20-P-Mom-JK-499. Mammoths

Momentum Conservation
Two mammoths collide head on

Same coding as for the two cars crashing problem, 20-P-Mom-JK-433

Question One – momentum conservation
What would be the final velocity of both the mammoths immediately after the collision? Assume this is a perfectly inelastic collision – that means they collide and stick together after the collision.
Mammoth A has a mass of 1210 kilograms and was heading to the right at 27.0 metres per second.
Mammoth B has a mass of 1710 kilograms and was heading to the left at 22.0 metres per second before the collision.

Take to the right to be positive.

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According to Wikipedia, "The mammoth was identified as an extinct species of elephant by Georges Cuvier in 1796. The woolly mammoth was roughly the same size as modern African elephants. Males reached shoulder heights between 2.7 and 3.4 m (8.9 and 11.2 ft) and weighed up to 6 **metric tons** (6.6 **short tons**)."

According to https://www.speedofanimals.com/animals/elephant, the top speed of a modern elephant is 8.2 m/s with a weight of 8.8 tons, so the mammoth speed would be similar.

m_A ranges from 3000 kg to 4000 kg

v_A ranges from 5.5 to 7.00 m/s to the right

m_B ranges from 5000 kg to 6000 kg

v_B ranges from 1.2 to 2.50 m/s to the left or negative

So the final velocity will always be positive or right.
To the right is positive.

Answers

mA = 3000 kg

vA = + 5.5 m/s

mB = 6000 kg

vB = - 2.5 m/s

total momentum before = mAvA + mBvB = 1500 kg m/s to the right
or + 1500 kg m / s if to the right was positive

by the law of conservation of momentum
total momentum after = total momentum before = +1500 kg m / s

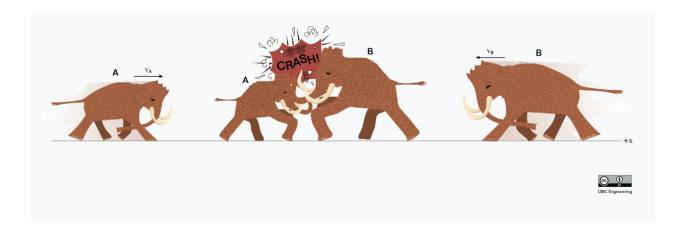total momentum after = (mA + mB) vAFTER

vAFTER = (1500 kg m/s) / (mA + mB)

v AFTER = 0.1667 [m/s] to the right
v AFTER = + 0.1667 [m/s]

v AFTER = (mAvA + mBvB) / (mA + mB)

Image 499-collision1.png

20-P-MOM-JK-499-collision2.png