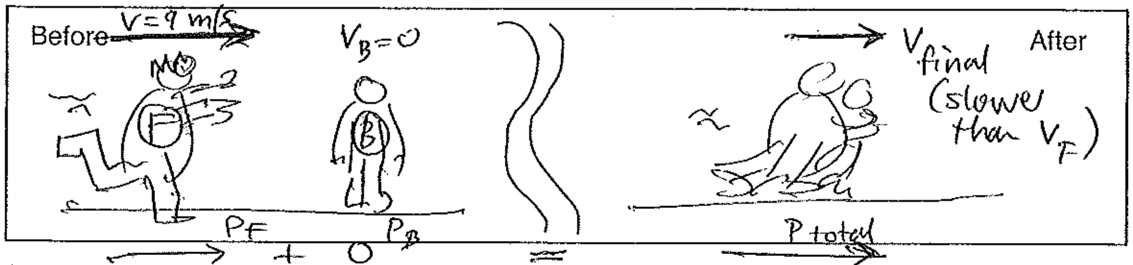
Physics 14 - Quiz 6 - Spring 2009[a]

SHOW ALL YOUR WORK AND REASONING

1a. (2 pts) Fred, a 120 kg football player, runs at 9 m/s into Barney (mass = 60 kg), who was at rest. Fred holds onto Barney after the collision.

Draw a picture showing them just before and just after they collide. Show their velocities accurately by drawing vectors of different lengths.



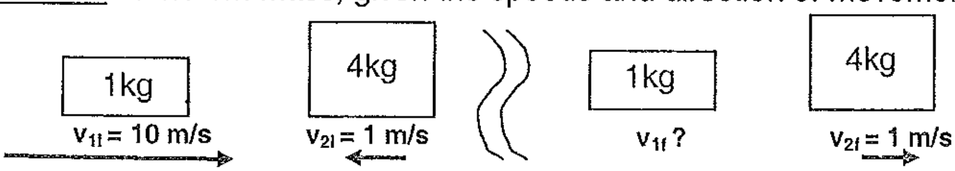
1b. (1 pt) Who has the greater acceleration during the collision? Explain.

Barney: Both feel the same force, but their masses are different ⇒ $a = \frac{F}{mass}$ → smaller mass ⇒ bigger accel.

1c. (1 pt) Whose momentum is greatest just after the collision? Explain.

They are moving at the same speed, but Fred's mass is bigger ($p = mv$) ⇒ FRED has more momentum.

2. (4 pts) Two carts collide and bounce, as shown below. Calculate the final speed and direction of the 1m mass, given the speeds and direction of movement below.



$P_{initial} = P_{final}$

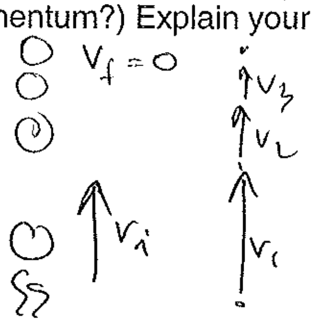
$m_1 V_{1i} + m_2 V_{2i} = m_1 V_{1f} + m V_{2f}$

$+(1)(10) - (4)(1) = (1) V_{1f} + (4)(1)$

$10 - 4 = 6 (4) = V_{1f} + 4 \; (-4)$

$2 = V_{1f} \Rightarrow V_{1f} = 2$ m/s (to right)

3. (2 pts) You throw a ball straight up into the air. Is the ball's momentum conserved or not conserved as it moves upward? (In other words, is its initial momentum equal to its final momentum?) Explain your answer.



It's momentum is changing – it is not conserved because there is an external force acting on the ball.

(Also, you see velocity changing ⇒ p changes)