PY105 Assignment 4 (946994)

0/20

Mon Oct 5 2009 10:15 PM EDT

Question	1	2	3	4	5	6	7
Points	0/1	0/3	0/3	0/3	0/4	0/3	0/3

Total
0/20

Description

This assignment is worth 20 points. Each part is worth 1 point.

Assume the numbers given in each problem are accurate to three significant figures. WebAssign expects your answers to be accurate within 1%. If you don't round off until the end, and then round off to three significant figures, you should be fine.

Occasionally there are errors in WebAssign. If you are convinced your answer is correct and WebAssign is grading you incorrectly please check with Professor Duffy.

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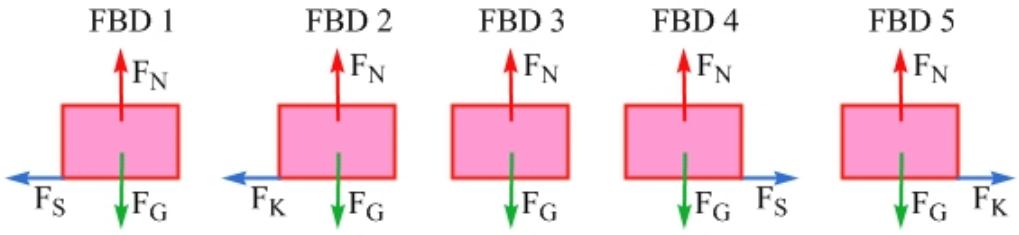
1. 0/1 pointsDuffy_EP_Ch05_P01 [488044]

A box is placed in the middle of the floor of a truck. From the five free-body diagrams shown below, determine which free-body diagram corresponds to the following situations. Assume the floor of the truck is horizontal at all times, and that for parts (a) - (d) the box does not slip on the floor of the truck.

(a) The truck is moving at constant velocity to the right.
(b) The truck is moving at constant velocity to the left.
(c) The truck, while moving right, is speeding up.
(d) The truck, while moving right, is slowing down.
(e) The truck, while moving right, is stopping so quickly that the box slides over the floor of the truck.
(f) The truck, while moving right, is speeding up so rapidly that the box slides over the floor of the truck.

You must select all the correct answers, and only correct answers, to receive credit for this question. F_G represents the force of gravity; F_N represents the normal force; F_S represents the static force of friction; and F_K represents the kinetic force of friction.

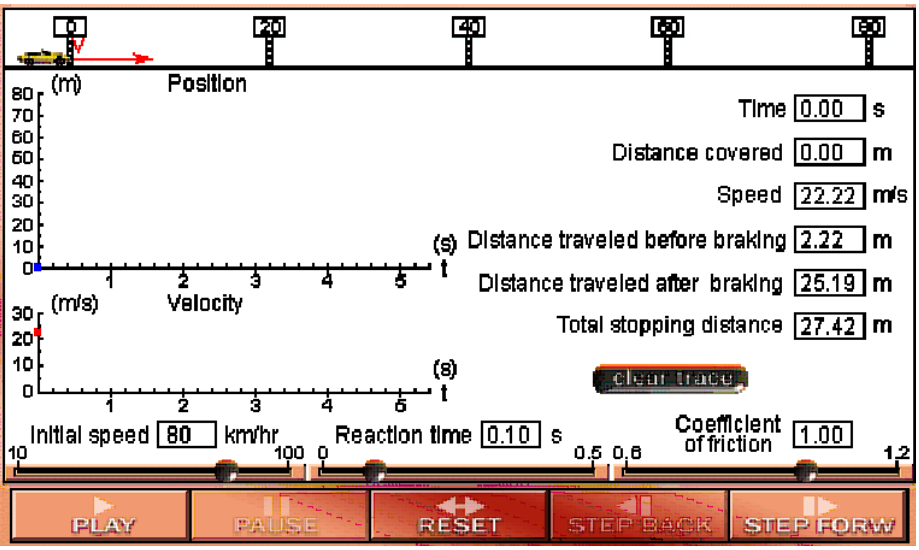


- ☐ In (a) the correct free-body diagram is FBD 3.
- ☐ In (a) the correct free-body diagram is FBD 4.

- In (b) the correct free-body diagram is FBD 1.
- In (b) the correct free-body diagram is FBD 3.
- In (c) the correct free-body diagram is FBD 3.
- In (c) the correct free-body diagram is FBD 4.
- In (c) the correct free-body diagram is FBD 5.
- In (d) the correct free-body diagram is FBD 1.
- In (d) the correct free-body diagram is FBD 3.
- In (d) the correct free-body diagram is FBD 4.
- In (e) the correct free-body diagram is FBD 2.
- In (e) the correct free-body diagram is FBD 5.
- In (f) the correct free-body diagram is FBD 2.
- In (f) the correct free-body diagram is FBD 5.

2. 0/3 points **Wiley Simulation 10.2. [192824]**

Stopping Distance of a Car



You are traveling along a road at 90 km/hr, maintaining a constant distance d between you and the car in front of you, measured from your front bumper to the other car's rear bumper.

(a) If the driver of the car in front of you applies the brakes to come to a complete stop, what is the minimum value of d required if you are not to hit the other car? Assume your reaction time (the time it takes you to see the brake lights in front and apply your own brakes) is 0.32 s and that the appropriate coefficient of friction between the road and your car tires is 0.85. Assume the acceleration due to gravity has a magnitude of 9.8 m/s^2.

8 m

(b) Assuming the length of a typical car is 3.00 m, express the minimum value of d in car lengths.

2.67 car lengths.

(c) What is the distance between the two cars at the instant you apply the brakes?

7.57 m

3. [0/3 points] **Duffy_EP_Ch05_P29 [1185507]**

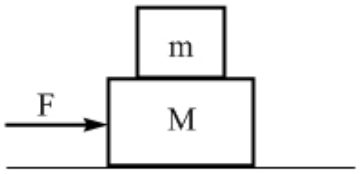
A box with a mass of 7.00 kg is at rest on a ramp that is at an angle of 20 degrees with the horizontal. The coefficient of static friction between the box and the ramp is 0.500. Use g = 9.80 m/s^2. You now want to make the box move by applying a force. To start the box moving, what is the minimum force you need to apply if your force is directed ...

(a) parallel to the slope?
8.77 N

(b) perpendicular to the slope?
17.5 N

(c) horizontally?
7.89 N

4. [0/3 points] **Duffy_EP_Ch05_P49 [1185760]**



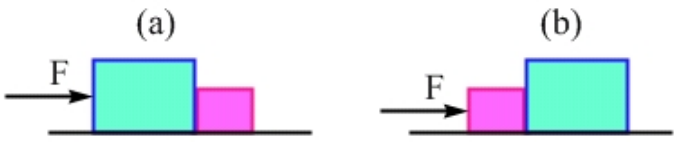
As shown above, a block of mass 2.00 kg is placed on top of a larger block of mass 12.0 kg, and the two-block system rests on a horizontal surface. There is friction between the two blocks, as well as between the larger block and the surface, with static and kinetic friction coefficients of μ_S = 0.300 and μ_K = 0.200 , respectively. As shown above, a horizontal force F is applied to the larger block. Use g = 10 m/s^2, and try doing this problem without a calculator.

(a) If the blocks are initially at rest, what is the minimum value of the horizontal force F necessary to start the system moving?
42 N

(b) Once the blocks are moving, what is the minimum value of the horizontal force F necessary to keep the system moving at constant velocity?
28 N

(c) Once the blocks are moving, what is the maximum value the horizontal force F can be such that the small block does not slide on the large block?
70 N

5. [0/4 points] **Duffy_EP_Ch05_P53v3 [1185786]**



Two boxes on a frictionless horizontal surface, as shown in the figure above, are moving together under the influence of a

horizontal force, *F*. The coefficient of kinetic friction between the boxes and the surface is 0.40. Use g = 10 m/s^2. In case (a), a horizontal force *F* directed right is applied to the larger box, which has a mass of 8.00 kg. In case (b), the horizontal force *F* is instead applied to the smaller box, which has a mass of 3.00 kg. The horizontal force *F* has a magnitude of 120. N.

(a) Let's say that the boxes are moving to the right, in the direction of the force *F*. What is the magnitude of the force exerted by the larger box on the smaller box in:

(i) case (a)

32.7 N

(ii) case (b)

87.3 N

(b) Now, consider the case in which the boxes are initially moving to the left, opposite to the direction of the force *F*.

(i) For case (a), what is the magnitude of the acceleration of the system?

14.9 m/s^2

(ii) For case (a), what is the magnitude of the force applied by the larger box on the smaller box?

32.7 N

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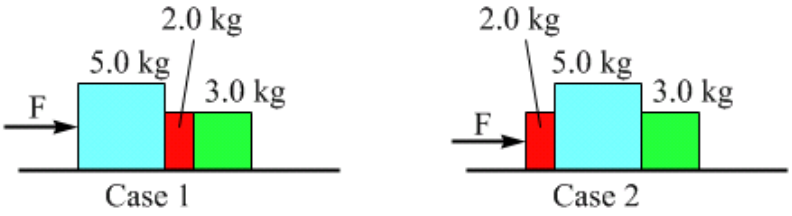
6. **0/3 points** **Duffy_EP_Ch05_P52 [488063]**

Try doing this problem without a calculator. Three blocks are placed side-by-side on a horizontal surface and subjected to a horizontal force F, as shown in case 1 of the figure below, that causes the blocks to accelerate from rest to the right. The coefficients of friction between each box and the surface are μ_S = 0.300 and μ_K = 0.200 . Use g = 10 m/s^2, and **consider case 1 only**.



If the horizontal force F is 70.0 N what is:

(a) The magnitude of the acceleration of the system?

5 m/s^2

(b) The magnitude of the net force acting on the 2.0 kg block?

10 N

(c) The magnitude of the force exerted by the 5.0 kg block on the 2.0 kg block?

35 N

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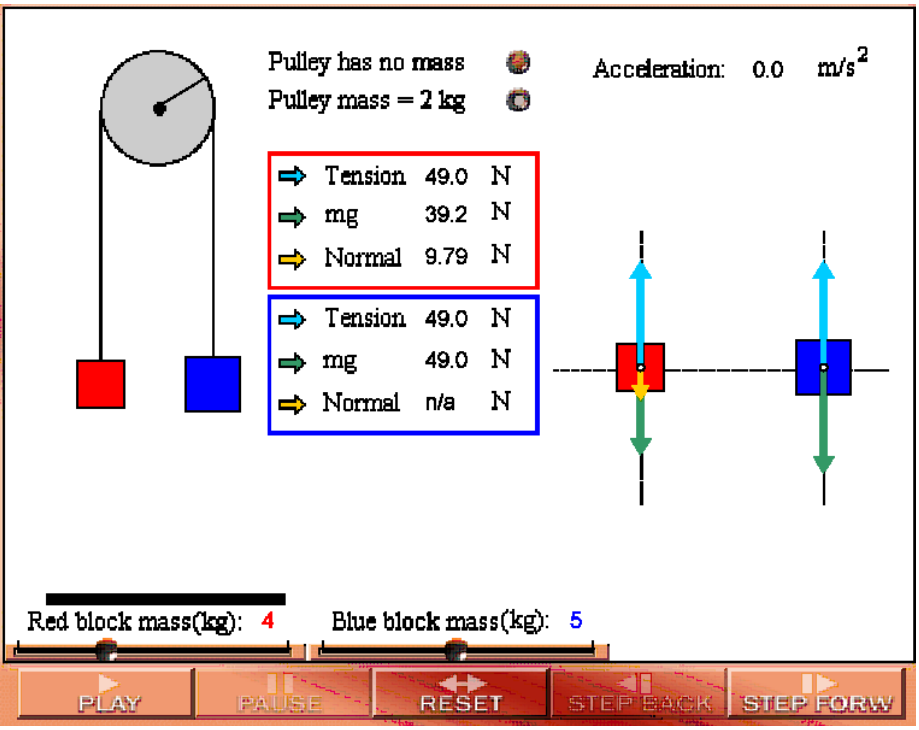
7. **0/3 points** **Wiley Simulation 20.1. [191954]**

Atwood's Machine



When the two blocks in the simulation have different masses the system is held at rest by applying a downward force (shown as a normal force) to the lighter block.

Choose all the correct statements about this system from the list below.

- ☐ Before the system is released the magnitude of the tension in the string equals the magnitude of the force of gravity on the larger block.
- ☐ Increasing the mass of the larger block results in an increase in the magnitude of the acceleration of the system when it is released from rest.
- ☐ When the blocks are in motion they move with constant velocity.
- ☐ When the blocks are in motion the magnitude of the net force on the red block is always equal to the magnitude of the net force on the blue block.
- ☐ Doubling the mass of each block doubles the acceleration of the blocks when the system is released from rest.
- ☐ When the larger block reaches the ground the ground in all cases applies an upward normal force equal-and-opposite to the force of gravity acting on the block.
- ☐ When the larger block reaches the ground the magnitude of the tension in the string equals the magnitude of the force of gravity on the smaller block.

(b) Given the limits on the sliders available to you in the simulation, what is the largest negative value the acceleration reading, shown at top right, can have?

-9.8 m/s^2

(c) Given the limits on the sliders available to you in the simulation, what is the largest positive value the acceleration reading can have?

8.02 m/s^2