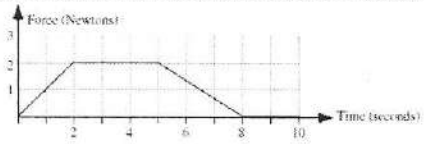
NT7B-RT12: FORCE VS. TIME GRAPH—IMPULSE APPLIED TO BOX

A 10-kg box, initially at rest, moves along a frictionless horizontal surface. A horizontal force to the right is applied to the box. The magnitude of the force changes as a function of time as shown.



Rank the impulse applied to the box by this force during each 2-second interval indicated below.

A. 0 to 2 s B. 2 to 4 s C. 4 to 6 s D. 6 to 8 s E. 8 to 10 s

Greatest 1 B 2 C 3 A 4 D 5 E Least

OR. The impulse applied to the box during each of the intervals is the same but not zero. ___

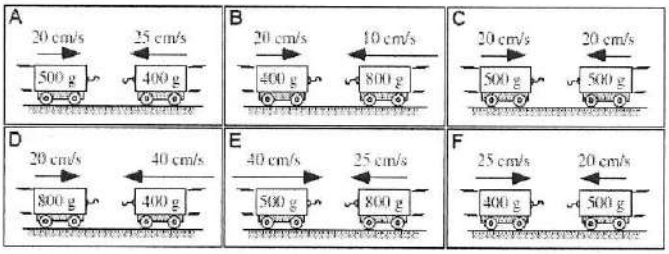
OR. The impulse applied to the box during each of the intervals is zero. ___

OR. We cannot determine the ranking of the impulse applied to the box during the intervals. ___

Please explain your reasoning.

NT7D-RT18: COLLIDING CARTS STICKING TOGETHER—FINAL SPEED

In each of the six figures below, two carts traveling in opposite directions are about to collide. The carts are all identical in size and shape, but they carry different loads and are initially traveling at different speeds. The carts stick together after the collision. There is no friction between the carts and the ground.



Rank these situations on the basis of the speed of the two-cart systems after the collision.

Greatest 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____ Least

OR. The speed is the same but not zero for these two-cart systems after the collision. ___

OR. The speed is zero for these two-cart systems after the collision. ___

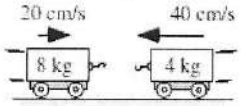
OR. We cannot determine the ranking for the speeds of these cart systems after the collision. ___

Please explain your reasoning.

The total momentum before the collision is zero in each case, so it must be 0 after the collision.

NT7D-CCT24: COLLIDING CARTS THAT STICK TOGETHER—FINAL KINETIC ENERGY

Two identical carts traveling in opposite directions are shown just before they collide. The carts carry different loads and are initially traveling at different speeds. The carts stick together after the collision.



Three physics students discussing this situation make the following contentions:

Alex: *"These carts will both be at rest after the collision since the initial momentum of the system is zero, and the final momentum has to be zero also."*

Belinda: *"If that were true it would mean that they would have zero kinetic energy after the collision and that would violate conservation of energy. Since the right-hand cart has more kinetic energy, the combined carts will be moving slowly to the left after the collision."*

Chano: *"I think that after the collision the pair of carts will be traveling left at 20 cm/s. That way conservation of momentum and conservation of energy are both satisfied."*

Which, if any, of these three students do you think is correct?

Alex ✓ Belinda ____ Chano ____ None of them ____

Please explain your reasoning.

Since they stick together, they have the same velocity. To have a momentum of 0 (which it is before they collide) the velocity after must be 0.