Momentum, Collisions and Stopping

Forces and motion · 4 questions · step-by-step answers at the end

Name: Date: Score: / 4

USEFUL EQUATIONS

$p = mv$ $F = \Delta p / \Delta t$ $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$

Questions

Show your working in the space under each question.

1. A 0.40 kg ball moving at 15 m/s is stopped in 0.050 s. Find the force.

2. A 2.0 kg trolley moving at 3.0 m/s hits a stationary 1.0 kg trolley and they stick together. Find their speed afterwards.

3. Two skaters stand still. A 60 kg skater pushes a 40 kg skater, who moves off at 3.0 m/s. Find the velocity of the 60 kg skater.

4. The braking distance at 20 m/s is 40 m. What is it at 40 m/s?

Step-by-step answers

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1. Δp = 0.40 × 15 = 6.0 kg m/s; F = 6.0/0.050 = **120 N**.

2. 1. Momentum before = 2.0 × 3.0 + 0 = **6.0 kg m/s**.
2. Afterwards the combined mass is 3.0 kg: 3.0 × v = 6.0.
3. v = **2.0 m/s** in the original direction.
Answer: 2.0 m/s

3. Total momentum stays zero: 60v + 40 × 3.0 = 0, so v = **−2.0 m/s** (2.0 m/s the other way).

4. Speed doubles, so braking distance is ×4: **160 m**.