

Two brothers, Dustin and Parker, have a combined mass of 168 kg. At an ice skating rink, they stand close together on skates, at rest and facing each other, with a compressed spring between them. The spring is kept from pushing them apart because they are holding each other. When they release their arms, Dustin moves off in one direction at a speed of 0.90 m/s, while Parker moves off in the opposite direction at a speed of 1.2 m/s. Assuming that friction is negligible, find Dustin's mass.

- a. 72 kg
- b. 80 kg
- c. 96 kg
- d. 77 kg
- e. 84 kg

Solution :

Let mass of Dustin = M

Velocity $V_1 = 0.9\text{m/s}$

Mass of Parker = $(168 - M)$

Velocity $V_2 = -1.2\text{m/s}$ (as the two moves opposite to each other, thus -ve sign is put)

Now when they release their arms they move apart such that the momentum is conserved

Thus, total momentum = 0

or $MV_1 + (168 - M)V_2 = 0$

or $0.9M - 1.2(168 - M) = 0$

or $0.9M = 1.2(168 - M)$

or $2.1M = 201.6$

or $M = 201.6/2.1 = 96\text{ kg}$

Thus mass of Dustin = 96kg