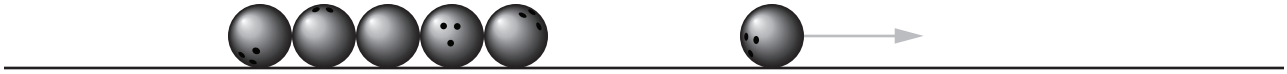
BOWLING BALLS IN COLLISION

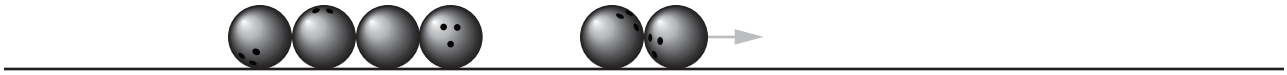
a. A 5 kg bowling ball moving at 8 m/s approaches a row of stationary balls lined up end to end in a ball return.

Comment on the likelihood of the following outcomes.

i. The incoming ball stops and one 5 kg ball leaves the row of stationary balls at a speed of 8 m/s.



ii. The incoming ball stops and two 5 kg balls leave the row of stationary balls at a speed of 4 m/s.

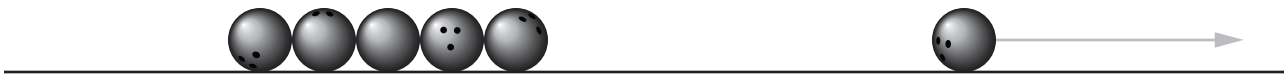


b. Two 5 kg bowling balls moving at 8 m/s approach a row of stationary balls lined up end to end in a ball return.

Comment on the likelihood of the following outcomes.

i. The incoming balls stop and two 5 kg balls leave the row of stationary balls at a speed of 8 m/s.

ii. The incoming balls stop and one 5 kg ball leaves the row of stationary balls at a speed of 16 m/s.



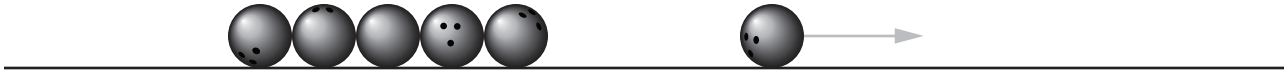
BOWLING BALLS IN COLLISION

a. A 5 kg bowling ball moving at 8 m/s approaches a row of stationary balls lined up end to end in a ball return.

$p = mv$ $\quad K = \frac{1}{2}mv^2$

Comment on the likelihood of the following outcomes.

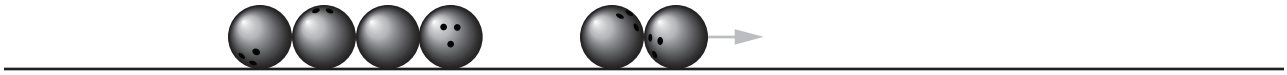
i. The incoming ball stops and one 5 kg ball leaves the row of stationary balls at a speed of 8 m/s.



$p' = mv$ $\quad K' = \frac{1}{2}mv^2 = K$

The bowling balls collided elastically, which is theoretically possible but practically impossible

ii. The incoming ball stops and two 5 kg balls leave the row of stationary balls at a speed of 4 m/s.



$p' = (2m)(\frac{1}{2}v) = mv = p$ $\quad K' = \frac{1}{2}(2m)(\frac{1}{2}v)^2 = \frac{1}{4}mv^2 = \frac{1}{2}K$

Momentum was conserved, but half the kinetic energy was lost. That's too much for bowling balls.

b. Two 5 kg bowling balls moving at 8 m/s approach a row of stationary balls lined up end to end in a ball return.

$p = (2m)v = 2mv$ $\quad K = \frac{1}{2}(2m)v^2 = mv^2$

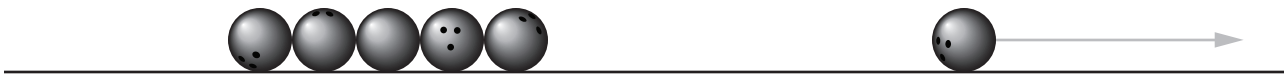
Comment on the likelihood of the following outcomes.

i. The incoming balls stop and two 5 kg balls leave the row of stationary balls at a speed of 8 m/s.

$p' = (2m)v = 2mv = p$ $\quad K' = \frac{1}{2}(2m)v^2 = mv^2 = K$

The bowling balls collided elastically, which is theoretically possible but practically impossible

ii. The incoming balls stop and one 5 kg ball leaves the row of stationary balls at a speed of 16 m/s.



$p' = m(2v) = 2mv = p$ $\quad K' = \frac{1}{2}m(2v)^2 = 2mv^2 = 2K$

Momentum was conserved, but kinetic energy doubled. That's not possible in this situation.