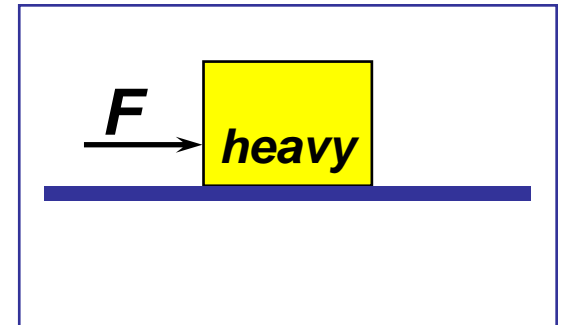Two boxes, one heavier than the other, are initially at rest on a horizontal frictionless surface. The same constant force **F** acts on each one for exactly *1 second*. Which box has more **momentum** after the force acts ?

1) the heavier one
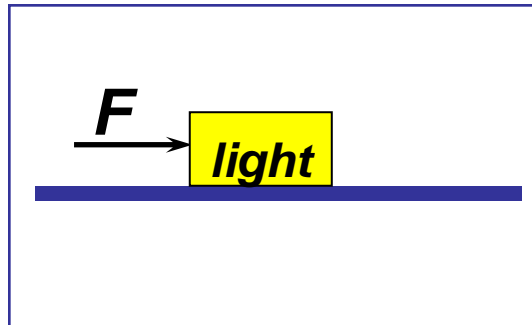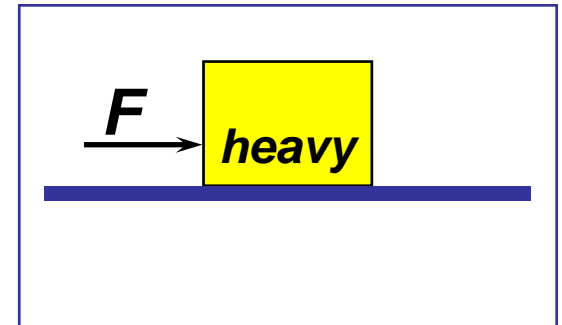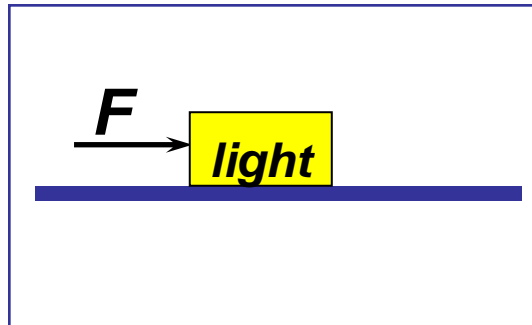
2) the lighter one

3) both the same

Two boxes, one heavier than the other, are initially at rest on a horizontal frictionless surface. The same constant force F acts on each one for exactly *1 second*. Which box has more **momentum** after the force acts ?

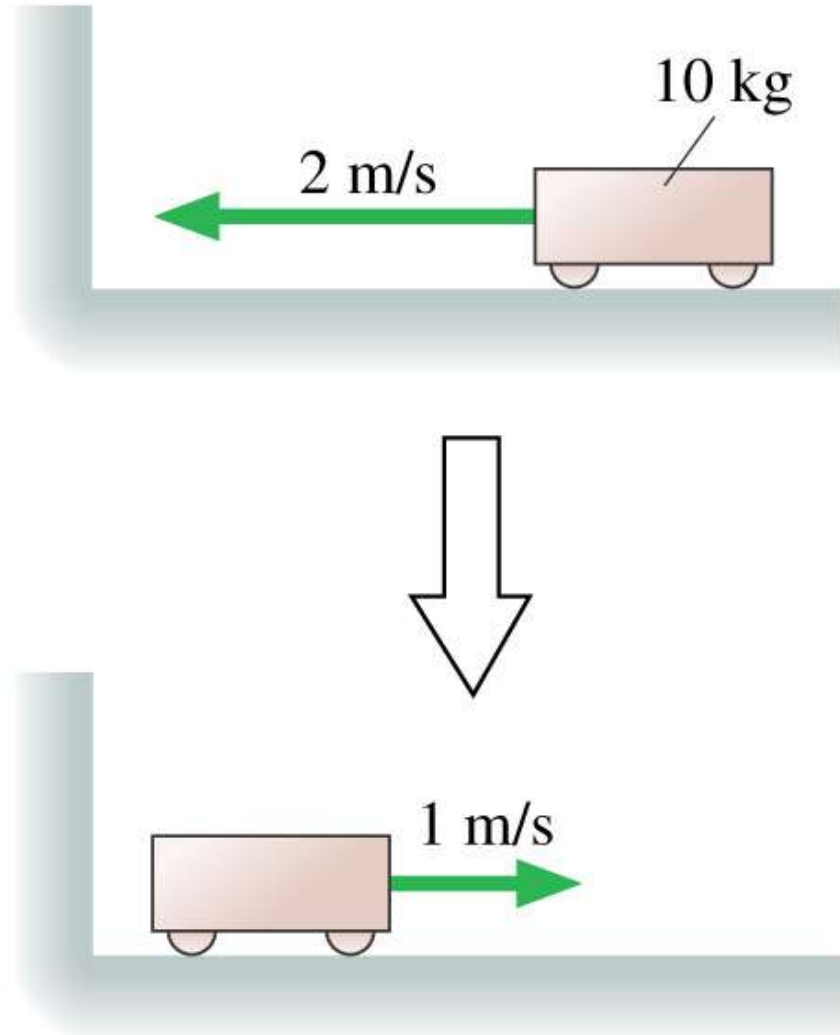1) the heavier one

2) the lighter one

3) both the same

In this case F and Δt are the **same** for both boxes. So impulse is the same for both! Since $I = \Delta p$, both boxes will have the **same final momentum**.
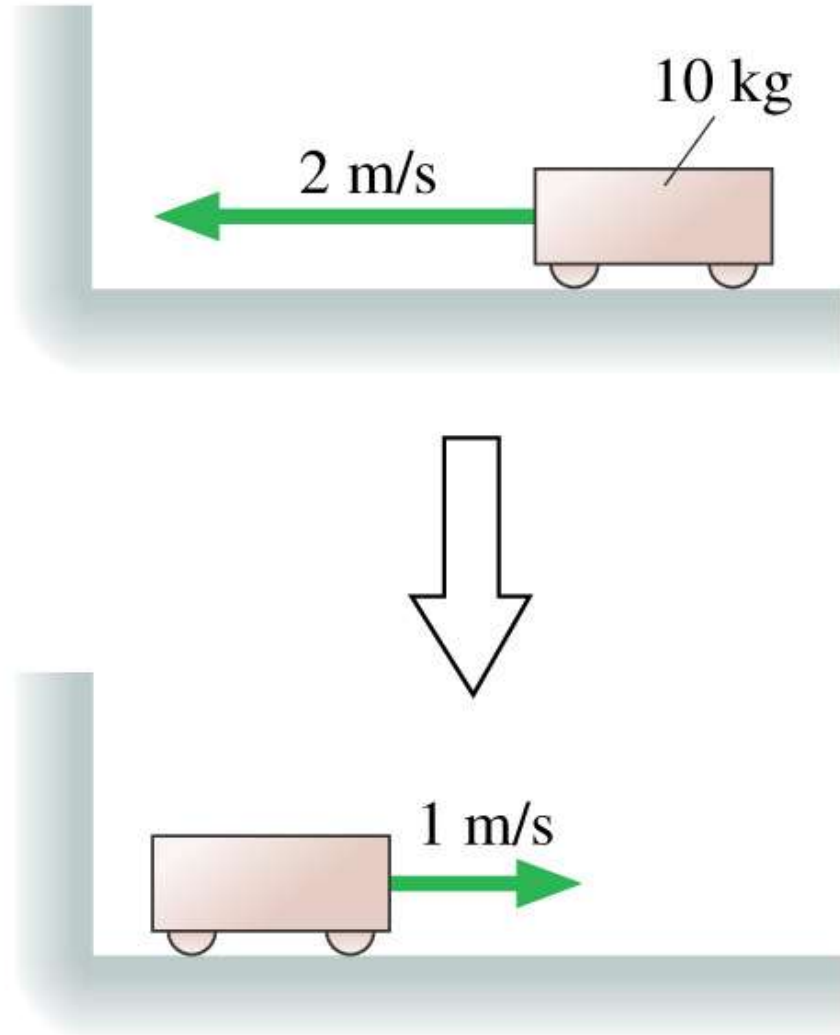
F → light

F → heavy

The cart's change of momentum is

1. –30 kg m/s.
2. –20 kg m/s.
3. –10 kg m/s.
4. 10 kg m/s.
5. 30 kg m/s.

10 kg

2 m/s

1 m/s

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1. –30 kg m/s.
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✔ **5. 30 kg m/s.**

10 kg

2 m/s

1 m/s

A 10 g rubber ball and a 10 g clay ball are thrown at a wall with equal speeds. The rubber ball bounces, the clay ball sticks. Which ball exerts a larger impulse on the wall?

1. The clay ball exerts a larger impulse because it sticks.
2. The rubber ball exerts a larger impulse because it bounces.
3. They exert equal impulses because they have equal momenta.
4. Neither exerts an impulse on the wall because the wall doesn't move.

A 10 g rubber ball and a 10 g clay ball are thrown at a wall with equal speeds. The rubber ball bounces, the clay ball sticks. Which ball exerts a larger impulse on the wall?

1. The clay ball exerts a larger impulse because it sticks.
✔ **2. The rubber ball exerts a larger impulse because it bounces.**
3. They exert equal impulses because they have equal momenta.
4. Neither exerts an impulse on the wall because the wall doesn't move.

A small beanbag and a bouncy rubber ball are dropped from the same height above the floor. They both have the same mass. Which one will impart the greater impulse to the floor when it hits?

1) the beanbag
2) the rubber ball
3) both the same

A small beanbag and a bouncy rubber ball are dropped from the same height above the floor. They both have the same mass. Which one will impart the greater impulse to the floor when it hits?

1) the beanbag

2) the rubber ball

3) both the same

Both objects reach the same speed at the floor. However, while the beanbag comes to rest on the floor, the ball bounces back up with nearly the same speed as it hit. Thus, the change in momentum for the ball is greater, because of the rebound. The impulse delivered by the ball is twice that of the beanbag.

For the beanbag: $\Delta p = p_f - p_i = 0 - (-mv) = mv$

For the rubber ball: $\Delta p = p_f - p_i = mv - (-mv) = 2mv$