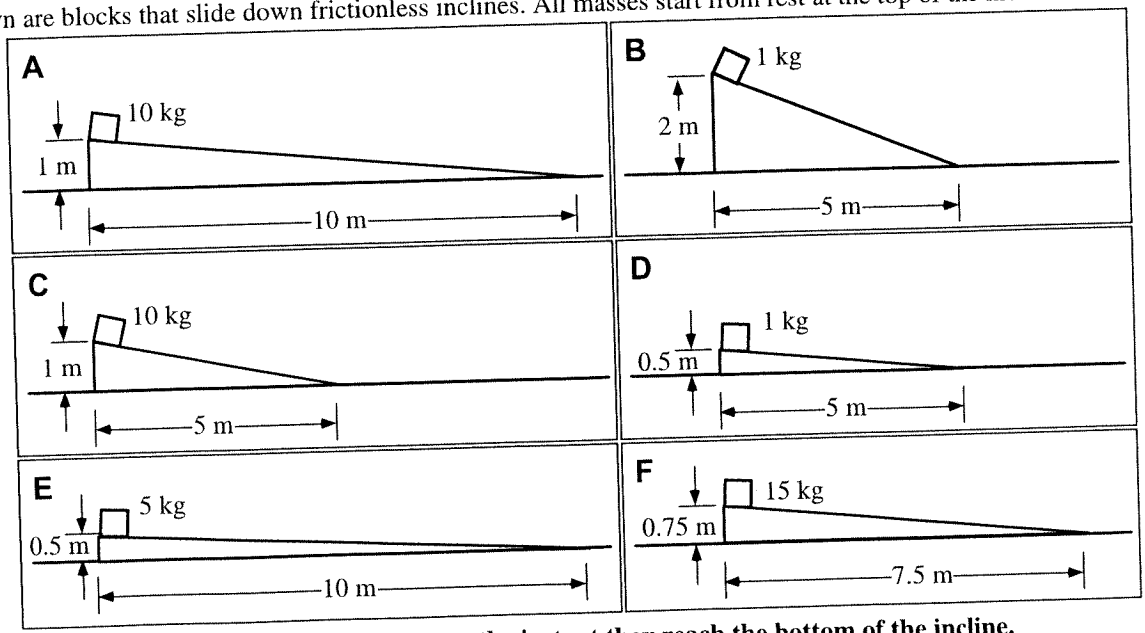
1	2	3	4	5	6	OR	☐	☐	☐
Greatest					Least		All the same	All zero	Cannot determine

Explain your reasoning.

#3

B4-RT45: SLIDING MASSES ON INCLINE—KINETIC ENERGY

Shown are blocks that slide down frictionless inclines. All masses start from rest at the top of the incline.



Rank the kinetic energy of the sliding masses the instant they reach the bottom of the incline.

1	2	3	4	5	6	OR	☐	☐	☐
Greatest					Least		All the same	All zero	Cannot determine

Explain your reasoning.

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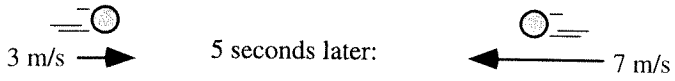
#4

B4-WWT03: Object Changing Velocity—Work

A 2-kg object accelerates as a net force acts on it. During the 5 seconds this force acts, the object changes its velocity from 3 m/s east to 7 m/s west.



A student states:

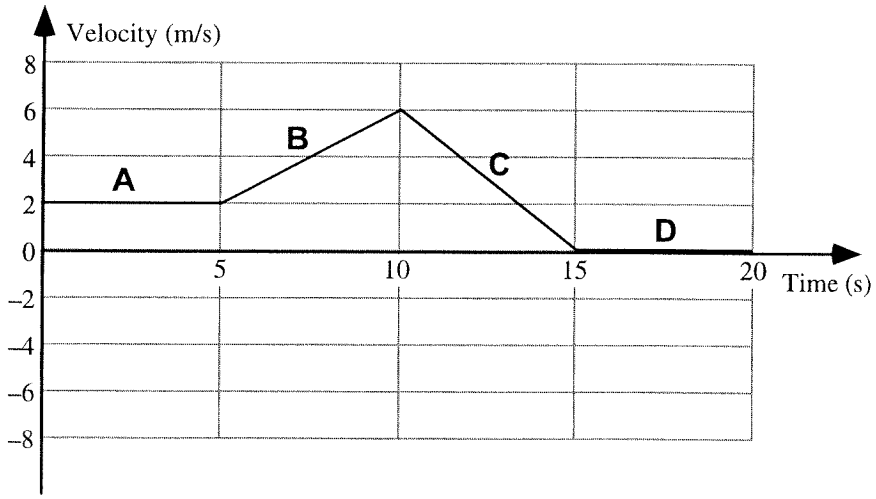
"The initial kinetic energy of the object was 9 Joules, and the final kinetic energy was 49 Joules. Thus the change in kinetic energy of this object during these 5 seconds was 40 J, and thus the work done on this object by the net force during this period was also 40 J."

What, if anything, is wrong with this statement? If something is wrong, identify it and explain how to correct it. If this statement is correct, explain why.

#5

B4-RT09: Velocity-Time Graph I—Work Done on Box

Shown below is a graph of velocity versus time for an object that moves along a straight, horizontal line under the perhaps intermittent action of a single force exerted by an external agent.



Rank the work done on the box by the external agent for the 5-second intervals shown on the graph.

☐	☐	☐	☐	OR	☐	☐	☐
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Explain your reasoning.

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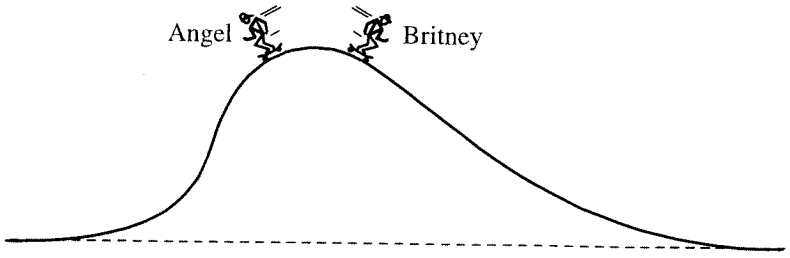
#6 **B4-CT28: SKATEBOARDERS ON A HILL—TIME, SPEED, KINETIC ENERGY, AND WORK**

Starting from rest, Angel and Britney skateboard down a hill as shown. Angel rides down the steep side while Britney rides down the shallow side. Angel has more mass than Britney. Assume that friction and air resistance are negligible.



(a) Is the speed at the bottom of the hill (i) *greater* for Angel, (ii) *greater* for Britney, or (iii) *the same* for both skateboarders? _____

Explain your reasoning.

(b) Is the time it takes to get to the bottom of the hill (i) *greater* for Angel, (ii) *greater* for Britney, or (iii) *the same* for both skateboarders? _____

Explain your reasoning.

(c) Is the work done by the gravitational force on the skateboarder (i) *greater* for Angel, (ii) *greater* for Britney, or (iii) *the same* for both skateboarders? _____

Explain your reasoning.

(d) Is the work done by the normal force on the skateboarder (i) *greater* for Angel, (ii) greater for Britney, or (iii) *the same* for both skateboarders? _____

Explain your reasoning.

(e) Is the kinetic energy at the bottom of the hill (i) *greater* for Angel, (ii) *greater* for Britney, or (iii) *the same* for both skateboarders? _____

Explain your reasoning.

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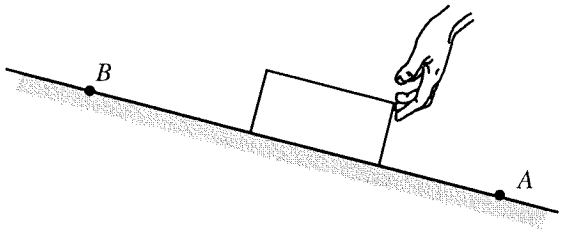
#7

B4-QRT22: BLOCK ON RAMP WITH FRICTION—WORK AND ENERGY

A block is pushed at constant speed up a ramp from point *A* to point *B*. The direction of the force on the block by the hand is horizontal. There is friction between the block and the ramp. The distance between points *A* and *B* is 1 m.



(a) The kinetic energy of the block at point *B*

(i) is *greater than* the kinetic energy of the block at point *A*.

(ii) is *less than* the kinetic energy of the block at point *A*.

(iii) is *equal to* the kinetic energy of the block at point *A*.

(iv) *cannot be compared* to the kinetic energy of the block at point *A* unless we know the height difference between *A* and *B*.

Explain your reasoning.

(b) The net work done on the block as it travels from point *A* to point *B*

i) is zero

ii) is Negative

iii) is positive

iv) Could Be positive or negative depending on the choice of coordinate system

Explain your Answers

(c) The work done on the block by the hand as the block travels from point *A* to point *B*

(i) is *equal* to 1 m times the magnitude of the force exerted on the block by the hand.

(ii) is *greater than* 1 m times the magnitude of the force exerted on the block by the hand.

(iii) is *less than* 1 m times the magnitude of the force exerted on the block by the hand but not zero.

(iv) is *zero*.

(v) *cannot be compared* to the magnitude of the force exerted on the block by the hand based on the information given.

Explain your reasoning.