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$m_A v'_A + m_B v'_B = m_A v_A + m_B v_B$ より、 (運動量保存の法則)

$$m = m_A = m_B, \quad v_A = 0 \text{ m/s}, \quad v_B = 10 \text{ m/s}$$

を代入して、

$$m \cdot v'_A + m \cdot v'_B = m \cdot 0 + m \cdot 10$$

$$v'_A + v'_B = 10 \quad \dots \textcircled{1}$$

《ここまで共通》

(1)

$$\frac{v'_A - v'_B}{v_B - v_A} = e \text{ より、} \quad (\text{反発係数の公式})$$

$$v_A = 0 \text{ m/s}, \quad v_B = 10 \text{ m/s}, \quad e = 1$$

を代入して、

$$\frac{v'_A - v'_B}{10 - 0} = 1$$

$$v'_A - v'_B = 10 \quad \dots \textcircled{2}$$

式①, ②より、

$$\therefore v'_A = 10 \text{ m/s}$$

$$\therefore v'_B = 0 \text{ m/s}$$

(2)

$$\frac{v'_A - v'_B}{v_B - v_A} = e \text{ より、} \quad (\text{反発係数の公式})$$

$$v_A = 0 \text{ m/s}, \quad v_B = 10 \text{ m/s}, \quad e = 0$$

を代入して、

$$\frac{v'_A - v'_B}{10 - 0} = 0$$

$$v'_A - v'_B = 0 \quad \dots \textcircled{3}$$

式①, ③より、

$$\therefore v'_A = 5 \text{ m/s}$$

$$\therefore v'_B = 5 \text{ m/s}$$

(3)

$$\frac{v'_A - v'_B}{v_B - v_A} = e \text{ より、} \quad (\text{反発係数の公式})$$

$$v_A = 0 \text{ m/s} , v_B = 10 \text{ m/s} , e = 0.6$$

を代入して、

$$\frac{v'_A - v'_B}{10 - 0} = 0.6$$

$$v'_A - v'_B = 6.0 \quad \cdots \textcircled{4}$$

式①, ④より、

$$\therefore v'_A = 8 \text{ m/s}$$

$$\therefore v'_B = 2 \text{ m/s}$$